# **KEYNOTE**

## The Role of Science, Technology and Innovation in Driving National Development

Prof. Dr. Bai Chunli President, Chinese Academy of Sciences, China

### Planning for Future with Science, Technology and Innovation

Prof. Dr. C N R Rao Jawaharlal Nehru Centre for Advanced Scientific Research, India

# **Plenary Session I**

# Nepal Graduation from LDC to Developing Country Status (PL-PL-1)

PL-PL-1-905

### **Driving Economic Growth in Nepal through Infrastructure Development**

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Infrastructure development is one of the core elements of growth strategy in developing countries. Most developing countries lack capital resources and technical capacity necessary for infrastructure development. In contrast, domestic capital, foreign exchanges (mainly from remittance), and thousands of young engineers have been largely underutilized in Nepal. Large portion of annual budget allocated for infrastructure projects remains unspent. On the other hand, aspiration for infrastructure building in a rapid pace is ever growing at both people and leadership level. The challenge is therefore to identify the critical gaps that are hindering infrastructure development, and devise effective policy to bridge these gaps. Nepal is, in fact, conventionally relying on donors' support for funding/financing and technical capacity. But donors' procedure for project implementation did not adequately focus on capacity building of domestic entities such as government agencies, consultants and contractors. Donors' stringent conditions on environment and social safeguards make the task of implementing infrastructure project quite complicated and challenging. Nepal should therefore chart a new strategic path to accelerate the pace of infrastructure building. Valuable lessons can be learnt from the experience of successful Asian countries. These includes, inter alia, provision of alternative funding sources for infrastructure investment, developing domestic capacity through learning-by-doing approach, emphasis on research in both policy and technical areas, and promoting public-private partnership for efficiency and innovation. Most importantly, being a latecomer Nepal can reap benefits from latest and innovative technologies in order to build modern and efficient infrastructure system.

PL-PL-1-874

### Current Energy Consumption Trends and Energy Security of Nepal

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Lack of access to modern and clean energy services is considered as one aspect of the energy poverty. The two major challenges of energy poverty are (a) lack of access to electricity and (b) reliance on biomass sources of energy for cooking. Nepal has the highest energy poverty in the South Asia, and it is becoming more and more dependent on imported and heavily subsidized fossil fuels. Nepal is facing a difficult energy supply crisis. The traditional energy source such as fuelwood has become scarce everyday with the growing population and people's migration from hilly region to southern plains. The forests are eventually becoming denuded. Due to the increase in the international prices of the petroleum products and the country's growing dependence on petroleum products, much of the export earnings are being used up for importing them. This dependence is precarious for the country's economy. In the power sector, the installed capacity was 780 MW and the peak

demand rose to 1,300 MW in December, 2014. The current growth in electricity supply is not keeping up with the increasing power demand, even though as per WECS (2010) and Dr.H.M. Shrestha (1965) Nepal has hydropower potential of 83.000 MW. of which 42.000 MW are considered economically viable. Overall, the demand for energy is growing at a rapid pace but the supply side is facing a lot of bottlenecks. No wonder, Nepal is facing dire energy crises day by day. It has become essential to have an integrated energy policy in the present context for energy crisis and long term energy security. As bottom - up modelling framework is preferably used for long term energy planning and policy analysis, The MAED - MARKAL integrated framework for Nepal was built up with a base year of 2010 and a target year of 2030. Alternative scenarios for 2030 were drawn up for different economic growth rates, sectoral growths, energy efficiency measures and inclusion of renewables in the supply side. Analysis of the different alternative scenarios indicates that Nepal can achieve substantial economic growth rates with no significant increase in greenhouse gas emissions, provided that it follows a policy pathway with high renewables and energy efficiency measures. This pathway results in enhanced access to modern energy and achieving the objectives of SE4ALL goals by 2030. Furthermore, it also indicates an enhanced energy security with drastic cuts in fuel imports and GHG emissions by 2030. The share of renewables is increased to 22% in 2030 from 3% in 2010.

# **Plenary Session II**

# Reconstructing Nepal in the Aftermath of the Gorkha Earthquake (PL-PL-2)

PL-PL-2-892

### Himalayan Tectonics: How Vulnerable Are We?

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Origin of the Himalaya and Tibet was seeded after the collision between the Indian plate and Asian plate at around 55 millions year ago (Le Fort, 1975). The Himalaya accommodates a significant proportion of Indo-Asia convergence during crustal shortening and mountain building processes. Total convergence rate between India and Asia is ~5 cm/year, while the convergence across the Himalaya is ~2 cm/yr (Bilham et al., 1997). During the orogenesis several large-scale faults and folds were developed to accommodate the convergence rate. Similarly, micro-seismically active duplex, lying close to a major anticlinorium, has also been recognized in the central Nepal (Pandey et al., 1999).

The tectonic-induced relative vertical upliftment of the mountains, which is at around 4 mm/yr in the Nepalese Himalaya, mimics the inter-seismic strain energy accumulation (Jackson et al., 1992). The Gorkha Earthquake of 25<sup>th</sup> April 2015 is a state of energy release of a fraction of such elastic strain that consequently triggered coseismic slip of Kathmandu valley at around 1.6 m towards south (Galetzka et al., 2015). The upliftment process is generally accompanied by increasing slopes' steepness which, in conjunction with intense precipitation, contributes to intense soil erosion, landslides, and floods. At the same time, the earthquake itself also triggers landslides, snow avalanche, glacial lake outburst floods, and related other hazards. Thus, the whole Himalayan region is vulnerable for, among others, various types of geo-hazards. But the state of preparedness is still not in satisfactory condition putting the lives of millions peoples, and physical infrastructures at great risk.

### PL-PL-2-887 Science, Technology and Innovation for Nepal's Meaningful Graduation from LDC Status

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There is a gulf between what the United Nations says is required for Least Developed Countries (LDCs) to graduate out of their present status and whatthe public perceives is necessary to genuinely feel that they are no longerun developed. A triennial review in March 2015 found Nepal eligible forgraduation from LDC status for the first time because it crossed the thresholds in the two of the three criteria: economic vulnerability and human assets. However, Nepal remains income-poor which would be needed foran "effective graduation," and not a mere technical promotion. Without growth picking up, it will also be difficult to ask the nation to for go some of the concessions – in terms of overseas aid or trade preferences – that LDCs have traditionally enjoyed. For a lasting graduation, therefore, Nepalmust make better progress on science and technology, including low-costimitation, innovation and indigenous adaptation, in ways that trigger and sustain high growth for at least a decade.

PL-PL-2-877

# Learning from History and its Dissipation for Disaster Risk Management in Nepal

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Nepal can also be levelled as the mini market for disasters due to the occurrence of fair numbers of disasters despite its relatively small size. Some disasters such as fire, flood and landslide occur in annual basis in Nepal. The high mountains and hills of Nepal are vulnerable to landslide and fire while the plains suffer from flood and fire. Moreover, it is struck by earthquakes large and medium every hundred and fifty years respectively. The Gorkha earthquake that occurred in April 2015 and the Udayapur earthquake in 1988 reflect this reality. People in Nepal have been using indigenous methods since time immemorial to combat these disasters. Some of them such as earthquake resistant technologies used since a long time resemble the present recipes prescribed in the Building Code indicating that the indigenous means were sound and robust which are otherwise written off as ineffective and inefficient. However, the adoption of history is not always easy. This article describes how the adoption of history was not accepted by a community despite being affordable and reliable leading to the development of new technology. This technology was dissipated by the students in five districts of Nepal which remain unaffected by the last earthquake. This model could be emulated in Nepal successfully. The article also describes how the student dissipation model is being tried in the case of few other disasters in Nepal.

# **Plenary Session III**

Science Focus (PL-PL-3)

PL-PL-3-61

### **Development of Dual Activation Catalysts**

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The catalytic enantioselective reaction is an ideal method to obtain optically active compounds from a small amount of chiral compound. In this presentation, three kinds of dual activation type catalysts (or multi-functional catalyst) for carbon-carbon bond-forming reactions will be discussed. Two functionalities on the catalyst molecule can activate the substrates cooperatively to afford the product in high yield with high enantioselectivities. The first one will be a heterobimetallic catalyst consisting of a rare earth metal, three alkali metals, and 1,1'-bi-2-naphthol (BINOL) moieties, which realized the first enantioselective Henry reaction (nitroaldol reaction) etc. The second one will be a dinuclear vanadium catalyst which promoted the oxidative coupling of polycyclic phenols in high enantiocontrol. The last one will be acid-base type organocatalysts which contain no metal species in the structure of the catalyst. The acid-base type organocatalysts can be used for aza-Morita-Baylis-Hillman (aza-MBH) reactions and some domino type reactions based on aza-MBH reactions.

PL-PL-3-879

# Climate and Landscape Changes in the Himalayas and the Tibetan Plateau During the Last Millennium: What Can We Learn From Tree Rings?

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The Himalayan-Tibetan plateau region is currently facing strong climatic changes that have far-reaching effects on landscape dynamics and ecosystems. As long-living organisms, trees can archive information on environmental changes in their tree rings with an annual dating precision. The wood of trees offers a wealth of different parameters that show site-specific and species-specific sensitivity to different climate factors. Ring-width variations are sensitive for winter temperatures at high-elevation sites, while in semi-arid areas, the can indicate annual or seasonal precipitation. Summer temperature variations are best recorded by maximum latewood density. Stable oxygen isotope ratios in tree-ring cellulose are indicators of summer moisture variability, whereas stable carbon isotopes are species-specific indicators of the ability to adapt water use efficiency to climatic changes. The presentation will provide an overview of existing tree-ring networks and major results of climate reconstruction efforts over the Himalayan-Tibetan region for the past Millennium. Of special interest is the link of climate variability and resulting changes in landscape dynamics. Glacier advance and retreat periods on the eastern Tibetan plateau since the Medieval warm period were reconstructed using moraine dating from trees growing on glacial deposits. Ages of maximum glacier advance periods show large-scale common characteristics, with major glacier advances during the Little Ice Age period in the pre-16<sup>th</sup> century, and around 1780, 1820, and 1910. Despite of large-scale similarity, each glacier shows local characteristics according to topographic and local climatic conditions. Stable oxygen isotopes in tree rings from glaciernear sites indicate that not only temperature changes, but also precipitation variations had an impact on glacier mass balances. New findings provide indication that a strengthened activity of westerly winds might have increased winter precipitation input in some regions.

PL-PL-3-876

#### **Chemistry and Bioactivity of Natural Products from Medicinal Plants**

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Chemical studies on a large number of Chinese medicinal plants (including TCM) have led to the identification of a big array of structurally interesting and/or bioactive components (1-8), e.g. anticancer, antiHIV and immunosuppressive agents [1,2]. Some compounds have been selected as lead structures for our drug development program, and over one hundred of modified chemical entities with significantly improved activities were also obtained; biological evaluation showed that some of the compounds exhibited remarkable anticancer (both cytotoxic and antiangiogenesis), immunosuppressive and antiHIV activities; several groups of bioactive compounds showed very clear structure activity relationships; A few of structurally interesting and biologically important compounds have been synthesized [2]. Our studies have provided good scientific background for drug development and understanding of the function and toxicity of the involved medicinal plants.



# **Plenary Session IV**

# Sustainability, Climate Change, Economy : A Multidisciplinary Perspective (PL-PL-4)

PL-PL-4-909

Agricultural Development for Nepal's Graduation from Least Developed Country Status

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Nepal aims to graduate from least developing country status by 2022, to achieve this target, under Economic Vulnerability Index (EVI) agriculture plays vital role to meet the requirements. In Nepalese, context agriculture has been considered as important vocation for the

socioeconomic development of the majority people for years. Records show that Implementation of first five year plan also the emphasis has been laid on agriculture and infrastructure development and employment generation. Out of 13 periodic developmental plans implemented, 9 have given the priority to agriculture, indicating that in Nepal inclusive economic development of the country can be achieved only through the development of agriculture sector among others. Agriculture contribution national economy is 34.7 % (Economic Survey 2013/14, MoF) and employs more than 66 % people and makes up 49 % of the Households income. In spite of priority in documents and some progress agricultural sector in Nepal is still in a low development stage, the growth has been not only slow (about 3%), but also highly variable mainly due to, low investment, high cost of production, weak governance, frequent natural disaster, poor access to appropriate technology to small farmers, low investment in research, irrigation facilities development, market and post production facilities along with political unrest, ( hartal/bandh )and blocked from time to time and land fragmentation (0.66 ha on average divided into 3 parcels). In order to meet the LDC graduation agriculture sector requires significant change with high degree of commercialization of subsistence agriculture within 2022. Development challenges are many, and new challenges of capacity-building and human resource development food safety and increasing demand of total food requirements (approximately demand for food grains would increase from 6463900.16Mt in 2016 to 6906450.8Mt in 2021). The demand for highvalue commodities (such as horticulture, dairy, livestock and fish) is increasing faster than Food grains. Globalization is opening enormous opportunities for food and processed commodities while at the same time throwing challenge of competing globally. To address all these issues the government of Nepal MoAD has approved Agriculture Development strategy and the strategy and approaches taken in the ADS support to meet the agricultural progress requirement to graduate into developing county status by 2022. ADS efforts are towards reduction minimization of the instability of agriculture production, diversification and quality enhancement of products, development of rural infrastructure, and mechanization of agriculture. It aims to be in Self-sufficiency in food grains and reduce trade deficit to 0%. importantly it aims to maintain Average annual growth of AGDP at 5-6%.

PL-PL-4-880

# Harnessing Science and Technology for Economic Development: Experiences from Singapore

#### R. Subramaniam

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Singapore is a small country in south-east Asia, with no natural resources. Despite these limitations, the country has made tremendous economic progress and has reached the status of a developed nation. While there are a number of factors that underpin Singapore's progress, key reason for its rapid advancement is the pronounced emphasis that it places on science and technology. The country has invested significantly in building science and technology competencies through education and tertiary institutions, with people being the main beneficiaries. Singapore was the first country in the world to set up a nation-wide broadband network for Internet access, and this has spawned the formation of numerous businesses that are able to ride on the network to promote growth. A vibrant knowledge infrastructure is also in place, and this has promoted collaboration between the private and public sectors. Further, probusiness policies and incentives are in place for multinational companies to invest in a range of businesses activities in Singapore by tapping on its skilled workforce. To reiterate the importance to people of science and technology in everyday life, there is also emphasis on non-formal science education, and this is driven by the science center as well as scholarly academies and scientific societies. The plenary address will provide further examples from the Singapore context and underscore the potential of science and technology for economic development in today's world.

#### Innovate to Educate: Motivate to Innovate

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For as long as a country is unable to extend the opportunity of access to high quality secondary and tertiary education - particularly in science, technology, engineering and mathematics - to all those who would qualify as students, it is without question that its rate of national development will be restricted. Nepal is currently in the lowest country grouping by Human Development Index and ranks 100 out of 140 countries in the annual Global Competitiveness Report, with notably low scores on both technology readiness and higher education and training. Nepal will only realise its enormous potential to become a developed or middle-income country if leaders focus on extending high guality education and training to all. This isn't about meeting number targets for children in classrooms: it's about overcoming enormous challenges to support and develop the next generation to create and excel in jobs and professions that don't even exist vet. In this presentation I argue that it is precisely those groups who are traditionally hardest to reach women, people with disabilities, the poor, the rural remote - who have the greatest capacity for innovation in development, because they have the most to gain. Traditional, classroom-based teaching is not going to bring about transformational change on the scale that is needed. It's time for a paradigm shift in the national approach to education. I offer the case study of The Open University UK, established in the 1970s with a mission to be open to people, places, methods and ideas. Higher education, previously available only to a wealthy elite, became an option for anyone with the will to study. Over nearly 50 years the university has continued to adapt and innovate in order to stay true to its mission, and is recognised by students and employers for the outstanding quality of both the experience and qualifications that it provides. As Nepal's leading experts and teachers of science, engineering, technology and mathematics, I challenge you to identify what innovations are needed in order to bring equity of access to your most hard-to-reach students, and how you can motivate them to become the innovators for Nepal's graduation to developing country status.

# **ORAL SESSION**

# Agronomy and Horticulture 1 (O-AH-1)

O-AH-1-160

# Fruit Quality Characters of Tomato (*Solanum lycopersicum*) Genotypes Differed by Maturity Stages

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Fruit quality parameters are important criteria for selection of appropriate genotypes for specific consumer's preferences. The general purpose of this study was to determine the qualitative characteristics (ascorbic acid, total soluble solid (TSS), pH, colorimeter reading) of tomato genotypes harvested at six different stages of maturity (green, breaker, turning, pink, light red and red). Seven advanced lines from AVRDC; AVTO 1288, AVTO 1289, AVTO 1418, AVTO 1424, AVTO 1455, AVTO 9331, AVTO 9708 and one local variety Pusa Ruby were used in the analysis. The result sowed that all the treatments had significant influence on level of colorimeter reading (L\*, a\*, b\*), ascorbic acid, TSS and pH. Color index L\* has tendency to decline while opposite tendency was recorded with color index a\*, which has tendency to increase during tomato ripening. The fruit harvested at light red stage retained significantly higher vitamin C than the fruit harvested in dark red stage while the highest TSS and pH was recorded at dark red stage of tomato. Generally light red color and deep red color of tomato had better quality. Therefore choosing appropriate genotype and suitable stage of maturity can increase fruit quality of tomato and will enhance the flexibility of farmers and traders to when and where to market their fresh tomatoes in order to make maximum profit.

O-AH-1-163

# Development of Sustainable Harvesting and Post Harvest Technology of Shatavari (Asparagus racemosus) in Sarlahi District of Nepal

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Satavari is a valuable medicinal plant found in tropical and subtropical regions of Nepal & India. Satavari is mainly cultivated and domesticated in private & public land in Dhanusha, Sarlahi, Parsa, Bara and Makwanipur districts of Nepal. Among these districts, Sarlahi is very famous for its cultivation. Asparagus contains chemical constituents such as steroidal glycosides (asparagosides), bitter glycosides, asparagin and flavonoids. Fresh leaves yield diosgenin and other saponins such as shatavarin I to IV. Due to lack of proper harvesting methods, farmers don't get good yield resulting in yield loss and deteriotating

quality. Therefore, there is dire need to develop sustainable harvesting and postharvest technology methods for mobilization, cultivation, germplasm conservation, extraction and value addition. The research experiment was carried out for three years in Sarlahi district. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications and four treatments. Tubers of *Asparagus racemosus* were harvested viz: 50%, 75%, 87.5% with comparison to control(100%). The harvested roots were washed with water and dried by 3 techniques: shade drying, boiling in big drum and autoclave (5-10 minutes) to remove barks from roots. The highest yield (5.91 T/ha) was found in 50% harvested tubers on the basis of crop growth, number of tubers, their length and dry weight.

*O-AH-1-187* 

# Prevalence of Citrus Huanglongbing Disease in Various Districts of Nepal Based on PCR-based Diagnostic Assay

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Huanglongbing (HLB) disease or citrus greening disease is the most serious and destructive disease of citrus around the world including Nepal. HLB disease being a quarantined disease, the fruits as well as the planting materials to be exported to other countries need to be HLB free and has to be certified via using standard disease diagnosis technique such as Polymerase Chain Reaction (PCR). The aim of this investigation was to determine the distribution of HLB infestation in various citrus nurseries and orchards of Salyan, Syangja, Parbat and Kirtipur districts of Nepal. The field visit to Salyan was carried out in 2013 and to Syangja and Parbat districts in 2014. Altogether 341 samples were analyzed for the detection of HLB disease using 16s rDNA PCR assay. The amplification of 1160 bp long fragment of HLB organism using primers OA1, OI1, and OI2C. DNA extraction was carried out by using DNeasy plant DNA Extraction Kit (QIAGEN). The PCR reaction was performed in 50 µl reaction volume and PCR products were analyzed by using 1.5% agarose gel in 1X TAE buffer. Out of 341 suspected samples of mandarin (Citrus reticulata), 50 samples were detected positive for HLB disease. Results indicated the incidence of HLB disease in all districts under study, where 21.25% samples were found positive in Salvan district, 19.08% in Svangia and Parbat districts and 3.077% in Kirtipur district. Based on the results of the study it can be stated that the disease has already become widespread in these districts. Therefore, an urgent need has been felt to develop and implement special program on Citrus HLB disease and its vector for its effective management and prevention of further spread so as to save Nepalese citrus industry. NAST is providing routine analytical service of diagnosis of HLB disease since 2002 to the citrus farmers and all citrus research stations of Nepal for the effective management of this deadly disease.

#### O-AH-1-211

### Study of Effectiveness of Farmers Led Experiments and on-farm Research in Terms of on-farm Technology Generation and Dissemination of Agricultural Technologies in Selected Districts of Nepal

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The Farmers Led Experiments (FLEs) are becoming a systematic pool between farmers and scientists to better disseminate the agricultural information in the HELVETAS project sites.

The farmer's field observations and outcomes of the study of Dailekh and Ramechhap districts of Nepal and the general recommendations made in the present study would be the tool for guiding and offsetting the dialogue among the stakeholders in future. As has been noticed in discussions with the experts from line agencies, the pathway for establishing the functional relationships between agricultural research, extension and education can be structured to reflect an order of participatory activities in order to learn from farmers and assessment of farmer's needs and capacities together. Likewise, it would be helpful to identify technological options to test and keeping knowledge of farming systems diversity through participatory design of methods and evaluation of impacts and feedback looping to research institutes including the academia. The firm output thus can be included into the new academic curricula. For all above, participation of farmers, scientists (both from academia and research) and extension works is a dire need to promote the agricultural technologies in order to improve the future agricultural production, although there are no hard and rigid rules to involve all the three interfaces in local level.

O-AH-1-257

# Evaluation of Improved Nutrient Management in Growth and Yield of Rice in Jhapa District

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Rice, the major staple food crop contributes 20% of AGDP and is prioritized in every agricultural plans and programs of the country. Yet the productivity of the crop is only 3.171 t/ha, owing majorly to low input (majorly plant nutrients) and lack of site-specific nutrient management practices. A field experiment was therefore conducted on farmer's field at two sites of Jhapa district viz. Dhukurpani (Damak and Gauradha) using Nutrient Expert® Rice model from 3rd week of July to 2nd week of October. The experiment was conducted in Randomized Completely Block Design replicated among thirteen farmers. Three treatments were NE (Nutrient Expert recommendation), GR (Government recommendation), and FP (Farmer practices). The result revealed significant difference in terms of no. of effective tiller/ m2, plant height, yield at 15.5% moisture and straw weight. The highest yield (5 ton ha<sup>-1</sup>) was obtained from NE followed by GR (4.08 ton ha<sup>-1</sup>) and FP (3.8 ton ha<sup>-1</sup>). NE based practices produced significantly higher yield and in comparison with GR. The yield estimated by Nutrient Expert® (NE) proved to be attainable at farmers' field, thus validating the NE model and can be recommended at field level for better yield.

*O-AH-1-302* Agricultural Sustainability: A Comparative Analysis of Organic and Conventional Farming Systems in Chitwan District, Nepal

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Rapid changes in the social and economic environment together with the deterioration of the natural resource base threaten the sustainability of farming systems. Thus, an urgent need to improve the environmental, economic and social acceptability for sustainability of farming systems has been felt clearly. The study is aimed to assess the sustainability of the organic and conventional farming systems based on their environmental soundness, economic viability and social acceptability. This study was carried out in Phulbari and Shivnagar VDCs of Chitwan District. The primary data on socio-economic status of farmers, farm characteristic, input and output of the agricultural systems and their economic values were collected through

door to door interview using semi-structured questionnaire. Soil fertility status was determined by laboratory analysis of soil samples. Significant differences were found in soil fertility management, pest and diseases management and labor cost. No remarkable variations were found in land use pattern, cropping pattern and crop yield. However, there is a significant variation in the gross margin/labor force and benefit cost ratio. Although the yield of major crops is higher in the organic farming system, economically conventional farming system is found more viable. The findings suggest that organic agriculture could be an economically and environmentally viable alternative to the conventional agriculture, if market distortions created by subsidies were removed, premium price was set to the organic products and giving financial benefits to organic farmers.

O-AH-1-40

# Effect of Variety and Practice of Cultivation on Yield of Spring Maize in Terai of Nepal

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This study conducted in farmer's field of Maina Pokhara and Deudakala of Bardiya district aimed to identify an appropriate farmers practice and improved practice of cultivation of maize in spring season. Two maize varieties Raikumar (hybrid) and Arun2 (Open Pollinated Variety-OPV) were sown at the field of 6 different farmer's field of two VDCs. Result obtained from the analysis revealed that the effect of cultivation practice and their interaction effect on grain yield were found non-significant but the response of the variety were found different significant on grain yield. Raikumar produced the highest average grain yield of 5.13 t/ha. The result further indicated that Rajkumar variety (hybrid) performs better then Arun 2(Open Pollinated Variety) in both improved and farmers practice of cultivation. Maximum grain yield ranging from (3.17 to 7.25 t/ha) and (1.60 to 6.32 t/ha) was produced by Rajkumar in improved practice and farmers practice of cultivation respectively. While minimum grain yield was found in Arun2 ranging from (0.95 to 4.43 t/ha) and (0.81 to 4.09 t/ha) in improved practice and farmers practice of cultivation respectively. P1V1 scored the highest score followed by P2V1, P1V2 and P2V2 in farmer's preference ranking. Raikumar variety cultivated with improved practice was found giving the best yield while performing economic analysis with highest net return and B:C ratio of Rs. 30047.7 and 1.41 respectively.

> O-AH-1-58 tuwa (Paris

# Techniques of Domesticating Chiraito (*Swertia chirayita*) and Satuwa (*Paris polyphylla*): A Case Study of Rasuwa district of Nepal

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The increasing demand of the Himalayan herbs in the international markets has caused the over-and unscientific harvesting of many medicinal and aromatic plant (MAP) species in Nepal. This has caused a rapid depletion of many species including Chiraito (*Swertia chirayita*) and Satuwa (*Paris polyphylla*) in Rasuwa district of Nepal. In order to reduce MAP exploitation and retain in its natural habitat and to encourage private farmers in domesticating and cultivation, Government of Nepal (GoN) has recently promulgated a Forest Policy. The policy aims at developing cultivation techniques of various MAP species and handing over to private farmers. Fortunately, most MAPs can be domesticated successfully both for domestic

and commercial market. In the absence of appropriate techniques, the process of domestication has not been enhanced yet. Domestication process also embraces issues of economic and scale. Hence, a study of domesticating *Swertia chirayita* and *Paris polyphylla* was under taken in Rasuwa district of Nepal for about 18 months. The case study shows that selection of sites, farmers' group formation, effective and efficient process of service delivery, interaction meetings, capacity building, preparation of business plan, networking and coordination for market flow and scientific technique of propagation, are very important elements for successful domestication of MAP species.

O-AH-1-83

# Evaluation of Organic and Inorganic Methods of SRI along with Direct Seeded Rice

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Consumer's concern towards organic production is increasing. The organic product has high market price and demand in international market. The System of rice intensification (SRI) promotes soil microbial activities and increased soil fertility hence is more suitable for organic production system. Field experiment was conducted during rainy season (June to October) 2014 at Regional Agricultural Research Station, Khajura, Banke, Nepal to study the performance of different rice cultivation methods on productivity using drought tolerance, medium grain rice variety "Sukha dhan-3". Treatments consisted of different rice cultivation methods viz., transplanted rice (conventional), direct seed rice (wet seeded), direct seed rice (dry seeded), SRI and and organic SRI. Results revealed that maximum number of tillers/m2, higher shoot length at maturity were recorded under organic SRI followed by SRI, while, conventional and direct seeded rice have lower growth parameters. Organic SRI produced the highest grain yield (7.53 mt/ha), followed by SRI (6.54 mt/ha) while, the lowest grain yield (4.02 mt/ha) was recorded under dry direct seeded rice. Similarly the highest straw yield (22 mt/ha), tiller per m2 (244.00), filled grain per panicle (195.60) were also recorded in organic SRI. The conventional rice cultivation and direct sown rice produced lower grain yield per unit area. Thus the present study shows the SRI is more suitable for organic production system and can be recommended in organic system to increase the rice productivity.

# Agronomy and Horticulture 2 (O-AH-2)

O-AH-2-900-I

# Prospects and Challenges for the Commercialization of Horticultural Production in Nepal

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Nepal situated in between 26° 22' to 30° 27' north latitude has three distinct geographical regions; mountains, hills and terai. Hills and mountains have diverse agro-ecological niches suitable to grow different kinds of plant species. Various kinds of tropical and sub-tropical fruits can be successfully produced in terai and lower hills. Eastern terai is suitable to produce mango, banana, litchi, papaya and pineapple. Banana can be successfully grown in humid terai areas like; Jhapa, Morang, Chitwan, Nawalparasi, Kailali and Kanchanpur. Citrus can be

produced throughout the mid hills. Climate in Sindhuli, Ramechap and Dadeldhura suitable to produce sweet orange. Eastern hills are very much suitable to produce limes and lemons. Kavrepalanchowk, Dolkha and Illam have suitable climate are to produce kiwi fruit. Sankhuwasava, Illamandneighbouring districts are very much suitable to grow cardamom. Hilly areas having high rainfall and relative humidity in eastern Nepal are suitable for tea cultivation, while Gulmi, Palpa and other districts having similar climate in the mid hills are suitable for the production of coffee. High hills of western Nepal which have low rainfall are very much suitable for the production of deciduous fruits. Apple is the most important deciduous fruit grown in higher altitude. Potential pocket areas for specific crop species has been identified and presented. Besides, most of the winter season vegetables in terai and neighboring India can be easily produced during spring and summer in the hills (off-season vegetables). There is great scope to promote commercial production of off-season vegetables, flowers, tea, coffee, spices and medicinal herbs in hills and mountains and exportto India. Bangladesh and other countries.Nepal has being the member of WTO has got the privilege to export its produce. Despite of great potentiality, the major constraints for commercial production are lack of know-how of production and postharvest handling technology, subsistence farming system, small land holding and fragmented land, lack of infra-structure, unavailability of good quality seed and other inputs, problem of market linkage, low volume of production, lack of processing technologyand scattered production.

O-AH-2-334

# Performance of Essential Oil Chamomile (*Matricaria chamomilla* L.) under Different Planting Methods, Manure and Fertilizer in Kathmandu Valley

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Field experiments on essential oil chamomile were conducted first time in Kathmandu valley, Khumaltar during winters of 2011-2013. The purpose of research was to evaluate growth performance and oil content for commercial cultivation of the herb. The results of variety cum planting method experiment revealed encouraging growth in row sowing, beneficial against broadcasting and transplanting. The major agronomical traits: plant height, No. of branches, flowers, buds, biomass yield were significantly (P<0.05) higher in row sown and transplanted plants. The newly introduced German variety had higher height, branch numbers, leaves, flowers and buds than Tarai local variety. The essential oil content had no difference between varieties but transplanted one gave higher oil percentage (0.95 %) than broadcasted (0.80%) which had significantly higher population. Another experiment was to determine appropriate rate of manures and fertilizers for better growth and higher oil content of German variety chamomile. Higher branch numbers, flowers, buds, biomass yield, plant height were recorded in the treatments with higher rate of cow and pig manure (@20 t/ha) and in combination (NPK 60:40:20 and manure 10 t/ha). The results were significant (P<0.05) and at par between the treatments. The chemical fertilizers (N:P:K @ 60:40:20 kg/ha) found not effective to enhance growth and oil percent. The oil content was highest in manure applied (20 t/ha) followed by combined fertilization (0.80%) treatment. Low rate (10 t/ha) could not increase oil in the fruit (<0.7%). It is concluded that the 3 years results suggest successful cultivation of chamomile by growers for income generation in the valley.

O-AH-2-335

# Performance of Maize-Wheat Cropping System as Affected by Tillage Methods, Residue Levels and Maize-Soybean Intercropping in Terai, Nepal

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A field experiment with three factors each with two levels i.e. tillage (CT: Conventional Tillage and NT: No Tillage), residue levels (RK: Residues Kept and RR: Residues Removed) and cropping system (maize - wheat and maize + soybean - wheat) was carried out to identify the effects of various tillage, residue levels and cropping systems on crop and system yields, economics and soil properties at Rampur, Chitwan during 2014 and 2015. Experiment was laid-out in strip-split plot design with eight treatments replicated four times. Individual crop and system yields, different soil properties and economic parameters were recorded and analyzed. System yield was significantly the highest (17412.7 kg ha<sup>-1</sup>) in NT, RK and maize + soybean-wheat system whereas the lowest system yield (11770.7 kg ha<sup>-1</sup>) was recorded in NT and RR plot with maize-wheat system. Tillage did not affect the soil organic matter (SOM) content; however, RK field had higher SOM of 3.73 compared to 3.49% in RR. Similarly, maize + soybean - wheat had the highest value of SOM with 3.66 over the field with maizewheat with 3.57 %. Maize + soybean-wheat had the highest value 0.172 available nitrogen over 0.165% in maize-wheat. Similarly, the highest value of available  $P_2O_5$  with 33.26 kg ha<sup>-1</sup> was in NT over CT with 32.59 kg ha<sup>-1</sup>, but the soil available  $K_2O$  content did not vary due to tested factors. Likewise, benefit cost ratio of 2.45 was recorded in maize + soybean-wheat and 1.60 in maize-wheat system. Thus, maize + soybean - wheat cropping system found promising when tillage was omitted and residue retained.

O-AH-2-343

# Optimization of Date of Transplanting for Off-season Bottle Gourd Production in Central Terai of Nepal

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Bottle gourd (*Lagenaria siceraria* (Mol) Stande) is an important summer vegetable crop in Terai where fruits are normally available from June to September. Fruit production during spring season is off season crop and price is very high at that period. Therefore, this trial was conducted at Parwanipur, Bara to find out optimum date of planting of bottle gourd for off-season production. Three-week-old seedlings of cv. Pusa Summer Prolific Long was transplanted on 5 different dates; December 15, December 25, January 5, January 15 and January 25 under shallow plastic tunnel in two consecutive years on RCBD design at the spacing of four meter line to line and 60 cm plant to plant fertilized with @30 t/ha FYM and 120:100:60; N:P:K kg per hectare. Plastic sheet was kept opened during day time till March 15 and harvesting was done upto May 15. Data were recorded on vegetative growth, yield and economic parameter. On the basis of overall performance, transplanting date December 25 was the most suitable date for getting significantly higher off-season yield (33.09 t/ha) with 3.51 benefit cost ratio followed by January 20 with yield 31.13 t/ha and 3.34 benefit cost ratio respectively.

### Early Paddy Helps in Food Self-sufficiency

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Rice is the staple food for more than 50% of the world's population and more than 90% rice is produced as well as consumed in Asia. The amount of sunlight is a critical factor affecting rice production. The average daily solar radiation available during the monsoon season in tropics is one-and-a-half times lower than that available in the temperate rice-growing regions like in Nepal, Italy, Spain, Australia and America. But because of farmers' dependence on rainfall, the farmers of rainfed rice in the tropics must grow rice when there is low sunlight intensity. On the other hand, where irrigation water is available, rice can be grown in the dry season and the grain yield will be higher than in the wet season. National Rice Research Program in Dhanusha, receives 600 calories per square centimeter per day solar radiation after flowering in early rice but the unit of solar radiation is 500 calories only in wet season rice. Because of the higher intensity of solar radiation, the productivity per hectare per day of early rice is 20-25% higher than wet season rice. This is really no-cost technology to enhance rice productivity. Now, the Government of Nepal has special program on early paddy from this year which focus on grow paddy in such a way, where it gets maximum amount of solar radiation especially during the reproductive and ripening stages.

### O-AH-2-548 Rayo Mustard (Brassica juncea) Seed Yield Decline in Mid-Western Region of Nepal

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Mustard is one of the major oilseed crops in Nepal. Rayo mustard (*Brassica juncea*) is traditionally cultivated in different parts of Nepal including mid-western region. However, Nepal has become a net importer of mustard oil in the recent decades due to declining seed yield and consequent loss in the cultivated area. This study focused on measures to improve mustard seed yield applying different tools. Survey results showed that none of the surveyed farmers have used the released varieties of rayo mustard. Rayo mustard farmers mostly applied only diammonium phosphate (66%), followed by urea (33%) and muriate of potash (6%). Though none of the surveyed farmers were using sulphur fertiliser in the mustard fields, soil analysis results revealed that available sulphur content in the soil was not a limiting factor for mustard yield. Rayo mustard yield was higher in the soils having neutral soil pH compared to acidic soil pH. Nutrient management experiment resulted into higher productivity with 60 kg nitrogen, 40 kg phosphorus and 30 kg potash nutrients, 20 kg zinc sulphate, 10 kg Borax and 10 ton organic manure per hectare among other treatments. Rayo mustard has potential to develop as a cash crop with availability of inputs in the mid-western terai where lands are left winter fallow after rice harvest.

O-AH-2-596

# Effect of Soil Treatments on Soil Microbial Biomass, Available Nitrogen and Crop Yield

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The effect of soil treatments on soil microbial biomass and crop yield was conducted in crop land of Post Graduate Campus, Biratnagar Nepal. The test crop was rice (Kanchi Mansuli). Five treatments with three replicates were studied in randomized block design using a plot size of 5mx5m. The treatments were I: Control; II: Urea; III: *Eichhornia* IV: *Eichhornia*+Urea (50:50); V: Compost of *Eichhornia*. After 30 days of treatment, microbial carbon ranged from 385µgg<sup>-1</sup> to 555µgg-1. Similar trend was observed for microbial nitrogen which ranged from 27µgg<sup>-1</sup> to 49µgg<sup>-1</sup>. Similarly, after 60 days of treatment microbial carbon ranged from 328µgg<sup>-1</sup> in control to 486µgg<sup>-1</sup> in *Eichhornia* alone and in same trends microbial nitrogen ranged from 23µgg<sup>-1</sup> to 55µgg<sup>-1</sup>. Available form of nitrogen in the agrosystems was NH4-N as reflected by its higher levels relative to NO<sub>3</sub>-N. After 30 days of treatment, NH<sub>4</sub>-N ranged from 3.6µgg<sup>-1</sup> to 5.2µgg<sup>-1</sup>. Similarly NH<sub>4</sub>-N ranged from 5.4µgg<sup>-1</sup> (in control) to 6.9µgg-1 (in Urea) after 60 days of treatment. NO<sub>3</sub>-N ranged from 2.1µgg<sup>-1</sup> after 30 days of treatment and from 3.4µgg<sup>-1</sup> to 5.2µgg<sup>-1</sup> after 60 days of treatment. Available N ranged from 5.8µgg-1 to 7.9µgg<sup>-1</sup> and 8.9µgg<sup>-1</sup> to 12.1µgg<sup>-1</sup> after 30 and 60 days of treatment. Total crop yield (weight of straw plus weight of grain) was maximum in *Eichhornia* + Urea (11.7th<sup>-1</sup>) and minimum in control (9.2th<sup>-1</sup>). Maximum percent increase in grain yield over the control was recorded in *Eichhornia* + Urea treated plot which was 53%. In present study, grain yield and straw yield was maximum in *Eichhornia* + Urea. So incorporation of *Eichhornia* in combination with Urea is suitable for sustainable production.

O-AH-2-623

### Seed Bed Preparation and Ecological Weed Management Practices for Direct Seed Rice in Sub Humid Condition of Chitwan, Nepal

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Transforming on rice establishment method including water, tillage and weed management practices in direct seeded rice (DSR) lead to changes in weed composition and diversity. In addition, adopting DSR may result in weed flora shifts toward more difficult-to-control and competitive grasses and sedges. Thus the weeds are a major constraint to the success of DSR in general and to Dry-DSR in particular. If the weeds are controlled properly even the dry-DSR was more advantageous to puddled TPR. The sesbania co-culture had produced significantly higher grain yield than sole Bispyribac Na application. Weed free, Pendimethalin - Bispyribac Na application, Pendimethalin - 2, 4-D application and Sesbania with 100 kg seeds and killing at 4<sup>th</sup> weeks after seedling had statistically similar. As these two treatments had higher yield attributes as compared to others. Two hand weeding at 28 and 40 DAS as farmers' practice had only 4.79% yield advantage over Sesbania with 100 kg seeds and killing at 4<sup>th</sup> weeks after seedling under Sesbania rice co-culture. During the monsoon rice the effectiveness of stale seed bed was not much greater (0.37%) than the normal seed bed. The optimum seed rates and killing dates of Sesbania under Sesbania rice co-culture were obtained as 31.67 days (nearly 32 days) and 102.28 kg ha-1 (nearly 102 kg ha-1) respectively. The growing of Sesbania along with rice under dry-DSR had equally effective as

farmers' practice of 2 hand weeding and best chemical weed management practices proving the best methods with respect to economics and environmental protection.

O-AH-2-630

### Improving the Productivity of Rice through Site Specific Nutrient Management in Foot Hills of Nawalparasi District of Western Nepal

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More effective N management through SSNM can increase grain yield per unit of fertilizer N applied. SSNM also harmonized uptake, utilization and metabolism of major nutrients, maintain appropriate panicle number, decrease ineffective tillers and increase thousand grain weight by determining optimal NPK rate and allocating N of basal and tillering fertilizer to panicle initiation. SSNM significantly decreased average N application rate by 4.18%, P application by 28.37% while K application was increased by 80.00% to effective uptake and utilization of the N and P and increased average yield by 5.93% as compared to recommended NPK. As compared to the farmers practice SSNM increased the yield by 35.25% with increased the NPK application by 43.32, 17.07 and 63.70 kg ha<sup>-1</sup>. With 25% lowering the SSNM was also equally effective as recommended NPK by saving of 28.14 and 27.77 kg ha<sup>-1</sup> N and P respectively while 14.00 kg K ha<sup>-1</sup> was required more than recommended dose. Only improving the K application (adding 31.70 kg ha<sup>-1</sup>) over farmers' fertility management the yield is increased by 17.10%. Improved N management caused greater yield responses to fertilizer N application, through improved N management with SSNM by using leaf color charts (LCC). LCC is an effective, low-cost tool that can assist farmers in improving their N management by adjusting the N application to match the needs of the crop need. The LCC can be a helpful component of SSNM for rice to N applied as the yield advantage of 0.31 t ha<sup>1</sup> over split N application.

O-AH-2-642

### Assessing the Productivity and Profitability of Rice in Eastern Terai and Midhills of Nepal using Nutrient Expert®-Rice Model

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The productivity of rice and profitability from growing rice in Nepal is very low. Different set of field experiments were conducted at farmer's field in Jhapa (Dhukurpani-Damak and Gauradha), Morang (Itahara and Babiyabirta) of towards the eastern-terai and Lamjung (Bhotewodar and Sundarbazaar) towards the mid-hill, Nepal using Nutrient Expert® Rice model from July to October, 2015. The experiment was complished in Randomized Complete Block Design with three treatments and 25 replications at two districts separately in Eastern Terai, and with five treatments and 4 replications in mid-hill. The highest yield (5.26 t ha<sup>-1</sup>) was obtained from NE fields followed by GR (4.53 t ha<sup>-1</sup>) and FP (4.08 t ha<sup>-1</sup>) in eastern terai, Nepal. Similarly the highest yield 7.36 t ha<sup>-1</sup> was noticed in NE hybrid followed by NE improved (5.86 t ha<sup>-1</sup>), GR hybrid (5.46 t ha<sup>-1</sup>) and GR improved (4.71 t ha<sup>-1</sup>) with the lowest yield of 4.77 t ha<sup>-1</sup> in the Farmer's Fertilizer Practices in mid-hills of Nepal. NE based practices produced 1.18 t ha<sup>-1</sup> higher yield in comparison to FFP and GR produced 0.45 t ha<sup>-1</sup> higher yield over FFP. The net revenues were found the highest in NE treatment followed by GR treatment and FPP treatment both in mid-hills and eastern terai of Nepal. The actual rice yields recorded in NE plots were almost similar with NE estimated attainable yield in eastern Nepal but, relatively higher yield in farmers field in mid-hills indicating some corrections in

model input files basically soil and weather data sets for authentic validation of NE software to GR and FFP both in eastern and mid-hills of Nepal.

# Agronomy and Horticulture 3 (O-AH-3)

O-AH-3-695

# Effect of Fodder Trees on Maize Crop Grown Under Terrace Riser-Based Agroforestry System

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The effect of commonly grown fodder/ forest trees by the farmers was quantified to verify their shading effect on maize growth and yield in Daraunepokhari VDC of Kavrepalanchok district in 2013-2014. The species included Khanyu (Ficus cunia), Kutmiro (Litsea polyantha), Koiralo (Bauhinia variegata), Timilo, Fosro (Grewia spp.), Kimbu (Morus alba), and Chilaune (Schima wallichii). There was variation of selected trees on the farmland in age (mean 10±4years), height 6.5±2.5m), girth (72±24cm), crown diameter (4.5±2.5m), main branches (13±7#). The mean fresh vield of fodder was 130 kg (Kimbu had the lowest 80 kg, Kutmiro had the highest 200 kg/tree). Average height of terrace riser was 1.4m (±0.6m). The means of the maize variables showed that most traits/ parameters were inferior under the shade of tree canopy compared to outside. The results were highly significant (P<0.01) between the treatment trees. According to the grand mean, less plant height (<18cm), stem girth (<0.5cm) 10cm above ground surface, size of cobs (<2.5cm length and 0.5cm breadth), weight of cobs (<57 g) but higher ear height (12cm) were recorded under the tree crown than outer circle. The shade of trees also delayed maturity (7-15 days) as immature cobs were observed. The data revealed the results of previous experiments. The closer planted maize is more affected by the trees, and the distance of 2m from the tree trunk should be used by planting shade loving crops like turmeric, ginger, others which have high value.

O-AH-3-732

# Research and Studies for the Promotion of Chiretta (*Swertia chirayita*) in Rasuwa District of Nepal

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Experiments on cultivation techniques, post-harvest, diseases and insect pest for better growth and quality of chiretta were conducted in Bhorle, Ramche, Dhunche and Syafru VDCs of Rasuwa during 2011-2013. Field survey was carried out in Ramche and Brabal, samples were taken to analyze in Pathology lab, Khumaltar. Seedlings in nursery were damaged by damping off, and cultivated plants by stem rot (*Rhizoctonia*), as economic diseases. No control measures applied, except spraying HPL 101, had little positive effect. Diseases caused infection of 20 to 70% based on location. The economic pests were white grub and cutworm. Their damage to plants was 30 to 60%. Intercropping with maize was conducted to verify the previous result. First year transplanted chiretta was small, after maize harvesting, allowed to grow sole. The growth and yield found satisfactory. Thus maize could be produced for first year in the same land. Result of postharvest research conducted in Ramche and Dhunche (Langtang NP) had: curing and drying of chiretta on shade for 5 to 7 days in small bundles (0.5 and 1 kg) and further storing in thin layer on shade for 2-3 months found better cured/ dried with good quality than wrapped with plastic sheet and dried on Sun or above fire.

O-AH-3-753 Assessing the Effect of Different Wheat Cultivars Under Different Sowing Date and Establishment Methods

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A field experiment using three wheat varieties at different sowing dates on two crop establishment methods was accomplished to identify the optimum sowing date at AFU Rampur during winter season of 2014/2015. Three wheat varieties namely: Tillotama, Danfe and Vijay sown on three dates: 14th November, 29th November, and 14th December under two crop establishment practices: Conservational and conventional agriculture were evaluated with strip –split plot design in three replications. Earlier sowing on 14th November gave the highest yield (3427.15 kg ha<sup>-1</sup>), total dry matter (8154.44 kg ha<sup>-1</sup>), with longest days to crop maturation (133.11 days). In case of varieties, Vijay gave the highest grain yield (3458.61 kg ha<sup>-1</sup>) and total dry weight (4456.11 and 8832.42 kg ha<sup>-1</sup> respectively) with earliest days to heading and maturity. The straw yield was the highest for 29<sup>th</sup> November sowing (5821 kg ha<sup>-1</sup>) and for Danfe variety (5756 kg ha<sup>-1</sup>). Vijay variety recorded the highest test weight (43.60 g) and highest harvest index (35.89%) even though with the lowest effective tillers per square meter (320.83), it proved to be the most promising variety.

O-AH-3-778

### Assessment of the Productivity and Resource use Efficiency of Rice Grown Under Different Establishment Methods and Nutrient Management in Sub Tropical Condition of Chitwan

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Nutrient dynamics under different rice establishment practices is important. Direct seeded rice is emerging practice with higher scope in present climate change scenario. Many research regarding the weed management in Direct seeded rice had been carried out but the optimization of Nitrogen input for Direct seeded is also important however information in this aspect is meager. A field experiment was conducted at the Agronomy experimentation station of Agriculture and Forestry University (AFU), Rampur, Chitwan, during wet season of 2014 to evaluate the effect of rice establishment methods and nitrogen management practices for lowland rice on the dynamics of mineral N, P and K. The experiment was laid out in a strip-plot design with three crop establishment methods as horizontal factors and seven nutrient management techniques as vertical factors with three replications. C-TDSR was found to be best among the establishment practices and LCC managed N was best among nutrient management practices. Economically also these two methods were found profitable.

O-AH-3-815

# Effect of Date of Sowing on Yield and Yield Attributes of Different Wheat Varieties under Conventional Tillage in Sub-humid Condition of Chitwan District of Nepal

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A field experiment was conducted at the Agronomy farm of Institute of Agriculture and Animal Science (IAAS), Rampur during winter season of 2014/2015 to find out the response of wheat varieties under different sowing dates. There where 9 treatments consisting three date of sowing (November 14, November 29 and December 14) in main plot and three varieties namely Tillotama, Danfe and Vijay in sub-plot and were arranged in split plot design with three replications. The grain yield was significantly higher ( $3.09 \text{ t/ha}^{-1}$ ) at November 14 where as highest straw yield was recorded for November 29 sown wheat ( $5.61 \text{ tha}^{-1}$ ). Effective tiller (414) and number of grain per spike (34.34) were highest for November 29 sown wheat. The late sown wheat had more sterile floret (42.65%) while early sown wheat had highest thousand grain weight (51.23 g). Danfe had highest straw yield (5.87 t/ha). Effective tiller/m<sup>2</sup> (419) and sterility percentage (43.35%) of Danfe was highest. Number of grains per spike (37.89) of Tillotama was highest and thousand grain weight (57.09 g) of Bijay was found highest. The grain yield of Bijay ( $3.30 \text{tha}^{-1}$ ) was highest when it was sown at November 29.

O-AH-3-817

# Screening Rice Varieties for Salt Tolerance at Germination and Early Seedling Growth Stage of Rice

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Salinity is becoming a serious problem in several parts of the world. In landlocked country like Nepal, cultivable land is becoming saline due to natural processes like mineral weathering or by artificial processes like haphazard use of chemical fertilizers or by improper use of irrigation water. Salinity results in poor plant growth and development due to osmotic stress and toxic ions. An experiment was carried out to study the response of 7 rice varieties (Hardinath-1, Makwanpur-1, Radha-4, Ramdhan, Sabitri, Samba Mansuli Sab-1 and Swarnashab-1) against 5 salinity stress levels (0, 4, 8, 12 and 16 dSm<sup>-1</sup>) on germination and early seedling growth on July 2014 at central laboratory, Lamjung campus. Data for speed of germination (SG), Germination Energy (GE), plumule length and radicle length were recorded and statistically analyzed. With the increase in salinity levels, all the parameters under study were decreased for all the rice varieties. However, rice varieties Ramdhan, Swarnashab-1, Makwanpur-1 and Hardinath-1 exhibited higher SG, GE, radicle length and plumule length as compared to other varieties. The result showed that at salinity level 8 dSm-1 there was greatest variation among the genotypes so that this level could be used in preliminary screening the rice genotypes for salinity stress.

# Fish and Aquaculture (O-FA-1)

O-FA-1-159

# Effect of Different Protein Levels on Feed Utilization, Growth and Body Composition on Fry of Snowtrout Schizothorax richardsonii

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Schizothorax rischardsonii, locally called "asala" is a popular coldwater species of temperate zone of trans-himalayan region. Slow growth of this species has been the constraints for its reproduction. In this context an outdoor experiment was carried out to determine the effect of different dietary protein levels on growth performance, protein intake and carcass protein composition of asala (snowtrout) for 77 days. Fry of S. richardsonii with an initial mean weight of 3.27±0.6 g were fed five experimental diets, 25%, 35%, 40%, 45% and 50% crude protein by dry weight. The experimental diets also differed in the ingredient composition of shrimp meal, soybean cake and corn gluten meal. Weight gain and specific growth rate were significantly (P<0.05) higher in fish fed witg a diet containing 45% protein than in those fed on the lower and higher protein diets. Protein efficiency ratio was not significant (P>0.05) among protein levels. Protein productive value was significantly (P<0.05) higher in fish fed the 45% protein diet supplemented with corn gluten. No significant differences (P>0.05) in carcass protein composition were found among the fish fed with the different protein level diets. The present investigation revealed that dietary protein level of 45% had a positive impact on the growth performance of fry of S. richardsonii. This study also suggested that corn gluten can be incorporated to the diets of S. richardsonii to enhance their growth performance. Further studies are warned to assess the suitability of other protein sources in growout diets of this indigenous coldwater fish.

O-FA-1-405

# Effect of Different Protein Sources in Feed on the Growth of Rainbow trout, *Oncorhynchus mykiss* Fingerling

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Fishmeal and shrimp meal are an essential component in the diet of rainbow trout, Oncorhynchus mykiss. In view of the increasing cost and relative scarcity of these feed stuffs, a considerable research effort has been expanded on evaluating the suitability of other feed ingredients as complete or partial replacement of the fishmeal components in trout diet. An experiment was conducted for 90 days to evaluate the three different feed formulations viz shrimp, shrimp+synthetic amino acid (SSAA) and shrimp+stinking nettle (SSN) on the growth rate of rainbow trout (Oncorhynchus mykiss) fingerling. The absolute growth rate of fingerling was not varied significantly (P>0.05) among fish fed on shrimp (554 mg.day-1), SSAA ((540 mg.day<sup>-1</sup>) and SSN (460 mg. day<sup>-1</sup>). At the end of experiment, survival rate was found significantly high (P<0.05) for fish fed on SSAA (98.4%) and shrimp (97.0%) than the fish fed on SSN (90.2%). Feed conversion ratio (FCR) of trout fingerling was significantly low (P<0.05) with feed SSAA (1.50) and Shrimp (1.62) than the fish fed on SSN (1.97). Feed efficiency was relatively high for feed SSAA (65.95%) but the differences in feed efficiency among feed formulations was not significant (P>0.05). Present study suggested that synthetic amino acid can be incorporated in trout feed to partially substitute shrimp. Further study is warned on determination of appropriate level of synthetic amino acid in feed for trout.

### 0-FA-1-481

### Potential of Periphyton Based Carp-SIS Polyculture

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An experiment was conducted at Agriculture and Forestry University, Chitwan, Nepal to compare fish production between carp-SIS polyculture and periphyton-enhanced carp-SIS polyculture in order to develop a cost-effective means to increase fish production. The experiment was carried out for 210 days. The experiment included four treatments:  $T_1$ (carp+100% supplemental feed), T<sub>2</sub> (carp+SIS+100% supplemental feed), T<sub>3</sub> (carp+SIS+50% supplemental feed+bamboo substrate) and T<sub>4</sub> (carp+SIS+bamboo substrate without supplemental feeding), each with three replications. Silver carp (Hypophthalmichthys molitrix), bighead carp (Aristichthys nobilis), grass carp (Ctenopharyngodon idella), common carp (Cyprinus carpio), rohu (Labeo rohita) and mrigal (Cirrhina mrigala) were stocked at a ratio of 4:1:4:3:5 at a rate of 15,000 fish/ha. Additionally, two Small Indigenous Species (SIS) dedhuwa (Esomus danricus) and pothi (Puntius sophore) were stocked at a ratio of 1:1 at density of 50,000 fish/ha. Carps were fed with freshly made dough of mustard oil cake and rice bran (1:1) daily at 5% of body weight; whereas, grass carp was fed daily with grass at 50% body weight. Total carp yield and combined NFY were higher in T<sub>3</sub>, due to higher survival and growth rate of carps caused by periphyton and supplementary feed. Production of SIS was lower in substrate ponds, indicating that they did not use periphyton as a significant food source. Gross margin was highest in T<sub>3</sub>, intermediate in T<sub>4</sub>, and lowest in T<sub>2</sub>.  $T_3$  was found to be the best among treatments, based on fish production and profit.

0-FA-1-495

#### Effect of Dietary Crude Protein Level of Feed on Growth and Survival of Fry

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Fry rearing is one of the important stage aims at obtaining high growth and survival for production of fingerlings required for stocking into grow out ponds as well as rehabilitation in natural habitat. This experiment was conducted with the purpose to test the effect of dietary crude protein level (CP %) of feeds prepared from similar feed ingredients in different ratios on growth performance and survival rate of rohu fry (*Labeorohita*). An initial density of 100 fry/m<sup>2</sup> was maintained in hapa fixed in the cemented tank. The dietary CP% level of feed tested were 20%CP, 25%CP, 30%CP, and 35% CP fed at 5 % body weight. Water temperature in ponds ranged from 27.4 to 29.1 <sup>o</sup>C during study period. The experiment ran for 53 nursing days. The results showed that there was no significant difference (P>0.05) in the growth rate (g/day) of fry among treatments. Rather group fed with higher protein level grew comparatively better indicating possibility of increasing need of protein in diets. However, the survival rate (%) of rohu fry was significantly different (P<0.05) in each tested CP% level of feed. Highest survival (82%) of fry was found in the feed of CP35% and lowest (56%) in the feed of CP 25%. It was predicted that feed with increasing level of CP % in diet is essential for increasing survival rate.

0-FA-1-560

#### Embryonic Development of Bhakur Catla Catla Hamilton 1822 (Cyprinidae)

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The present study was carried out to investigate the embryonic development of Bhakur, Catla catla. The spawning season is monsoon which lasts between May to August. Since, the riverine environment is required, natural breeding does not occur within ponds, even though the species attain maturity, thus hormonal induction is required. Under normal condition Bhakur grows to 1-1.2 kg in first year compared to 700-800g for Rohu and Mrigal respectively. So, this fish is very important in the contest of commercial view to know the embryonic development. The incubation period of Bhakur was found to be 13 hrs of post fertilization at 30±1 °C of water temperature. The present work generated some important information on the early life history and developmental stages of Bhakur in Nepal. This study will help the fishery biologist in understanding the developmental biology of the fish, which might be of great help to take appropriate steps for the sustainable development of the culture, management, and production of indigenous breeds required for fish culture in Nepal.

*O-FA-1-582* 

#### Histological Study of Fish Ovary after Administration of Ketuke

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Agave americana is a herbal pesticide commonly known as ketuke, which is used unmonitored to kill the fishes in different parts of Nepal. The present investigation was carried out to see its effect on ovary of *Clarias batrachus*. Fishes were administered sub lethal dose of ketuke i.e 30gm in 30 litres of water for different periods of time. The behavioural changes was observed - restlessness, jerky and violent movements with excessive secretion of mucus. Histological alterations were observed like increased number of atretic follicles, cytoplasmic shrinkage, and others. Study showed that although herbal pesticides are considered less toxic but it provoke morphological changes in vital organs of fishes. Hence, precautions must be taken when herbal poisons are used in fish inhabiting areas.

*O-FA-1-586* Comparative Efficacy Study of Four Anaesthetic Agents on Naini, Cirrhinus Mrigala Fry

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The improvements in carp fish seed handling and transportation technique by introduction of new innovative techniques using suitable anaesthetics and their optimal sedative doses to ensure the delivery of less stress with high survival of fish seed for farmers at its culture farm/ponds from nurseries is essential. The anaesthetic efficacy of MS-222, benzoak® vet, AQUI-S® and clove oil were evaluated on Naini fry having body weight of 1.4±0.39g (Mean±SD) and length of 5.6±0.41cm (Mean±SD) for handling and transportation purpose. The fish fries were acclimatized to hatchery conditions and starved for 24h prior to perform

the experiments. Glass aquaria of 45 L equipped with aeration stone was used in the entire experiments. Behavioural observations revealed that the lowest concentration that induced surgical anaesthesia in ≤3min and recovery in ≤5min were 100 mg L-1 of MS-222, 25 mg L-1 of AQUI-S®, 75 mg L-1 of Benzoak® vet and 20  $\mu$ I L-1 of clove oil for the Naini fry. The results showed that the effective sedative doses for the transportation purpose found were 20 and 30 mg L-1of MS-222, 5 and 7.5 mg L-1 of AQUI-S®, 15 and 22.5 mg L-1 benzoak® vet, and 6  $\mu$ I L-1 of clove oil for Naini fry. The anaesthetics MS-222, benzoak® vet, AQUI-S® and clove oil were found suitable for aquaculture purposes in handling and transportation of Naini fry. Commercial use of clove oil in the transportation of carp fish seed is feasible in Nepal as it is economic, effective, safe and eco-friendly anaesthetic.

O-FA-1-634

### Administration of Ovaprim in Artificial Reproduction of Labeorohita

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The present study has demonstrated that *Labeorohita* can be successfully induced to produce sperm and ova using an intramuscular injection of ovaprim. This success achieved with ovaprim may be owing to the lenpe method, which consists in treating fish with a combination of gonadotrophin-releasing hormone analogue (GnRh) plus to dopamine antagonist. Studied fish specimens were spawned successfully following a suitable dose of ovaprim with 0.5 ml/kg for female and 0.3 ml/kg for male brooders. The result obtaining in the present study clearly demonstrates that Labeorohitaresponse well to the synthetic hormone ovaprim in Chines circular Eco hatchery system of induce breeding. Over all fertilization and hatchling % age was 82% and 85% respectively.

*O-FA-1-804* First record of *Argulus japonicas* (Crustacea: Branchiura) Infestation on Common Carp (*Cyprinus carpio*) in Nepal

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Argulus japonicas (Crustacea: Branchiura) known as fish louse, is an ectoparasite of fresh water fish species. The parasite *A. japonicas* with body length of  $4.65 \pm 0.38$  mm at species level are the first record in Nepal. Its out break was observed during winter when water temperature reduced to 15.5 °C. Clinical symptoms in common carp (*Cyprinus carpio*) infected with *Argulus japonicas* were scratching on earthen pond walls, abnormal swimming, jumping and poor growth. Heavily infected fishes showed hemorrhage reddish appearance throughout their body, especially on the caudal fins and body portion. Prevalence rate of this parasite was 80% in one summer old common carp with an average weight  $261 \pm 85g$  and length  $22.9 \pm 4.9$ cm. *Argulus* count was averaged 8.1 per infected fish with relatively high infestation in body surface (2.8) followed by caudal fin (1.8) and dorsal fin (1.1). The effective dose of the drug was 0.3g per kg feed and fed for 3 days consecutively with one day off and then again for 2 days. Studies are warned to identify the interaction between environmental conditions and outbreak of *A. japonicas* for developing better management practices of carp aquaculture.

# Food Security and Technology (O-FS-1)

O-FS-1-132

A Policy Study on Agriculture and Food Security of Nepal: Possibilities and Challenges of Agriculture Development Strategy (ADS) 2015

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Government of Nepal endorsed Agricultural Development Strategy 2015 setting its ambitious objectives. The strategy envisages to achieve a self-reliant, sustainable and competitive agriculture in the country. However Nepalese agriculture couldn't experience true transformation in agrarian system. More than sixty percent of the farmers are still unable to produce sufficient food for a year. There are continuing concerns on service delivery system, the role of market, and institution process to ensure food security of all. This research paper will deliberate on this agriculture policy issues and critically analyze how they attempt to enhance agricultural production and productivity and ensure food security of all. This paper draws primary reflections through desk review of existing literature and policy document. Some of village level cases were brought to supplement secondary data from Rasuwa and Dhading. Interview with concerned stakeholders and policy actors supported to bring key policy challenges in effective implementation of agricultural development initiative in achieving food security.

O-FS-1-171

### **Possibility of Organic Farming in Nepal**

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Organic farming is sustainable farming and consistently gaining worldwide acceptance with an expansion of 20% in the last decade, accounting for over 43.7 million hectares worldwide. Nepal a developing country with an agricultural economy of 35% GDP is not an exception to this change. In recent years, Nepal's efforts to expand into manufacturing industries and other technological sectors have achieved much progress. Farming is the main economic activity followed by manufacturing, trade, and tourism; therefore, it is utmost necessity to develop agriculture economy to boost up economic status of Nepal. This could be gained by encouraging organic farming and developing the advance technologies for it. It was first initiated by NGO sector since 1980 as sustainable agriculture, permaculture, and organic agriculture. 26% of Agriculture land (farm lying in remote areas) in Nepal is estimated to be organic by default and another 21% is using very low external inputs. It is flourishing as the awareness is being raised against pesticides hazards and important intake of healthy food among consumers. Many success cases of organic farming, in organic tea, organic highland coffees, and vegetables are reported in Nepal with the involvement of several government organizations, NGOs, entrepreneurs, producer group and individual farmers. Organic production is commercial blooming in Nepal since 1990s. Moreover, Government of Nepal is also supporting the scheme of organic farming or organic agriculture by developing policies as National Coordination Committee on Organic Agriculture production and Processing System and National Organic Agriculture Accreditation Body. Future of organic farming in Nepal is promising and milestones can be obtained through combine effort of both the government and farmers.

O-FS-1-303

# Contribution of Rupa Lake for Sustainable Food Security and Local Climate Change

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Rupa Lake is advancing eutrophic in Lekhnath Municipality in Kaski district, Nepal. Environment around the lake has been improved in a period of 10 years because of conservation practices initiated by communities including the Rupa Lake Restoration and Fishery Cooperative. As a result abundance of NTFPs has increased. At present, 49 NTFPs are available in the lake basin, some households, i.e., 10% has additional income from NTFPbased medicine as indirect provider to food security. A few household already started farming of NTFPs. Availability of fodder and fuel wood from community forestry has been significantly contributing to livelihoods where as wild edible fruits and vegetables have supplementary for food security based on questionnaire and focus group discussion. There is a year-round food security for 50% of sample household with 22% of this having surplus food. A 5% of HHs has food security for less than three months where as 19% HHs have food security for more than six months. However, livelihood and nutritional security has been improving by fish farming and water from lake. This lake is most important for local environment and also help for ecotourism. It is found that 92% observed the climate change in the form of rise in temperature (74%), unpredictable rainfall (77%), shift in rainfall (64%) and phenological change (51%). It showed that the lake supports to restoration of natural water capacity, maintain local climate, and sound environment by better natural resource management for environment friendly ecosystem.

O-FS-1-496

### Rice Technologies Make the Country Self-reliant in Food Production

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Rice is one of the most important cereal crops in Nepal. As per the preliminary estimate of Fical Year 2015/16, the rice crop was grown in 1.36 million hectare producing 4.3 million metric tonnes and the productivity was 3.154 t/ha. There are less possibilities of bringing more lands into production. Therefore, we have to increase the productivity per hectare per day by any means. The promising technologies generated by agriculture research play the pivotal role for increasing rice productivity. Nepal so far has released and registered more than 100 rice varieties with full package of practices. The modern varieties can express their yield potentiality only when recommended packages are practiced. Quality seeds alone can contribute approximately 15-20% yield. Early paddy and Boro (winter) rice can be used for increasing rice yields by utilizing higher intensity of solar radiation. We also say "Using Sun to reduce Hunger or increase rice productivity ". Solar radiation is no-cost technology or free gift of nature. The system of rice intensification (SRI) is the other agronomic manipulation, which can increase rice yield. However, we should not forget the environment-friendly and sustainability issues while increasing the productivity and production. It is said "Grow Paddy with Soil Fertility, Wheat with Fertilizers", and "Healthy Seedlings are responsible at least for half of the yield".

O-FS-1-519

### Factors Influencing Adoption Decisions: A Bivariate Probit Analysis

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We analyze the determinants of important farming decision- adoption of improved cereal seeds and chemical fertilizers- through bivariate probit analysis in cross-sectional data of the Nepal Living Standards Survey 2011 (NLSS 2011). We found landholding size, wealth, number of adult family members, use of hired labour, and access to irrigation, extension services, roads and markets as the most important factors influencing adoption of improved cereal seed varieties and chemical fertilizers in Nepal. On contrary, education of household head and livestock size were found to negatively influence the adoption of decisions with regard to improved cereal seed and chemical fertilizers. Hence, in Nepalese context, improved market access, better functioning of factor markets, increased irrigation facilities and extension services are pre-requisites for agricultural technology adoption.

0-FS-1-583

#### Status of Fish Marketing System in Kalimati, Kathmandu, Nepal

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Study was carried on fish marketing status at Kalimati as this is the biggest fish market in Kathmandu. This survey investigated the casual relationship between transport, marketing and supply of fishes. The distribution channels were identified. 75% of the fish was found to be imported from India. Fishes found was mostly from Cyprinidae family. Daily demand in this market was found to be 11.41 MT. Traders faced number of marketing problems such as low price of fishes, high transportation cost, high market tolls and others. Strong policies are necessary to enhance this business. Co-operative societies are needed.

O-FS-1-605

### A Study of Nak Cheese: Functional Aspects

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Previous studies on functional aspects of nak (Female Yak) cheese are scarce. This research work aims to study the functional aspects of nak cheese produced in Nepal with respect to its probiotic potential, and presence of phytochemicals. Three nak cheeses were collected randomly from regional factories of Dairy Development Corporation (DDC) in Nepal, located at altitude of 2900 m, 2600 m and 2400 m respectively. Total probiotic Lactic acid bacteria (LAB) present in these cheeses enumerated on MRS media with 0.25 % bile salts were lower than 106 cfu/g. The total LAB population were negatively affected by the ripening duration of cheese. The 3 cheeses were subjected to phytochemical extraction using methanol as solvent followed by quantification of the total phenol content (TPC) and flavonoid content (TFC) in their extracts. The TPC and TFC of these cheeses were 6.06-10.9 mg GA/g dry extract and 4.12-7.70 mg QE/g dry extract respectively. Similarly, antioxidant activity (IC50) and toxicity (LC50) of the studied nak cheeses extract were 371.64-518.30 mg/L and 350.19-698.95  $\mu$ g/mL (i.e., moderate toxicity) respectively. Thus, nak cheese doesn't meet the recommended minimal population of 106 -107 cfu/g for any probiotic LAB in a product at the

end of shelf-life (Miller, 2004) to have their functional aspects. Nak cheese may be considered as good source of antioxidants and its regular consumption might improve consumer health due to antioxidant activity, anti-cancerous activity and biogenic/probiotic effect of LAB.

O-FS-1-647

### Simulations to Agronomic and Climate Change Scenarios on Major Food Crops in Central Nepal using Dssat Ver 4.5 Crop Model

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The lower yield of major field crops and wider yield gaps existed between the potential. experimental and farmer's field yield in Nepal. The major research in agricultural institutions of Nepal was concentrated to the aspects of varietal and crop management, weed, irrigation and nutrient management of rice, maize and wheat only. Crop modeling is new approach of research in making proper decision, farming tool and due care on data recordings and handlings to predict the yield. Profitability of the crops and cropping systems through the proper knowledge of agro-climatic indices based on regression. DSSAT ver 4.5 model is the new milestone in line of making proper decision on various agronomic management and climate change scenarios and its application in the academics, research and development field would be vital for increasing resource use efficiencies (RUE). Higher GDD requirement and constant HUE was better to determine the stable and sustainable yield of rice, maize and wheat crops under changing climatic scenarios. CSM-CERES- Rice, Maize and Wheat Models were valid to the central Nepal and show high sensitivity to change in different weather scenarios; hybrids and short duration cultivars were more affected than the local and long duration cultivars. Maintaining food security is challengeable tasks, hence, model simulation results obtained from research highlighted that there is utmost importance to develop and climate ready crops to feed the future generation after 2020 scenarios of IPCC (2007). The model results should be extrapolated to the major domain of agriculture pockets in Nepal.

O-FS-1-730

### Formulation and Quality Evaluation of Astamandal Soup Prepared from Underutilized Crops found in High Altitude of Nepal

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This research aimed to study the effect of variation of cereals (Taichung rice, Jumlimarsi rice and Chino) and legumes (Mung and Chirbiresimi) on the sensory and nutritional quality of Asthamandal. Six formulations were prepared using three types of roasted cereals (Taichung rice, Jumlimarsi rice and Chino) and two types roasted legumes (Mung and Chirbiresimi) keeping the spices (Ajowan, Cumin, Coriander) and salt constant. These formulations were coded as A (Taichung rice flour+Mung flour+Spices), B (Taichung flour+Bean flour+Spices), C (Jumlimarsi rice flour+Mung flour+pices), D Jumlimarsi rice flour+Bean flour+Spices), E (Chino flour+Mung flour+Spices) and F (Chino flour+Bean flour+Spices). Asthamandal soup powder formulation was done by taking 100 parts by wt. of cereals and legumes mixture, 6 parts by wt. of spices and 6 parts by wt. of salt. The consistency of Asthamandal soup prepared from formulations A, B, D and F was good. However, for formulations C and E, Corn starch (3 parts by wt.) was added for consistency. From sensory analysis (color, taste, flavour, consistency, smoothness and overall quality), Sample C which was prepared by using

Jumlimarsi rice and mung with added starch was found to be the best. Proximate analysis of Sample C showed moisture  $(4.13\pm0.06\%)$ , crude protein  $(17.60\pm0.29\%)$ , crude fat  $(3.16\pm0.10\%)$ , total ash  $(8.19\pm0.45\%)$ , crude fiber  $(3.34\pm0.07\%)$  and carbohydrate  $(63.46\pm0.14\%)$ . Furthermore, mineral analysis of the same sample showed iron  $(3.65\pm0.14mg/100g)$  and phosphorus  $(430.67\pm15.04mg/100g)$  respectively. From this study, it can be concluded that, highly nutritious asthamandal soup powder could be prepared by using locally available raw material in house hold level.

# Livestock and Veterinary (O-LF-1)

O-LF-1-120

#### Taking Care of the Male Calves Obtained in Modern Dairy Farming

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Nepal has one of the densiest populations of cattler in the world where over 7 millions head and 5.8 head of animals per household have been recorded. This is no doubt related with our traditional farming and socio-cultural transformation. We have legal and sentimental obligation towrads these lovely four feeted animals. With the status of the national animal, cows are constitutionally given the protection. However, as Nepal aims to graduate to a developing country we have to discuss all dimensions in open and critical environment. The same holds to the emotional topic of how we are to manage the male calves born to the "Holy Cow". As dairy farming gains popularity, introduction of exotic breeds *Bos taurus* has increased. Government of Nepal has stressed on upgrading local cattle with imported or locally collected semen from exotic shires. The multi dynamic use of the local cattle is no doubt not possible with the male from these exotic animals. The socio economics, ecological consequences of the current trend which is on rise has to be understood for wider impact analysis. Attempts to use sex assorted semen has not been successfull in context of Nepal however Theriogenology do give us some options that sould be explored with wider perspectives.

0-LF-1-121

### **Artificial Insemination of Animals in Nepal**

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Breed improvement have come a long way In Nepal too, from natural mating services to Artificial Insemination (AI). Large ruminants, small ruminants, swine, poultry, fish, bees are some species from domesticated animals that have benefited from AI technology. National Livestock Breeding Center (NLBC) Pokhara and its satellite facilities at Lahan and Nepalgunj serve the national need for AI semen. The records from NLBC for the year 2014-15 AD revealed that 6 lakh 26 thousand doses of semen straw were produced. The record for the same period mentions Chitwan district leading in adopting this advance technique at 45 thousand doses, followed by Rupendhey (40,000 doses), Nawalparasi, Morang and Jhapa with 29,000 doses each. The conception rate currently hovers around 55.75% in cattle and 45.50% in bufallo. The difference in the two species is partly because of the silent heat in bufallo. Chitwan is leading in all fronts because of a strong system of research and extension in this district. The advanced dairy farming practiced in Chitwan offers relief from having to manage bulls or transport the animal in heat to mating sites. Moreover Nepal has also started

experimenting with embryo transfer and sex assorted semen however the available techniques and facilities are still in very poor condition.

0-LF-1-373

# Studies on Blood Levels of Pregnancy Specific Protein B (PSPB) by Biopryn Method in Nepalese Buffaloes

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Buffaloes have a major contribution in milk production in Nepal. The productivity of the buffalo is poor mainly due to delay in first parturition and the subsequent conception time. Early diagnosis of pregnancy is crucial to decrease the days open via finding non-pregnant buffaloes. This study is focused to find the basal and pregnant blood levels of PSPB in Nepalese buffaloes as a step towards validating the method in buffaloes. Weekly blood samples were collected, from 15 ovulation synchronized buffaloes by using CIDR protocol for fixed time AI, starting from pre-insemination time (for basal or control value) until week 6, and then on week 11. The basal circulating PSPB level was 0.32±0.01 and 0.27±0.02 ng/ml in parous and heifers, respectively. The mean PSPB value in pregnant buffaloes was similar to the basal value upto two weeks post AI. On week 3 and onwards, the PSPB level in pregnant buffaloes increased significantly as compared to the basal levels and that of the levels of nonpregnant buffaloes. In pregnant buffaloes, PSPB level was similar in weeks 4 and 5 but was higher than that of any of the prior weeks. On week 6, its level rose dramatically, however, a slight decrease in its level was observed to on week 11. Neither the physical condition of the animals nor the parity affected the basal and pregnant levels of PSPB. Pregnancy based on the circulating PSPB level can be detected in buffaloes as early as week 3 post AI with BioPryn test. This early pregnancy test in buffaloes bears an immense value and its further validation is required for the wider use.

*O-LF-1-399* Study on Growth Performance Evaluation of Goat Fed with Cultivated Forage (Oat, Berseem) and Crop by Product

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An experiment on growth performance evaluation of goat was conducted in livestock farm of regional agricultural research station, Khajura, Banke for a period of 90 days during the winter season in the year 2014. There were altogether 16 female goats kept on trial, the experiment was conducted in completely randomized design consisting of 4 treatments replicated four times. The treatments comprise of T1: Farmers management practice (grazing with no concentrate supplementation), T2: Seaonal fodder (Oat, Berseem ) 75 % (Cultivated forage legume and non legume) + Lentlil Bhusa 25 % + concentrate 100 gm, T3: Seaonal fodder (Oat,Berseem ) 80 % (Cultivated forage legume and non legume) + Lentlil Bhusa 25 % + concentrate 100 gm, T3: Seaonal fodder (Oat,Berseem ) 80 % (Cultivated forage legume and non legume) + Lentlil Bhusa 10 % + Arhar bhusa 10 % + concentrate 100 gm, T4: Seaonal fodder (Oat,Berseem ) 85 % (Cultivated forage legume and non legume) + Lentlil Bhusa 7.5 % % + Arhar bhusa 7.5 % + concentrate 100 gm, per day. Daily feed intake and weight of the animals were taken at beginning and at the end of experiment and 15 days interval. There was a significant difference observed among the treatments on total weight gain and average daily gain (p<0.05). The average daily weight gain is found highest in T2 (64.67 g/day) followed by T3

(58.78 g/day), T4 (51 g/day) and lowest in T1(31.95 g/day). The result indicated that Seaonal fodder (Oat, Berseem ) 75 %, (Cultivated forage legume and non legume) + Lentlil Bhusa 25 % + concentrate 100 gm can be used in stall feeding management.

0-LF-1-484

# Evaluation of Productive and Reproductive Performance of Cattle in Dairy Pocket Area of Chitwan and Nawalparasi Districts

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A study was conducted in major milk pocket area of Chitwan and Nawalparasi districts to find out the productive and reproductive performance of dairy cattle reared in those areas. This study also aimed at finding out the existing breeding scenario of cattle farming followed by the farmers. Four years of data of 728 animals send to data management section of Animal breeding division in the period between (2008-2012) under Dairy Cattle Improvement Program (DCIP) were reviewed and analyzed. Similarly, monthly data recording of 380 animals taken from May, 2012 to April, 2013 were used to find out information on reproductive performance. Average milk yield, fat percentage and protein percentage of cattle were observed 2841±84.9 L, 4.43±0.66% and 3.33±0.17% respectively and effect of genotype on these traits were found significant (p<0.001, p<0.001 and 0.01) respectively. Similarly, Calving interval, post partum estrus, post partum conception, age at maturity and age at first calving were observed 422.8 ±7.71, 108.9±6.13, 149.93±27.04, 498.5±16.32 and 816.0±17.41 days respectively. Age at maturity and age at first calving was significantly affected by genotype (p<0.01 and p<0.05). In addition, average number of insemination per conception was observed 1.38 in survey household. Breeding system of cattle followed by the farmers were found satisfactory in the survey household but need gradual improvement. It was observed that the cross of Jersey and Holstein performed better in terms of productive and reproductive performance in farmer managed condition of Nepal, therefore, rotational crossing of Jersey and Holstein for maintaining blood level between 50% to 75% of either breed is most better choice for farmers.

O-LF-1-613

### Comparative Study of Sheep Blood with Citrated Human Blood and Commonly Available Livestock Blood as a Substitute in Blood Supplemented Agar Medium for Routine Use

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Fastidious microorganisms can grow only in nutrient rich media that support their growth, such as blood agar media. Sheep and horse blood are most commonly used blood for the isolation of such fastidious microorganisms. However, in many countries, sheep is not a common livestock. Hence, different blood agar plates prepared from the citrated human blood and blood of cow, buffalo, pig, and goat (which are common livestock in Nepal) were evaluated for the growth, colony morphology, colony size and hemolysis of different organisms, *Escherichia coli* (ATCC strain25922), *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* (ATCC strain25923), and *Streptococcus pyogenes*. All observations were done in 24 hours and 48 hours. Good growth was seen on almost all blood agar plates and there was no significant variation in the colony morphology of the isolates. Hemolysis was also similar in all blood agar plates. But cow and pig blood gave comparative

results in terms of hemolysis and colony morphology. In general, we can conclude that cow and pig blood can be used as suitable alternatives for sheep blood in blood supplemented agar media. Despite the good qualities of cow and pig blood agar observed in this study, however, there is a need for it to be tested further for its ability to support more fastidious organisms.

0-LF-1-632

# Current Status and Constraints in Indigenous Buffalo Production in Western Hills of Nepal

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An attempt has made to study the current status and constraints of indigenous buffalo production in western midhills of Nepal. A total of 70 buffalo raising farmers were interviewed in Tarakhola of Baglung and Ramche of Myagdi district through a semi-structural questionnaire survey from December, 2015 to February, 2016. Finding of the study revealed that farmers have adopted conventional animal husbandry practice with indigenous breed, native forage and fodder species and traditional veterinary practices. Average number of indigenous buffalo per house hold was found 2, comprising of 37.2%, 34.9% and 27.9% of lime, Parkote and crossbreed respectively. Milk production of these buffalo varied between 2-7 L/day with a lactation length of 180-540 days. Major factors associated with constraint in indigenous population are lack of appropriate conservation strategy from government (30%) followed by insufficient profit from indigenous buffalo farming (23.3%), considered no attraction in agriculture occupation and seeking alternate from it (23.3%), no adaptation of improved technology (13.3%) and all of aforementioned (10%). Majority of respondent (39%) are reluctant to choose agriculture occupation and are interested to seek other attractive job. About 34.1% of them replied that a large number of rural youths have been migrating to foreign countries for searching attractive job. Similarly, 7.3% of respondent consider lack of awareness on genetic improvement as a major cause, effect of climate change on buffalo production (4.9%), lack of proper breeding policy (2.4%), unavailability of suitable breeding bull (2.4%) and all of above (7.3%).

O-LF-1-712

# Factors Affecting Adoption of Improved Shed by livestock Farmers in Terai Region of Nepal

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Consequences generated by climate change disasters in the vulnerable agricultural system of Nepal could increase in coming days in the absence of effective adaptation strategies in both agriculture and livestock sector. There is growing evidence that improved shed construction can be a potential adaptation strategy, but adopted in a limited scale. The objective of this paper was to identify factors affecting the adoption of improved shed by livestock farmers in the terai region of Nepal. Survey of 600 households, 100 from each district in Morang, Sarlahi, Bara, Chitwan, Rupendehi and Banke were analyzed using logistic regression technique. The results showed that size of livestock holding has significant positive effect on adoption of improved shed and increase in 1 LSU will result in the 21% more chance to adopt. Similarly, training on livestock management, involvement in group and co-operatives, involvement of household members in remittance earning and Brahmin-Cheetri ethnicity increase the probability of adoption by 81%, 126%, 82% and 92% respectively as compared

to lack of training, households not involved in group and co-operatives, non-remittance earning and ethnicity other than Brahmin-Chhetri. Our findings have suggested to move towards commercialization of livestock keeping, increase source of income, training on livestock management and increase membership in group and co-operatives to increase adoption of improved shed.

0-LF-1-840

# Seroprevalence and Risk Factors Associated with Mycoplasma Hyopneumonia in Kailali and Kanchanpur District of Farwestern, Nepal

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Respiratory diseases can cause great distress to individual animals and have a serious effect on performance and production in affected groups of pigs. A pilot study was conducted to determine the seroprevalence and risk factors associated with Mycoplasma hyopneumonia, causative agent for enzootic pneumonia and one of the primary contributors to Porcine Respiratory Disease Complex (PRDC) in Kailali and Kanchanpur district of Nepal. A total of 184 porcine serum samples were collected randomly. Information on the herd level was captured with structural and standardized questionnaire. Samples were tested by ELISA for the detection of the antibodies against the M. hyopneumonia. Chi square and fisher exact test was applied to find out the significance of the risk factor contributing spread of disease. Forty two samples were found positive to infection, indicating prevalence of 22.83%. Pigs rearing under confinement (modern and semi conventional) were found significant in causing disease. Infection was found high in the continuous production system (32%) as compared to all in all out (11.11%). Partition between the separating pens was found to be significant in causing disease. Pigs in semisolid partition had shown high prevalence (34.95%) as compared to solid partition (18.18%). Prevalence rate was higher in improved breeds (27.46%) compared to Local breeds (7.14%). Age wise prevalence showed highest rate of infection during growing period (36.36%). Study suggests that environmental and management factors contribute a major role in introduction and spread of this disease.

# Plant Protection (O-PP-1)

O-PP-1-912-I

# Efficacy of Biorational Compounds against Diamondback MOTH, *Plutella xylostella* (L.) (Lepidoptera: Plutellidae) on Cabbage

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An experiment on the efficacy of different biorational compounds- commercial microbial and botanical pesticides, along with chemical pesticide were conducted against diamondback moth (DBM), *Plutella xylostella* (L.), on cabbage with three replications under field conditions. The highest larval population reduction was observed in Derisom treated plots, followed by *Bacillus thuringiensis* Berliner var *kurstaki* and Fenvalerate, respectively. The efficacies of Derisom, *B. thuringiensis*, Fenvalerate and Margosom decreased after seven days of spray except entomopathogenic fungi which showed fluctuating trend. Maximum Gross yield, low number of damaged wrapper leaves and higher net head yield were recorded in Derisom

followed by *B. thuringiensis* and Fenvalerate treated plots, respectively. Derisom followed by *B. thuringiensis* performed better in reducing this pest, had less damage and gave higher head yield and better benefit cost ratio than other treatments.

O-PP-1-108

# Effect of Meteorological Factors on the Development of Lentil *Stemphylium* Blight at Different Sowing Dates inRampur, Chitwan, Nepal

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Stemphylium species are pathogenic to a number of crops under broad geography and diverse environments. Stemphylium blight of lentil (Lens culinaris Medik) caused by Stemphylium botryosum Walr is becoming a serious emerging threat to lentil cultivation and become widespread throughout major legume growing areas of Nepal. Lentil crop was shown in different dates to observed incidence and severity of Stemphylium blght at Rampur, Chitwan during two consecutive years 2012-2014. Over years, early shown lentil (November 1, 6 and 11) escaped the higher severity of Stemphylium blight with the increase in yield. Disease severity increased with the advancement of sowing date from November 1 to December 21 with decreased yields. The trends of disease development were similar in both vears. The meteorological parameters recorded and correlated with disease development, in two years indicated that the average maximum and minimum temperatures, total rainfall and sunshine hour ranging from 22.42-24.23°C (mean 23.32°C), 4.12-13.00°C (mean 8.56°C), 9.6-30.5mm (mean 24.85mm) and 200.05-309.85 hour (mean 254.95 hour) respectively were favorable for disease development. A simple multiple linear regression based model with temperature, rainfall and sunshine hour described Stemphylium blight disease severity on lentil plants.

O-PP-1-337

# Prospects of Grafting Technology for the Management of Bacterial Wilt and Rootknot Nematode on Tomato

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Tomato is the high value fruit vegetable in Nepal. Its cultivation has been contributing in uplifting the livelihood of the growers. Bacterial wilt (BW) caused by Ralstonia solanacearum and Rootknot nematode (RKN) caused by Meloidogyne spp. are economically important diseases of tomato. Because of soil-borne nature, these diseases are very difficult to control. Planting of seedlings grafted in resistant root stock of wild eggplant is one of the options to manage these diseases. Evaluation of indigenous wild plant species and some exotic eggplant genotypes against BW in inoculated conditions under screen house at Khumaltar showed exotic wild eggplant (Solanum sisymbriifolium), indigenous wild eggplant, Bihin (S. torvum) and exotic eggplant genotype, EG 195 from AVRDC were found resistant to bacterial wilt. Whereas, the eggplant genotype, EG 203 showed 17% wilt incidence showing resistant reaction. Under plastic tunnel, bacterial wilt susceptible tomato variety Pusa ruby grafted on wild eggplant found 100% survival until 12 weeks after inoculation (inoculation done a week after transplanting) compared to 100% mortality of non-grafted plants due to wilt within three weeks after inoculation. Regarding RKN in tomato, experiment conducted in infested field at Hemja, Kaski complete control of knot (gall) formation in grafted tomato plants (highly susceptible variety Srijana) in S. sisymbriifolium compared to 7.5 galling index in 0-10 scale

with increased yield by 37% over non-grafted plants. Hence, Grafting technology could be one of the effective tools in managing these diseases in prone areas of such diseases. And also, it could be one of the tools of management of these diseases in organic farming.

O-PP-1-374

# Effect of Agronomic Practices on Rice Blast Disease (*Mgnaporthe grisea* Hebert.) and its Mapping – A study on landrace Variety Jethobudho from Kaski District, Nepal

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Rice forms the very important diets for the peoples from mid hills in which their livelihood was bonded. The percentage of small farmers (<0.25 ha) was higher in Hemja (54%) than in Dhikurpokhari(15%). Average of 1811.96 Kg/Ha of rice was produced in Dhikurpokhari, whereas 2571.71 Kg/Ha rice was from Hemza. Seedling is removed from seed bed for transplantation generally after 30 days (average 31.87 days in Dhikurpokhari and 31.96 days in Hemza). Ageratum houstonianum, Drymeria cordata, Polygonum nepalense, and Bidens ramose were recorded as the major weeds in both the study area. 78% of the respondents from the Hemja VDC were known to rice blast and 67% of the respondents from Dhikurpokhari VDC. The disease incidence, disease severity, AUDPC and apparent rate of infection (r) of blast disease were less in seed sown on earlier dates as compared to later date's sown rice. Three times hand weeding is seen to be more reliable to reduce the leaf blast density on jethobudho landrace. GIS map of disease density shows that almost half of the area of agriculture land was affected by moderate density of rice blast with 10-20 % of the area with high severity of blast from Hemja VDC,

O-PP-1-429

# Fungitoxic Properties of Invasive Alien *Ageratina adenophora* (Spreng.) R. M. King & H. Robinson on soilborne fungi

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Change in soil microbial community in Ageratina adenophora invaded soils has been corroborated by its antibiosis properties. Studies on effects of leachates from different parts of A. adenophora on ecologically important soil fungi are still deficient. We studied fungitoxic properties of A. adenophora on five important soil fungi (Alternaria alternata, Trichodermaharzianum, Aspergillus niger, Chaetomium funicola and Fusarium oxysporum) by using poison food techniques. Leachates from root, leaf and litter of A. adenophora were prepared in distilled water that mimics rain water leaching chemicals form the plant parts. All the leachates show inhibitory effect on radial growth of the test fungi. The degree of inhibition varies with the fungus and leachate type. Leaf leachate showed maximum inhibition to the Alternaria alternata; litter leachate to Chaetomium funicola; root leachate to Trichodermaharzianum followed by Aspergillus niger. Fusariumoxysporum was minimally inhibited by all types of leachates. In general, different plant part of leachates from A. adenophora has different degree of antifungal activity to specific soil fungi. In consequence of, A. adenophora leachates could be involved in mediating the soil fungal community composition after invasion that might facilitate further invasion (a positive feedback). On the other hand A. adenophora plant parts leachates can be sorted for its biopesticidal properties on pathogenic fungal strains as well.
O-PP-1-468

#### An Identification of Natural Molluscicides

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A huge amount of crops has been damaged by snails in the eastern terai region (Morang, Sunsari, and Jhapa) of Nepal. To control their population growth, several molluscicides are available in the market but these are harmful to the aquatic plants and animals and diminish soil fertility as well. These burning problems can be mitigated by using organic molluscicides. Two of the seven plants extracts show remarkable effect to control population multiplies. Plants namely *Argemone mexicana, Clerodendron infortunatum, Urtica dioica, Kalanchoe pinnata, Agertum conyzoides, Polygonum flaccidum, and Scleroderma citrinum* in different concentrations were tested on three different molluscs (*Achatina fulica, Bensonies nepalesis, and Cyclophorus spp.*). Among the tested plants extracts, *Urtica diocia* and *Polygonum flaccidum* at the concentration 5000 parts per million showed significant effect in the population growth of mollusca.

*O-PP-1-504* 

### Adoption Behavior and Knowledge of Farmers about Attributes of Bio-control Measures in Nepal

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Pest management is an important practice in crop production and management. Use of chemical pesticides need to be minimized so that it would be least hazardous to human health, must be environmental friendly, socially acceptable, economically viable and sustainable . This study was conducted in Chitwan and Dhading district where heavy dose of chemical pesticides are used. A total of 152 farmers those undergone training for Integrated Pest Management (IPM) at Farmers field school (FFS) were selected for the study. Scale developed by Ghoderao and Ingle (1984) was used to measure innovation attributes with suitable modification. The result showed that majority of farmers (55.26 per cent) used pheromone trap as a bio-control measures in the field. According to level of perception of farmers about profitability 51.32 per cent of the farmers showed the moderate level of profitability while 72.37 per cent of the farmers showed moderate level of perception about congruity. The study further revealed that 57.90 per cent of the farmers had moderate level of perception about feasibility of the use of bio-control measures in their locality whereas 86.84 per cent of the farmers told moderate level of complexity of the use of bio-control measures. Regarding the knowledge and adoption level, 73.68 per cent of the farmers had medium level of knowledge about the use of bio-control measures while 80.92 per cent of the farmers had moderate adoption level about bio-control measures.

O-PP-1-607

### Antifungal Effects of Some Plant Essential Oils Against *Alternaria alternata* (fr.) Keissl. and *Aspergillus niger* Van tiegh. from Grapes

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The essential oil of six plants viz. Murraya koenigii (L.) Spreng., Eucalyptus citriodora Hook., Artemisia indica Willd., Cinnamomum camphora (L.) J. Presl., Cinnamomum tamala (Buch.-

Ham.) Nees and Eberm and Lantana camara L. were assessed in vitro for the antifungal activity against Alternaria alternata (Fr.) Keissl. and *Aspergillus niger* van Tiegh., causing postharvest rots in grapes. The tested fungi were isolated from infected grapes available in local markets. The essential oils were extracted through hydrodistillation process using Clevenger oil extracting apparatus. For screening of antifungal activity treatments at concentration of 20, 40, 80, 160 and 320µl/ml and controls were set to determine percentage inhibition of mycelial growth of two test fungi using poisoned food technique. All the tested oils exhibited significant antifungal effect (p<0.05) over tested fungi. Among all six essential oils, *Cinnamomum camphora* showed the most effective antifungal activity against *Aspergillus niger* which inhibited the mycelial growth by 81.58% and 100% at 20 and 80 µl/ml oil concentration respectively. Furthermore, Cinnamomum tamala showed best antifungal effect in controlling Alternaria alternata among all six oils whichinhibited the mycelial growth by 93.11% at 20µl/ml and by 100% at 80µl/ml oil concentrations.

*O-PP-1-704* 

# Comparative Study of Seed Mycoflora of *Lens culinaris* Meddik.from Different Storage Conditions and Control using Plant Extracts

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Lentil a major winter pulse of Nepal manages to maintain sixth position on productivity globally. So, lentil has a good potentiality for trade and export but its production has been ceased as its seeds are infested by storage fungi at higher rate than any other legumes. Five hundred forty seeds of lentils (Lens culinaris) from three different storage sources [seed distributer (NARC) as site one, local market as site two and traditional storage as site three] were tested for seed-borne fungi. Thirty five different fungi were isolated, Potato Dextrose Agar method being better than Standard Blotter technique. Seeds from storage condition of site three were found to be more infested with seed-borne fungi than site one and site two. Surface disinfection of seeds with 90% ethyl alcohol reduced the fungal incidence and frequency. Alternaria alternata was best controlled by Ageratum houstonianum, Aspergillus niger by Eclipta prostrata, Fusarium sp. pink by Vitex negundo and Ageratum houstonianum. The aqueous extract at 100% concentration was found best than fungicides for the fungal inhibition except Chaetomium funicola which was completely inhibited by Carbendazim. The inhibition increased from lower concentration (25%) to higher (100%). Out of total 35 different fungi only 10 different fungi were isolated from seeds treated with plant extracts. Ageratum houstonianum checked the fungal incidence and frequency best as compared to Eclipta prostrata and Vitex negundo on seed treatment.

O-PP-1-761

### Screening Pipeline Varieties of Potato Against Red Ants and White Grubs in Western Hills of Nepal

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An experiment was conducted under farmers' field conditions at Salija (2050 meters above sea level), Parbat in 2014 to identify economic pests of potato-based agro-ecosystem, assess the damage level of both red ant and white grubs and to screen the pipeline potato genotypes against the pests. The experiment was laid out under randomized complete block design (RCBD) with ten treatments each replicated four times. Data regarding total yield, damaged tubers numbers and weight as well as fresh tubers and weight were recorded. In red ant

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experiment, infested tubers' number was not significantly different among the tested genotypes. However, Ms 35.9 incurred the lowest level of damage  $(0.386\pm0.312\%)$  and the highest level of damage  $(7.567\pm7.857\%)$  was calculated in PRP 25861.11. On the weight basis PRP 35861.18 incurred the lowest level of damage  $(0.309\pm0.221\%)$  and the highest level of damage  $(9.973\pm10.556\%)$  was observed in PRP 25861.11. Similarly in white grub screening trial, PRP 35861.18 incurred the lowest infestation  $(0.126\pm0.063\%)$  and PRP 25861.11 was affected much  $(9.973\pm10.556\%)$ . And on the weight basis, result was found similar, PRP 35861.18 ( $0.126\pm0.063\%$ ) and PRP 25861.11 ( $0\pm0.221\%$ ). On the infestation of both white grub and red ant all the tested potato genotypes were statistically at par. However, the lowest tuber infestation ( $0.525\pm0.063\%$ ) in number and damage by weight ( $0.309\pm0.221\%$ ) and the highest number of tuber infestation was ( $9.553\pm0.715\%$ ) as well as the damage by weight ( $13.152\pm12.699\%$ ) was documented. It is concluded that the red ant infestation is maximum as compared to other insect pest. Based on the single season data, it can be concluded that the genotype PRP 35861.18 is suitable for the location.

### Animal Ecology and Diversity (O-AE-1)

O-AE-1-19

# First Report of Nematode Parasites of Marbled Toad, *Bufo stomaticus* (Bufonidae) from Nepal

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*Rhabdias* sp. and *Aplectana* sp. are the parasites of the lung and alimentary canal of amphibians and reptiles. During the period of April to June 2013, a total of 20 *Bufostomaticus* were collected in Kirtipur area and examined for nematode parasites. *Rhabdias* sp. was identified on the basis of cylindrical body, mouth surrounded by six distinct small lips, oesophagus ending with bulb, short and conical tail. Similarly, *Aplectana* sp. was identified on basis of short oesophagus and narrow and pointed tail. Both of the parasites are reported from toad for the first time in Nepal.

O-AE-1-232

# Entomological Indices and Container Preference of *Aedes Aegypti* in Kathmandu District, Nepal

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An entomological investigation on potential artificial breeding habitats of *Aedes aegypti*, a primary vector of dengue virus was conducted from April 2009 to March 2010 in Kathmandu district of Nepal. The larval collections were made in each locality to find out the House Index (HI), Container Index (CI) and Breteau Index (BI) as well as Breeding preference ratio of this species in all wet containers presented in and around the houses and their premises. The highest HI, CI and BI recorded were 4.42, 3.63 and 9.73 respectively for *A. aegypti* larvae in Kathmandu in October, 2009 and the lowest value recorded were 2.24, 1.11 and 3.37 in June 2009. Not a single larva was detected in December 2009 to March 2010. The breeding preference ratio was highest for discarded tires in Kathmandu district. The highest breeding preference ratio was 1.89 in discarded tires in the month of August and the lowest was 1.37 in November. It was observed that discarded tires lying outdoors were the preferred breeding habitats of *A. aegypti*. The accumulation of all sorts of discarded or unused tires around

human dwellings seems to be the main cause in occurrence of A. *aegypti*. These unused tires are intensive, favoring the number and dispersion of potential breeding sites for *A. aegypti* in these areas. So, integrated vector management, minimizing the breeding potential of Aedes aegypti by adopting tire and container management practice by individuals are suggested for the effective vector control in future.

O-AE-1-271

# Correlations Between Fish Assemblage Structure and Environmental Variables of the Seti Gandaki River Basin, Nepal

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This paper deals the relationships between fish assemblages and environmental variables of the Seti Gandaki River basin in Pokhara, Nepal. A total of five sites were selected for this study, three along the main channel and two along the tributaries Mardi and Vijaypur. Water sampling was done fortnightly for environmental variables and fish sampling was done monthly using two-pass removal method in which a cast-net and a back-pack shocker were applied with an equal effort. Altogether 30 species of fishes belonging to nine families were recorded. The Redundancy Analysis (RDA) revealed significant correlation between fish assemblage structure and environmental variables. The first two axes accounted for 44.15 % of the variation of which RDA1 explained 30.32 % and most strongly correlated with the variables conductivity, pH, dissolved oxygen, free carbon dioxide, ortho-phosphate, nitrite and silicates; while RDA2 explained 13.83 % and most strongly correlated with depth, width, discharge and nitrates. Likewise RDA1 revealed the gradient from species requiring more oxygenated waters of pre-urban sites dominated by Schizothorax richardsonii, Pseudecheneis eddsi, Naziritor chelynoides, Garra annandalei, Schistura rupecula, Lepidocephalichthys guntea etc. to less oxygenated urban, lower tributary and post-urban sites dominated by the species Puntius sophore, P. conchonius, Barilius bendelisis, B. vagra, Garra gotyla, Mastacembelus armatus, Channa orientalis etc. while RDA2 revealed the aradient from species inhabiting deeper, wider and higher flow urban and post-urban sites to shallower, narrower and limited flow pre-urban sites.

O-AE-1-316

### Foraging Behavior in Asian and European Honeybees: A Model of Biological Invasions

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Biological invasions and the impact of invasive species on native species have long been of interest to both applied and theoretical ecologists. The western honeybee, *Apis mellifera* Linneaus (Hymenoptera: Apidae) plays a complicated role in this story. It is native to Europe, Africa and the Middle East, and has been introduced throughout most of the world thereby competing with other native bees. *Apis cerana* is the most widespread species of the Asian honeybees, frequently cultivated by bee-keepers, and similar to *A. mellifera* in habits and appearance. Nepal is a particularly interesting place to carry out this study, as *A. mellifera* is still a relatively new introduced species, and populations of *A. mellifera* are still small, relative to *A. cerana* populations. This study compares three main aspects of interactions between Asian and European honeybees: pollen foraging, nectar foraging and the costs and benefits

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of *A. cerana* beekeeping over *A. mellifera* beekeeping in relation to seasons and landscapes in Nepal. Preliminary results show that both *A. mellifera* and *A. cerana* possess foraging strategies that could either minimize or exacerbate competitive effects. The impacts of competitively-driven changes in foraging behavior on *Apis cerana* populations depend on the degree to which their plant preferences overlap with those of *Apis mellifera*, the length and timing of nectar scarcity compared to periods of resource abundance, and the ability of *A. mellifera* to exclude *A. cerana* from particular patches or plant species.

O-AE-1-351

# Ecophysiology of *Eclipta prostrata* (L.) L. Occuring in Biratnagar, Eastern Terai, Nepal

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Ecophysiology of Eclipta prostrata of Biratnagar (Lat. 26º20'N, Long87º16'E, Alt. 72 msl) was studied by observation in the field and experimenting in the petridishes and earthen pots in the laboratory of Post Graduate Campus, T.U. Biratnagar, Nepal. The effect of different concentrations of NaCl and KCl and flooding was studied in petridishes and effect of different soil texture on seedling growth in earthen pots. The average length and breadth of E. prostrata seeds were 0.17 cm and 0.08 cm, respectively, average weight of air dried seed was 0.00043 g, average number of head per plant was 20, average number of seed per head was 67, and seed output/plants was 1340. NaCl and KCl showed inhibitary effect on the seed germination and salinity showed adverse effect on seedling growth. The root and shoot length of 30 days old seedling showed significant reduction with the increase in NaCl and KCl concentration beyond 0.15 M (p<0.05). The effect was more inhibitory beyond 0.2 M (p<0.01). NaCl and KCl also reduced the seedling growth with the increase in salt concentration. Plant biomass was decreases in the following order: root biomass decrease as Loamy sand >Sand >Sandy clay loam >Sandy loam >Loam >Clay loam; stem biomass as Sandy clay loam >Clay loam >Sandy loam> Loam >Loamy sand >Sand; leaf biomass as Sandy loam > Sandy clay loam >Clay loam >Loamy sand >Loam > Sand; and inflorescence biomass as Clav loam >Sandy clav loam >Sandy loam > Loam >Loamy sand >Sand. The total biomass of E. prostrata was maximum in sandy clay loam followed by sandy loam and minimum in sand. The most stunted root was observed in clay loam (16.8 cm) and the longest root was recorded in sand (22.8cm). Loamy sand (p< 0.01) and sand (p< 0.05) had significantly increased the root growth. The longest shoot was in sandy clay loam (33.1 cm). However, shoot growth was not appreciably variable with soil texture at significant level. In pot culture experiment, resource allocation in clay loam soil was highest in stem and least in the inflorescence - Stem (40%)> Root (26%)> Leaf (25%)>Inflorescence (9%). Loam was highest dry biomass in stem with order: Stem (40%) > Root (34%) >Leaf (21%) >Inflorescence (5%). Sandy clay loam also had highest resource partitioning in stem with order of: Stem (37%) >Root (34%) >Leaf (22%) >Inflorescence (7%). But in the sandy loam root biomass was maximum, order in decreasing was: Root (39%) >Stem (33%) >Leaf (22%) >Inflorescence (6%), Like sandy loam, similar pattern was follow in loamy sand: Root (44%) >Stem (33%) >Leaf (20%) >Inflorescence (3%) and in sand: Root (40%) >Stem (34%) >Leaf (20%) >Inflorescence (6%).

#### O-AE-1-447 Diet and Activity of Macaca assamensis in Shivapuri-Nagarjun National Park, Nepal

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Diet and activities of Assamese macaques (Macaca assamensis) in natural and provisioned habitat were studied in the Nagarjun forest in Shivapuri-Nagarjun National Park, Nepal to investigate and compare the diet, the preferences and, the activities of the macaque species as a detailed study on the topic has not been carried out yet. Scan and all occurrences sampling were used for recording diets and activities of Assamese macagues in two social groups, a wild group and a provisioned group, throughout a year from August 2013. A total of 21836 behavior events was recorded by the 2008 scan samplings for 508 hours. Unlike most of other studies of Assamese macaque, the Assamese macaques in Nagarjun were highly frugivorous, though they utilized a wide range of trees, herbs, shrubs and climbers including insects and their secretions. Trees contributed a larger proportion of their diet than plants with other life forms. The macagues spent 55.2% of behavior events on feeding in the wild group and 35.3% in the provisioned group. The wild macagues spent more time on feeding and moving, and less time on resting and social interactions than did the provisioned macaques. The macaques were quite arboreal, as they were in trees in 98.5% of behavior events in the wild group and 85.7% in the provisioned group. Availability of artificial foods affected the activity budget of the macaques in the provisioned group.

O-AE-1-549

#### **Epiglottal Taste Buds and Different Feeding Habits of Mammals**

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Taste buds which occur in the laryngeal surface of epiglottis of mammals share many similarities with lingual taste buds, although their function is different. These taste buds mediate reflex action to close the laryngeal opening or initiate the cough reflex when food comes in contact with the posterior surface of the epiglottis. Repeated microscopic studies were carried out on 6 µm serial haematoxylin and eosin stained sections of epiglottides of buffalo, guinea pig, house rat, human, lamb and rabbit. Quantitative investigation was carried out on the taste buds on the rostral, middle and caudal regions of the epiglottides of each of these mammals. Relative frequency of occurrence (RFO) value for comparative assessment of taste buds is proposed here. The average number of taste buds was found higher in the herbivorous buffalo, goat and rabbit, while the number was lower in the omnivorous guinea pig, house rat and the human. The density of taste buds was found to be directly proportional with the feeding behaviour of mammals, showing their significant role in inducing reflexes for safe passage of bolus through oesophagus and for protection of respiratory tract congestion. Since the number of taste buds was found higher in the herbivorous mammals, it was concluded that bigger the volume of the bolus higher is the density of epiglottal taste buds. These taste buds are adapted to protect the respiratory passage during swallowing and drinking, by initiating the reflex action.

O-AE-1-775

## Life Table and Efficacy Study of Orgilus Lepidus (Muesebeck) in Its Host *Phthorimaea Operculella* (zeller) in Khumaltar, Lalitpur

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The purpose of this experiment was to find out the life table and efficacy of larval parastitod, Orgilus lepidus (Muesebeck) in its host Potato Tuber Moth, Phthorimaea operculella (Zeller). The parasitisation rate of O. Lepidus was studied on different aged host insect. Efficacy of parasitoids was studied in glass house by releasing both host and parasitoid and subsequent collection of host infested leaf followed laboratory analysis. The life table study revealed that the eqg to pupal period, pupal mortality and pupal to adult period was found to be 18.18±3.49 days, 3.2±0.89 percent, 9.32±1.10 days respectively in honey water fed condition as compared to respective14.5±1.8 days, 5.4±1.03 percent and 9.67±1.46 days in control condition. Adult longevity of male and female was found 7.73±4.06 and 7.13±3.06 days respectively in honey water provided condition however, it was only 4.40±1.11 and 5.27±1.31 days in control condition. Fecundity in honey water provided condition (50.4±3.84 per female) was found significantly higher (p<0.05) than control (25.53±3.51 per female). The efficacy study of parasitoid on glass house condition showed that both population of host and parasitoid was build where population of host was found 81.13 percent and parasitoid was found 18.87 percent indicating establishment of parasitoid was somewhat successful in glass house condition. Hence, this study illustrated that larval parasitoid is potential to suppress the potato tuber moth population.

O-AE-1-776

### Freshwater Red Algae *Nemalionopsis shawii* Skuja and *Compsopogon caeruleus* (Balbis ex C. Agardh) Montagne, New Record for Nepal

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Freshwater red algae (Rhodophyceae) of Nepal is least studied. Only one red algae i.e., *Batrachospermum moniliforme* Sirodot [Synonym: *Batrachospermum gelatinosum* (Linnaeus) De Candolle] was reported from Hanumante River, Bhaktapur till the date. Present study added two new freshwater red algae *Nemalionopsis shawii* Skujaand *Compsopogon caeruleus* (Balbis ex C. Agardh) Montagne, collected from Lati Khola (26°42' 16.1"N, 087°19'18.5E, Alt. 132 m) and Khayera Khola (26°41'22.6"N, 087°19'22.2"E, Alt. 126 m), Sundar Dulari Municipality, Morang in April, 2015, respectively. These rivers are also rich in *Batrachospermum* species.

### Applied Microbiology and Biotechnology (O-AM-1)

O-AM-1-168

# Comparison of Methods for the Detection of Biofilm Production in Staphylococcal Isolates

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The ability of biofilm formation seems to play an essential role in the virulence of Staphylococci. Biofilms are a great threat to invasive devices causing slow persistent infections. Biofilms interfere in antibiotic therapy, undergo gene transformation to become highly virulent and protect bacteria from host immunity. The study was carried out to evaluate the methods for the detection of biofilm formation in Staphylococci. Biofilm production was studied in 90 Staphylococci isolated from different clinical specimen by three different methods; tissue culture plate method (TCP), tube method (TM) and congo red agar method (CRA). Among 90 Staphylococci isolates, 12 (13.3%) showed biofilm formation by TCP method and addition of glucose increased positive biofilm formation by 44 (48.9%). They were categorized as high 17(18.9%), moderate 29 (32.2%) and weak or non-producer 46 (51.1%). TM method correlated well with TCP method showing 17 (18.9%) high and 18 (20%) moderate biofilm producers. CRA method showed only 6 (6.7%) strong biofilm producers. With high sensitivity and specificity, TCP method was found to be most reliable method for detection of biofilm formation by Staphylococci. TCP method also has the advantage of being quantitative method and could be used as a screening method for the detection of biofilm formation by Staphylococci in medical devices.

*O-AM-1-291* 

#### Prevalence of Intestinal Parasitosis, Related Risk Factors and Possible Impact on Nutritional Status among Private School Children in Kathmandu

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Intestinal parasitosis (IP) has been a major public health problem in resource limited country like Nepal. This study was designed to determine the prevalence of IP, related risk factors and association with nutritional parameters among private school children of Kathmandu. This cross sectional study was conducted from July-November, 2014. A total of 329 stool and blood samples were collected and taken to the laboratory of Shi-Gan International College of Science and Technology. Anthropometric data were collected and guestionnaire related to their personal hygiene, socio-economic condition were done. Stool samples were processed formal-ether concentration technique. Hemoglobin estimated using was bv cyanmethemoglobin method. Statistical analysis was done by using SPSS 20.0. The overall prevalence of IP was 17.9% with protozoan parasites dominant (47.5%) over helminthes (22.0%). Giardia intestinalis (29.9%) and Trichuris trichiura (24.7%) were the most common protozoan and helminthes respectively. The prevalence of infection was slightly higher among boys and among the children <10 years. No statistically significant association was observed with parents' literacy, use of antihelminthic drug, source and treatment of drinking water etc. A total of 41.0%, 29.0% and 11.0% children were stunted, underweight and wasted respectively. Similarly, about 20.5% of children were anemic without significant association

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with parasitic infections. The prevalence of IP was found high in private school children so there is need of periodic deworming programmes, improvement of sanitation and hygienic practices.

O-AM-1-315

# Study of Extended Spectrum Beta Lactomase (ESBL) and Carbapenamase Activities in Gram Negative Bacteria Isolated from Different Clinical Sample

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Antibiotic resistance is one of the leading problems in developing country like Nepal with the growing trend in emergence of multidrug resistance organisms. Extended Spectrum Beta Lactamase (ESBL) and carbapenamase producing multidrug resistant (MDR) bacteria complicate therapeutic management and limit treatment options. Therefore, detection of ESBL and carbapenamase activities are of therapeutic importance. Between August 2014 and June 2015, a prospective study was carried out in Nepal Police Hospital with an objective to determine the status of ESBL and carbapenamase producing multidrug resistant Gram negative isolates from different clinical samples. Organism was analyzed using standard microbiological methods, followed by In vitro antibiotic susceptibility testing performed by Kirby Bauer disc diffusion method. ESBL was confirmed by combined disc assay and carbapenamase by Modified Hodge test (MHT). A total of 348 Gram negative bacteria were isolated from 2870 total proceed sample and majority of them were Escherchia coli (235/348, 67.52%) followed by Klebsiella pneumoniae (51/348, 14.6%). 176/348 (50.57%) isolates were multidrug resistant, among them 106 were meropenem resistant. Out of MDR isolates, 47 (26.7%), 34 (19.3%) and 34 (19.3%) isolates were ESBL positive, carbapenamase positive and both (ESBL and carbapenamase) positive respectively. Pseudomonas aeruginosa (60%) was the major ESBL and carbapenamase producer followed by K. pneumoniae (59.5%) and E. coli (47%). Thus, the continuous surveillance is necessary in order to prevent the infection and risk caused by ESBL and carbapenamase producer.

O-AM-1-601

### Comparative Study of $\beta$ -lactamase Test by Microbiological and Biochemical Methods

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 $\beta$ -lactams were the most commonly used antibiotics for treatment of staphylococcal infections. Two primary resistance mechanisms to beta-lactams are noteworthy in Staphylococcus spp.: the expression of beta-lactamase enzymes encoded by the blaZ gene and production of the penicillin-binding protein 2a re-sulting in a higher-level of resistance encoded by the mecA gene, which reduces the use of Beta-lactams. This study was aimed to compare three test methods clover leaf technique, acidimetric test and iodometric test for the detection of  $\beta$ -lactamase enzyme produced by 108 S. aureus isolated from skin and soft tissue infections. The study was carried out following standard methodology during February 2013 to October 2014 in Birendra Hospital Chhauni, Kathmandu, Nepal. Sensitivity, specificity, positive predictive value, and negative predictive values of the tests were calculated taking clover leaf technique (microbiological technique) as the standard. Of the two

biochemical methods, iodometric test was found to be more sensitive (92.75%) and had high negative predictive value (86.79%), whereas, acidimetric test was more specific (87.18%) and had high positive predictive value (92.19%). Both of the methods were found to be comparable for the detection of  $\beta$ -lactamase production. However, clover leaf method is comparatively cost effective, can be done in any routine diagnostic laboratory and does not involve the use of specialized technique or equipment in contrast to the other two test methods.

O-AM-1-656

#### Molecular and Probiotic Attributes of Lactobacilli Isolated from Nepalese Dahi

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Lactic acid bacteria (LAB) are believed to be beneficial for the human host and are currently being evaluated as potentially probiotic bacteria. Objectives: To find the prevailing natural LAB in traditionally fermented Nepalese dahi, study genetic diversity and determine the probiotic properties of selected isolates. Methodology: Altogether, 64 traditional fermented dahi samples were collected from different altitudes of Nepal. Lactobacillus comprised of 62% of the total isolates obtained and were further identified to species level by Ribosomal Spacer Analysis (RSA), 16S rRNA sequencing and species-specific attributes molecular. Intra species genetic diversity analysis was carried out by combined use of repetitive element and Random Amplified Polymorphic (RAPD) DNA. Identified cultures of Lactobacillus species were evaluated for probiotic properties such as gastrointestinal transit resistance, adhesion using Caco-2 cell, antibacterial activity, and antibiotic resistance. Results and Discussion: Among the presumptive isolates of LAB, 120 isolates were identified to 10 different species of Lactobacillus based on PCR-based methods. The intra specific genetic diversity revealed that the biodiversity of the isolated cultures correlated with dahi samples of different altitudes. Two isolates of Lactobacillus paracasei NAST-RHM82 and L. helveticus NAST-RHL103 were found to be more prominent among the tested isolates. Both the isolates were able to survive and grow at pH 2 and 0.3% bile, positive for adhesion to Caco-2 cells and exhibited inhibitory activity against some food borne pathogens; Bacillus cereus, Escherichia coli, Listeria monocytogenes and Staphylococcus aureus. Conclusion: These two lactic isolates which have shown good in vitro probiotic properties may be probiotic candidates in future.

O-AM-1-668

# Studies on Bactericidal Effect of Zanthoxylum armatum on Pseudomonas aeruginosa, Escherichia coli, Streptococcus pyogenes and Staphylococcus aureus

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The anti-microbial activities of Zanthoxylum armatum was tested, being extracted using solvents; against *Pseudomonas aeruginosa, Escherichia coli,Streptococcus pyogenes* and *Staphylococcus aureus* by agar well diffusion method and MIC was determined using four antibiotics as standards. *Pseudomonasaeruginosa* was resistant to oleoresin extracted with all antibiotics. *E. coli* was affected by oleoresin extracted with chloroform and petroleum ether and sensitive to Ampicillin and Chloramphenicol. *Staphylococcus aureus* was most sensitive

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to oleoresin extracted with methanol and sensitive to Chloramphenicol, Streptomycin and Tetracycline. *Streptococcuspyogenes* was affected by oleoresin extracted with acetone, methanol and petroleum ether and low profile sensitive to all antibiotics.

*O-AM-1-67* 

# Quality Assessment of Herbal Medicines and Products with Reference to Selected Microbial Isolates

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This study has focused on microbial quality of different herbal medicines and herbal products. This descriptive and inferential study was carried out from September 2014 to July 2015 to determine the microbial quality of herbal medicines/products available in market of Kathmandu Valley. The test procedure was based on the "WHO Guidelines for Assessing Quality of Herbal Medicines with Reference to Contaminants and Residues" with few modifications. The results showed that among the 114 herbal samples processed, 50.8% samples were contaminated with aerobic bacteria whereas 40.3% samples were contaminated with aerobic fungi. Furthermore, 38% of the samples had the presence of pathogenic microorganisms. All local samples were contaminated whereas 12% of the branded samples were contaminated with pathogenic microorganisms such as Staphylococcus aureus, Pseudomonas aeruginosa, Clostridium perfringens and Escherichia coli. Here, 39.5% of the samples did not comply with the limits as stated by WHO guidelines. There is a need for constant and continuous monitoring and quality control of the herbal medicines/products available in Nepalese market. Consumers and producers should be aware whereas the concerned authorities should be responsible about the microbial quality of herbal medicines/products.

O-AM-1-789

## Plasminogen Activator Inhibitor-1 Regulates Infiltration of Macrophages into Melanoma Via Phosphorylation of FAK-Tyr 925

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Tumor-infiltrating macrophages are potential candidates for cancer immunotherapy. However, the detailed molecular mechanism underlying macrophage infiltration into tumors is poorly understood. Based on our previous finding that plasminogen activator inhibitor-1(PAI-1) enhances vitronectin-dependent migration of macrophages, we investigated the potential role of PAI-1 in macrophage invasion into melanoma. Experimental evidence obtained from spheroid confrontation assay clearly showed that PAI-1 overexpression significantly enhanced the invasion of RAW 264.7 cells into B16F10 melanoma. We further demonstrated that PAI-1 induces phosphorylation of focal adhesion kinase (FAK) at Tyr<sup>925</sup>, which, in turn, mediated the invasion of macrophages into the melanoma. This work further illustrates that low-density lipoprotein receptor related-protein 1 (LRP1) is essential for PAI-1–mediated FAK phosphorylation and macrophage invasion into melanoma. In conclusion, our study demonstrates a novel role of PAI-1 in macrophage invasion into melanoma and provides insights into the underlying molecular mechanism.

### *O-AM-1-85* Phenylhydrazine Induced Hematotoxicity and Effects of Oxidant-Antioxidant State in Wistar Albino Rats

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Phenylhydrazine is a potent drug to meet blood disorders. PHZ induced toxicity is attributed to the lipid peroxidation which occurs in the membrane of RBC. PHZ is an oxidant drug which destroys red cells by its effect on enzymes involved in energy metabolism. It results in the denaturation of red cell hemoglobin *in vitro* or *in vivo* with little evidence of toxicity to other tissues. The aim of this study was to evaluate the toxicity caused by the PHZ on redox status of albino rats. Twenty albino rats weighing 200-250grams were selected for the study. 10mg/kg body weight of PHZ was induced intraperitoneally. The lipid peroxides and hydroperoxides were free radicals markers whereas catalase, superoxide dismutase and glutathione peroxidase, vitamin A, C, E and total antioxidants revealed antioxidant index. PHZ induced rats showed significantly higher lipid peroxides and hydroperoxides. The enzymatic antioxidant showed lowered redox-state as compared to their healthy counterparts. The p-value less than 0.005 were considered significant. From these results, it was suggested that PHZ administration ameliorates RBC related injuries increasing oxidative stress and decreasing antioxidant capacity. The study concludes that PHZ induces anemia in experimental albino rats and alleviates redox state.

### Diversity and Distribution of Plants-1 (O-DD-1)

0-DD-1-903-I

### Poverty Trap and Biological Resources in Nepal: Role of Science, Technology and Innovation

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Poverty trap is a spiraling mechanism which compels people to remain poor. It is so binding in itself that it doesn't allow the poor people to escape from it. Nepal Himalaya is rich in biodiversity that supports human society ecologically, economically, culturally and spiritually. It is also a source of livelihoods for local communities who suffer most when biodiversity is lost, However, Nepal, despite possessing rich biodiversity, has been unable to escape from the poverty trap. The pressing issues pertaining to sustainable management of biological resources include conflicts between resource dependent communities and conservation agencies, and under-utilization of biological resources. Science, technology and innovation (STI) is recognized as an important driver for sustainable growth that can also help Nepal to overcome poverty and graduate from least developing country. This is one of the recommendations after a review of the MDG achievements and limitations in preparations for the Post-2015 Development Agenda. The key to the successful implementation of STI practice is how to build ownership and capacity at the local level to develop STI strategies and to create enabling and practical solution based programmes for the country. Trade models suggest that a country should specialize in industries in which it has a comparative advantage, so a country rich in biological diversity would be better off specializing in the extraction of the biological resources. However, increase in exploitation of valuable biological resources could more or less result in 'Dutch disease' where a country's other industries

become less competitive. The main objective of the presentation is to analyze scenario of current socio-economic and biodiversity in Nepal and discuss strategy and necessary steps to climb out of poverty in Nepal. The presentation will cover conceptualization and interlinkages between biodiversity and poverty traps in global context, followed by national context of characterization of socio-economy, status of biodiversity, impact of Gorkha earthquake 2015 in forest and biodiversity, scenario of science and technology, and bottlenecks of STI strategy. Finally, national initiatives and recommended strategic approaches will be discussed.

O-DD-1-118

#### Tree Diversity Conservation Initiatives in Sacred Groves of Kathmandu Valley, Nepal

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Study was conducted in two sacred groves of Kathmandu Valley, Pashupati Sacred Grove and Bajrabarahi Sacred Grove, aiming to analyze diversity of tree species and their role in conserving biodiversity. Parallel transects with concentric circular plot survey methods were applied for data collection. During the study 23 tree species belonging to 22 genera and 15 families were recorded in Pashupati sacred grove, whereas only 19 tree species belonging to 16 genera and 13 families were recorded from Bajrabarahi Sacred Grove. The Shannon-Weiner diversity indices were higher (H=1.91) in Pashupati sacred grove compared to Bajrabarahi Scared Grove with 1.80 Shanon-Weiner Indices. Three types of forest were recorded from Pashupati Sacred Grove namely *Schima-Pyrus* forest, *Myrsine-Persea* forest and *Quercus-Myrsine* forest, and only one *Neolitsi acuipala* forest from Bajrabarahi sacred grove. Sacred grove is one of the pioneer and community based management regime of forest resource management system and is playing positive roles in biodiversity conservation compared to that of government management system.

0-DD-1-136

# Tree Species Richness along Altitudinal Gradient in Chamelia Valley, Api Nampa Conservation Area, Western Himalaya, Nepal

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A major focus of research in mountain ecology over the past 25 years has been to understand why the number of species varies geographically. The most striking, and perhaps best documented, pattern in spatial ecology is the altitudinal gradient in species diversity in which the number of species, for most taxa, declines with increasing elevation. However, the spatial ecology in the Himalayas are limited in terms of geographical representation. Species richness pattern in relation to the elevation gradient needs to be understood before drawing conclusion towards the role of biodiversity on ecosystem processes. Elevation gradient is a unique situation that allows assessment of species richness within a small geographical area. In this study, forest vegetation was sampled in one hundred fourteen quadrats of size 10 m x 10 m along an elevation gradient from 2,000 masl to 3,800 masl at an interval of 100 meters elevation. We report 38 tree species belonging to 19 families. Tree species richness followed hump-shaped relationship with elevation with its peak at mid-elevation i.e. upper temperate

zone. The regression drawn between elevation and species richness shows significant relation ( $r^2$ =0.743). Tree basal area also showed maximum value at mid-elevation. *Quercus semecarpifolia* showed the highest IVI (41.3) followed by *Betula utilis* (30.5) and *Tsuga dumosa* (26.3). This study gives an insight into tree species richness in the Chamelia valley of western Himalaya and fills some information gap on the area. The influence of other environmental factors on species richness pattern needs to be explained in order to know more on ecosystem processes.

*O-DD-1-147* 

#### Tree Fern Distribution and Association in Panchase Mountain Forest, Nepal

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The research focused on distribution and ecology of threatened pteridophytic species tree fern (Alsophila spinulosa wall. Ex Hook) found in subtropical ecosystem of Panchase mountain forest area of Central Nepal.The study aim to map the distribution status of tree ferns, explain structural features and determine associated vegetation layer. The extensive field survey was conducted from April 2014 to March 2015. Total of 72 circular quadrates were laid down to collect the information on tree ferns and associated vegetation composition. Baseline map of tree fern in Panchase area was prepared with GPS location of 403 and directly counted 756 individuals. It was recorded from 6 Village Development Committees of Kaski, Parbat and Syangja District of Panchase. Tree fern in Panchase were recorded from 902 m to 1783 m altitudinal range, preferred north and northeast aspect, slope of 18 to 27 degree, shady area with relatively high soil moisture and near of natural water sources. No significant relation was found between the number of tree fern & altitudinal variation or different soil chemical parameters tested except with nitrogen content, which shows good positive relation. Some structural features were quantified and found the longest fronds of 4.35 m, maximum DBH of trunk is 57.3 cm and maximum height is 14.1 m. Association was mainly with Schima wallichii, Castonopsis indica and Macaranga pustulata in tree layer. Immature tree ferns were recorded in only 58.33 % of the studied quadrates.

O-DD-1-174

### Vegetation along a Fire Gradient in Subalpine Shrubland in Langtang National Park, North-Central Nepal

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Fire induced by migratory pastoralism and other additional disturbances have threatened the fragile high-altitude ecosystem in the Himalaya. In this study, change in species richness and composition in response to fire intensity gradient was analyzed by stratified random sampling method. This study was carried out after two years of fire on the northern aspect of a subalpine rhododendron-dominated shrubland at an elevation of 3900-4100 m asl in Langtang National Park, Nepal. Altogether, 67 species and 14 biophysical variables were recorded in 89 plots, including 49 plots in burned and 40 in unburned habitats along three different levels of fire intensity, which decreased along the ascending topographic gradient. Species richness in all the spatial scales (sub-plot, plot and habitat) studied was pronounced in the burned than in the unburned habitat. There was gradual increase in mean species richness in both habitats along the topographic gradient with decreasing fire intensity.

However, the difference between burned and unburned habitat was remarkable in mid-slope with intermediate fire-intensity. Indicator species distinguishing burned (n = 8) and unburned (n = 2) habitats were identified among the 47 species present in both habitats. Majority of indicator species were Himalayan endemics. The indicator species of unburned habitat were predominant species of rhododendrons, whereas those of burned habitat were graminoids and perennial forbs, including Agrostis pilosula, Aletris pauciflora, Anemone rupestris, Bistorta macrophylla, Chesneya nubigena and Pleurospermum apiolens. This study supports the hypothesis that intermediate fire-intensity favors species richness and burning replaces woody species favoring herbaceous ones.

O-DD-1-307

### Taxonomy and Diversity of Freshwater Algae of Bagh-Jhoda Wetland, Morang district, Nepal

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Taxonomy and diversity of freshwater algae of Bagh-Jhoda wetland of Morang district has been studied. Epiphytic algae were collected from three different sites of the wetland during winter, summer and rainy seasons in 2014. A total of 74 algae (Chlorophyceae 66%, Bacillariophyceae 15%, Cyanophyceae 11%, Euglenophyceae 5% and Dinophyceae 3%) belonging to 43 genera were reported. Among them 22 alga are new record for the country. Seasonal variation of algal genera was observed. Common genera found in all sites in all three seasons were *Anabaena, Navicula, Oscillatoria, Closterium, Nitzchia, Gomphonema, Chroococcus, Aphanocapsa* and *Sorastrum*. Highest number of algae genera was observed in winter season (93%) followed by summer (88%) and rainy (81%). Statistical analysis *viz.,* ANOVA, Chi-Square test, Shannon-Wiener Diversity Index, evenness of species in different seasons and similarity between two seasons were also performed. P-value lower than 0.001 showed significant (P < 0.05) association between species and seasons. High value (4.92256) of (H) in summer season showed rich diversity in this season. Evenness or equitability in winter, summer and rainy seasons were 0.9185, 0.9449 and 0.9219, respectively.

O-DD-1-321

### Demographic and Growth Traits of *Rhododendron campanulatum* D.Don.at Treeline Ecotone of Annapurna Conservation Area, Mustang District, Nepal

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Climatic treeline ecoton is the most sensitive ecosystem to the climate change impact which results on changes in species composition and their density. In this research demographic parameters and growth traits of *Rhododendron campanulatum* were analyzed across treeline ecotone in Mustang district. Along 4 vertical transects, a total of 72 quadrats (5m×5m); 34 above treeline and 38 below treeline were sampled to analyze regeneration pattern, specific leaf area (SLA), and other growth traits of *R. campanulatum*. In general *R. campanulatum* was regenerating in both habitats, as evident from reverse J-shaped density diameter curve, with the highest life expectancy of juveniles. The type III survivorship curve was found in both habitats with highest mortality during early stage of life but the seedling mortality was higher below treeline than above. Dead stems were more common below treeline than above. Canopy was major factor affecting successful regeneration, as evident from significantly

higher number of juveniles in relatively open areas above treeline as below. But, the seedling density was significantly higher below treeline. The SLA was higher below treeline (54.67 cm<sup>2</sup>/gm) than above (47.05 cm<sup>2</sup>/gm). The decline in SLA above treeline has made the species hardy in climatically stressful conditions. The high density and frequency of juvenile, low mortality, low SLA and long inter-node length indicated that the species has been successfully adapted above treeline with potential to expand upward.

0-DD-1-350

# Diatom (Bacillariophyceae, Algae) Diversity of Bagmati River, Kathmandu, Nepal

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Epilithic, epipelic and epiphytic diatoms were studied from three different sites of Bagmati River [site 1: Mulkharka (above Sundariial dam, as unpolluted). 27°46'45.02"N. 85°25'27.31"E°, Alt. 1674 m; site 2: Gokarna (as mild polluted), 27°44'6.64"N, 85°24'17.83"E°, Alt. 1325 m; and site 3: Guheswori-Pashupati (as polluted), 27°42'37.43"N, 85°21'15.99"E°, Alt. 1306 m) during winter, summer and rainy seasons in the year 2015.All together, 48 diatoms were reported belonging to 25 genera under 12 families. Genu Gomphonema was represented by maximum number of species whereas Amphora, Aulacoseira, Cocconeis, Cyclotella, Diatoma, Diploneis, Fragilaria, Meridion, Neidium, Planothidium, Sellaphora and Ulnaria wererepresented by single species throughout the study period. Species diversity was rich at site 1 (i.e., 87.5%) and poor at site 3 (i.e., 39.58%). Similarly, larger sized diatoms were observed in site 1 and smaller sized in sites 3. These indicate the influence on diatom diversity and frustules size by level of water pollution. There were 8 common diatoms found in all three sites. In site 1, maximum number of taxa were observed during summer (39 taxa) and least during winter (10 taxa) and habitat preference were as epilithic (56%) > epipelic (24%) > epiphytic (21%).In general, dominant diatoms of Bagmati river were Achnanthes crenulata, Gomphonema pseudoaugur, Nitzschia linearis, N. palea, Pinnularia cf divergens and Surirella linearis and scarce were Amphora ovalis, Aulacosiera granulata, Cymbella aspera, C. tumida, Diploneis ovalis, Encyonema ventricosum, Epithemia adnata, E. sorex, Eunotia bidens, E. botuliformis, E. minor, Fragilaria vaucheriae, Frustulia rhomboids var. saxonica, Gomphonema acidoclinatum, Gyrosigma kuetzingii, Meridion circulare var. constrictum, Pinnularia grunowii, Stauroneis gracilis and S. smithii.

### Diversity and Distribution of Plants-2 (O-DD-2)

O-DD-2-164

# Diversity of Useful Plant Species in Jaljala Mountain Area, Rolpa, Western Nepal

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Documentation of useful plants and quantitative assessment of their importance is a major focus in ethnobotanical research. This study aimed to document useful plant species, analyze their importance and assess their diversity along elevation gradient in Jaljala Mountain, Rolpa, Nepal. A list of useful plant species was prepared through empirical ethnobotanical study. Richness of useful plant species was studied through plot sampling (n = 42; size 100

m<sup>2</sup>) along elevation gradient (2200-3400 m asl) covering different vegetation types. A total of 175 plant species, belonging to 73 families and 144 genera, identified in this study as useful, were grouped under ten major use categories with highest number of species under medicinal (83) and food (75) use categories. Based on the use value index, the most important species were Aconitum gammiei, Swertia chirayita, Berginia ciliata, Rheum austral and Taraxacum parvulum. A total of seven forest types were delimited based on abundance of tree species. Richness of useful plant species was high at low altitudes and in alder-oak and mixed broadleaved forests. However, all of the forest types harbor potential species with high conservation and local use values. Therefore, forest management should be based on integration of landscape with different habitat types, associated species and local knowledge.

O-DD-2-29

#### Flowering Plants of Panchase Protected Forest, Kaski District (Central Nepal)

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Panchase Protected Forest is one of the linkages of Chitwan Annapurna Landscape (CHAL). This paper enumerates the flowering plant species within the elevation range of 900-2500 m, of Panchase Protected Forest. Altogether 593 species of flowering plants are recorded belonging to 382 genera and 108 families. The number of plant species shows a unimodal pattern of distribution, as the number of species increases up to 1600 m, and gradually decreases to 2500 m. The study revealed two taxa as new record for Flora of Nepal. *Dischidia bengalensis* Colebr.(Apocynaceae) and *Phreatia elegans* Lindl.(Orchidaceae). Orchidaceae is the dominant family with 124 species (49 genera), which comprise 27.5% of total orchid species of Nepal, followed by Poaceae (25 spp.), Asteraceae (24 spp.), Lamiaceae and Fabaceae (16 spp. each), Rubiaceae (14 spp.) etc. Five endemic plant species of Nepal, viz. *Begonia flagellaris* (Begoniaceae), *Eria pokharensis, Oberonia nepalensis, Odontochilus nandae* and *Panisea panchaseensis* (Orchidaceae) are reported from the study area. The present study suggests that PPF is one of the hotspots for floral diversity representing typical mid hill of Nepal.

O-DD-2-498

#### Pteridophyte Flora of Manaslu Conservation Area, Central Nepal

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The Pteridophytes comprising ferns and fern allies constitute an important part in Nepalese flora. Pteridophyte flora of the Himalayan region is considered to be the basic requirements for the knowledge of pteridology. This paper aims to provide an inventory based research work carried out mainly in Nubri valley of Manaslu Conservation Area (MCA), Central Nepal. A total of 105 species of Pteridophytes was collected belonging to 45 genera and 20 families including *Athyrium contingens* Ching as a new record for Nepal. Based on the number of taxa belonging to particular rank, Polypodiaceae and Dryopteris are the largest family and genera respectively with 8 and 12 taxa. On the basis of habitat, majority of the species are terrestrial (65) followed by epiphytic (28) and lithophytic (34). Similarly, a few species are also recorded growing in more than one particular habitat. 16 species are found growing in both epiphytic and lithophytic conditions. Similarly, one species is growing in epiphytic as well as terrestrial whereas only four species growing in terrestrial and lithophytic habitats.

#### O-DD-2-515 Population Growth Performance in Endemic Himalayan Poppy *Meconopsis napaulensis* along the Altitudinal Gradient in Central Nepal

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Endemic species are generally considered highly vulnerable due to genetic, demographic and environmental stochasticity. They are mostly habitat specific, less abundant with small incompatible populations, and are poor competitors. Thorough assessment of populations at the spatial and temporal scale is needed for their conservation and management. In this study, we compared variation in life history traits of a plant species endemic to Nepal -Meconopsis napaulensis DC (Papaveraceae). The study was carried out at two elevation levels (3500 - <4000 m asl and >4000- 4700 m asl) in Langtang National Park, central Nepal, covering six populations. Populations at both elevation levels were compared in terms of their size and structure, and traits responsible for the population sustenance. Life history traits were found to be strongly affected in response to the environmental factors, among them altitude was the significant discriminating factor. Inadequate representation of younger life stages, poor vegetative growth and malformation of capsules were found to be the major driving factors for the reduction in population size at high elevation compared to lower elevation. Plants at alpine level showed significant trade-off between vegetative investment and reproductive potential (more investment toward seeds/capsule), which is expected to be essential for the population resilience. In conclusion, poor plant growth performances of Meconopsis napaulensis at high elevation due to ecological constraints affect population persistence. Management should focus on increasing seedling recruitment and reducing damage to the reproductive adults so as to maintain long-term population viability.

O-DD-2-526

#### Vascular Plant Species Richness and Distribution Pattern in Subalpine-alpine Gradient in Chameliya Valley, Far-west Nepal

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Species richness and distribution of vascular plants in subalpine-alpine gradient were studied in Api-Nampa Conservation Area (ANCA), upper Chameliya valley, Darchula, Nepal. Plant species were sampled in four mountain summits, along elevation gradient (3950 to 4450 m asl), and having same local climate. Vegetation sampling was carried out applying standard method of Global Observation Research Initiative in Alpine Environment (GLORIA). Analysis revealed that plant species richness decreased in summits along elevation gradient. Aspect, slope, radiation, and substrate types were the major environmental variable that correlated with species richness. In addition, the altitudinal variation of species richness was affected by human disturbance. As a result of great topographic variation the study area harbored significant proportion of endemic and rare plant species. Majority of plant taxa recorded from summit sites were Himalayan endemics followed by species with Pan-Himalayan distribution. The study area is greatly influenced by Western Himalayan floristic elements with a number of unique species recorded in the plant families like Poaceae, Apiaceae, Gentinaceae and Orobanchaceae. The subalpine-alpine life zone, which bears high proportion of Himalayan endemics, is fragile and may experience decline of a variety of such species due to change in the local environmental conditions and if increasing human encroachment is not properly checked. The result of the present study can be used as base line for future monitoring of change in species distribution pattern.

#### *O-DD-2-606* Species Richness from Cropland to Forest in Ghunsa Valley, Eastern Himalava

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Species richness is the number of total species present in an ecological community which is widely used to measure biodiversity. This study was carried out in Ghunsa valley, Kanchenjungha Conservation Area of Eastern Himalaya during 2012. Four land use types, namely crop land, meadow, exploited forest and natural forest were selected at each of five elevational bands starting from 2,200m asl at Sekathum to 3,800m asl at Rambuk kharka, Taplejung. A total of 70 transects, having 25m x2.5m size, were laid and the vascular plant species found within each transects were recorded twice. Altogether 360 species of vascular plants belonging to 257 genera and 95 families have been documented. Among them, 25 species belongs to pteridophytes, 7 species of gymnosperms and 328 species of angiosperms. One-way ANOVA showed the total species richness (including all groups) was significantly different (F3, 66 = 7.494, p=0.000) in different land use types. Species richness was found highest in exploited forest. Pteridophytes, gymnosperms and angiospermic tree species were found higher in natural forest, whereas, richness of shrub was high in exploited forest, and that of herb was found in meadow. Detrended correspondence analysis (DCA) revealed land use types significantly influenced (p=0.000999) on species composition.

O-DD-2-660

# Growth Performance of Abies Spectabilis Along the Elevation Gradient in Manang and Mustang district, Nepal

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High altitude Himalayan vegetation, growing at the upper ecological range, is much sensitive to climate change. Abies spectabilis, a tree line species in the Himalayas is one of the best indicators for assessing the climate-growth relationship. This research was aimed at assessing the growth pattern of A. spectabilis in three different elevation points in Manang through the analysis of 120 tree cores, whereas, four elevation points were considered in Mustang and 140 tree cores were analyzed. The average radial growth in Mustang was significantly higher than Manang (ANOVA; p<0.01). In both areas, there was not any specific trend in the radial growth with increasing elevation. However, the common trend is that optimum growth was found in the middle elevation in both areas. In both areas the average growth increased with elevation for certain elevation and again decreased with further increase in the elevation. In both sites, lowest growth was found in the highest elevation near treeline, which might be due to harsh environment in such altitudes. The higher growth was found in the trees with highest DBH class (≥45 cm). In Mustang, the growth was significantly different among different DBH classes but in Manang, growth between DBH groups was not significant for all groups. The highest growth in the bigger DBH class indicates that the forests at sampled sites were still at growing stage.

O-DD-2-768

#### Studies on Algal Diversity of Rajarani Lake, Dhankuta, Nepal

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Algal flora of Rajarani Lake (Lat. 26°52'50.90" to 26°53'03.80"N and Long. 87°26'04.20" to 87º26'12.20"E: elevation 1574 msl), Rajarani VDC, Dhankuta has been studied. Samples were collected from eight peripheral littoral site of the lake in winter, summer and rainy seasons in 2014. Water parameters viz., temperature, pH and DO were measured for each collection sites. In the present study a total 46 algal taxa belonging 34 genera and 3 classes (Chlorophyceae 54.35%, Bacillariophyceae 28.26%, Cyanophyceae 17.39%) were reported. A total 13 algae were reported as new to Nepal. Genera Ankistrodesmus, Closterium, and Desmodesmus showed maximum number of species and 25 genera were represented by single species. The maximum number of algal taxa was found in summer(59%) followed by winter(48%) and rainy(39%) seasons. There were 6 common algae found in all season's viz. Ankistrodesmus falcatus, Aulacoseira granulata var. angustissima, Flagilaria tenera, Microcvstis flos-aquae. Navicula radiosa and Oedogonium sp. Algae viz., Anabaena affinis. Cyclotella meneghiana,Pinnularia divergens, Pinnularia subcapitata, Tetrastrum heteracanthum, and Ulothrix subtilissima were found only in winter season. Similarly, Aulacoseirsa granulata var. muzzanensis, Bolbochaete sp., Closterium striolatum, Cylindrospermum muscicola, Desmodesmus abundans, Desmodesmous quadricauda var.bicaudatus, Eunotia bilunaris, Gomphonema lacusrankaloides and Gomphonema pseudoaugur were observed only in summer. Aphanocapsa pulchra, Oscillatoria sancta and Pediastrum duplex var. gracillimum were observed only in rainy season

O-DD-2-801

#### Fern and Fern Allies of Daman and Adjoining Areas of Makwanpur District

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534 species of pteridophytes (fern and fern allies) are reported in the publication Pteridophytes of Nepal which includes a checklist of 534 species of belonging to 102 genera and 35 families. Fern and fern allies are abundantly found in humid and shady forests. They are most diverse in the tropics, and in Nepal in different climatic zones they form an attractive component of the vegetation of its hills and forests showing different ecological habit as epiphytic, lithophytes, terrestrial, tree ferns, hanging club mosses, climbers and hydrophytes but some species occur in more than one habitat. Present paper aims to provide the overview of fern and fern allies present in Daman and its adjoining areas of Makwanpur district. A total of 128 species belonging to 40 genera and 21 families were recorded, with Polypodiaceae and Pteridaceae as the largest family and the five genera namely Athyrium, Pteris, Lepisorus, Phymatopteris and Thelypteris occupying the top position respectively. With regard to habits, terrestrials (42 species), epiphytes (32 species) and lithophytes (54 species) were identified for ferns and fern allies, respectively in Daman and some adjoining areas.

### Ethnobotany: Plants for Life (O-EB-1)

O-EB-1-139

# Traditional use of Himalayan Giant Nettle (*Girardinia diversifolia* (Link) Friis) in Kailash Sacred Landscape (KSL), Nepal

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The Himalayan Giant Nettle (Girardinia diversifolia (Link) Friis), locally known as 'allo' is one of the important fiber bearing plant species of Kailash Sacred Landscape (KSL) which comprises four districts in Western Himalya such as Darchula, Baitadi, Bajhang and Humla of Nepal. Different parts of the plant are traditionally used by local healers (Baidhya and Dhami); and indigenous and local communities (ILCs) such as Thagunna, Bohora, Manyal living in Api Nampa Conservation Area (ANCA), Darchula district. The present study has been carried out to document traditional use and practice of 'allo' in ANCA. The information documented in four field surveys from 2013-2015. Focus group discussion, informal meetings and field observations were used as the primary method of data collection. Semi-structured questionnaire was used by establishing informed consent with the participants. Traders, traditional healers, 'allo' processors and entrepreneurs were consulted. The study revealed that ILCs of ANCA extensively use fiber of 'allo' as primary source to prepare different types of products such as porter strap (Namlo), rope for a domesticated animal (Damlo), coat, pant, bag, shawl, purse and many more items. Both men and women were involved in all the stages from collection to processing. The traditional spinning method by hand spindle (Katuwa), wooden hammer (Mungro) is still in practice. White clay soil (Kamero) is utilized for softening. The plant species is also used as a medicinal plant for treating gastritis, joint pain, headache, tuberculosis and asthma. Use of improved technologies would enhance the quality and quantity of 'allo' products.

O-EB-1-162

### Traditional Use and Practice of Medicinal Plants in Kailash Scared Landscape (KSL) in Far Western Region, Nepal

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Plants have long been used as traditional medicines in high altitudes due to remoteness or lack of alternates and some of them are in trade. Medicinal plants (MP) still contribute more than 80% of the total medicines contributing to human health traditionally. There is no documentation of traditional use and practice of medicinal plants in the Kailash Sacred Landscape (KSL) in western Himalayas of Nepal. Present study examines the ethnobotany of plant species as medicine. Two field studies were carried out in 2014-2015 by consulting with local healers, herders, resource persons, and focus group discussion and key informants. A total of 64 medicinal plants, (54 were identified belonging to 49 genera and 31 families) their collection and use details were documented. The present study found that more than 49% of flora of the study region had medicinal values in contrast to an average of 21-28% ethnomedicinally important plants reported for Nepal. Another interesting finding of this study was documentation of use practice of three plants by local healers for diagnostic purpose. Overexploitation, unsustainable harvesting and illegal trade are bringing some medicinal

plants in risk of extinction. Unsustainable use and trade of MP; and lack of documentation of traditional knowledge may cause the genetic erosion and knowledge erosion respectively in near future. Traditional knowledge systems are culturally and scientifically important for drug discovery and disease cure at local level. Further study is required to understand the scientific validity of traditionally used MP by local people through phytochemical screening.

# Ethno-Medico-Botanical Study of Magar Tribe in Dhawadi VDC, Nawalparasi, Nepal

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Dhauwadi VDC, the study area, lies in Nawalparasi District which extends from 200m to 1800m altitude. Magar tribe is homogeneously inhabited in this area having traditional knowledge on medicinal plants. This knowledge has been gained due to the relationship between plants and people and need to be recorded before lost. The collected ethnomedicinal plants practiced by Magar tribe have been authenticated from local healers and elder people. Altogether 87 species of ethno-medicinal plants belonging to 48 families were recorded from the study area, which are used to treat different types of ailments such as fever, cough, cuts and wound, gout, rheumatism, bone fracture, urinary infection, menstrual disorder, diarrhea, dysentery, typhoid, pneumonia and gastritis. The local people have pleasant experience of recovery by using these medicinal plants. This knowledge of ethnomedicine is valuable in the rural areas where allopathic medicines are not available for the treatment.

O-EB-1-233

O-EB-1-190

# Medicinal Plants Practices by Tamang Community in Dhunche Village Development Committee, Rasuwa District, Nepal

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Dhunche VDC is located in between 1229 m to 4830 m from the sea level. An investigation on folk herbal medicine on the basis of traditional uses of medicinal plants by Tamang community was done in 2014. The local traditional healers, elder men and women, traders and teachers, were consulted as key informants for documentation of indigenous knowledge on the medicinal plants. It was found that altogether 64 medicinal plant species belonging to 62 genera and 45 families were used by local people for 22 diseases. Roots (of 21 species) and entire plants (of 14 species) were the most frequently used plant parts. Greater numbers of species were found to be used in fever (11 species), cuts and wounds (10 species) and diarrhea and dysentery (5 species). Most medicines were prepared in the form of juice (39 species). Local people have sufficient knowledge on medicinal plants is under threat due to unmanaged utilization of forest resources.

O-EB-1-520

### Traditional Practices of Herbal Remedies for the Management of Diabetes Mellitus in Kathmandu Valley, Nepal

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The traditional healers with indigenous knowledge provide an important service in Nepali community. Herbal remedies are being prescribed by the traditional practitioner and also accepted by the diabetic patients of rural as well as urban areas. A survey was conducted to document the medicinal plants used for the treatment of diabetes mellitus in Kathmandu valley. This paper includes twenty two different plant species used by traditional healers for the management of diabetes mellitus. The study based on the correct information obtained regarding botanical sources, family, local name, used plant parts, methods applied in preparation and application along with various precautions were investigated.

*O-EB-1-562* 

#### Incense Plants, Their Uses and Diversity in Upper Manang, Central Nepal

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The local people of Upper Manang are highly knowledgeable and totally dependent on local plants for incense. Present study aims to document the incense plants including its other uses as well and its diversity along different elevation gradients. A total of 31 plants were found to be used as incense. *Juniperus indica* is the most common used plant by the local people of different household including few other plants like *Tanacetum gracile, Nardostachys grandiflora, Betula utilis,* etc are also used by mixing with *Juniperus indica.* The plants used as incense were also found to be used in other purposes. The ecological sampling was done at an altitudinal gradient of 3300 to 4300 m and total of 66 plots (10m × 10m) was taken. In total 24 incense plant species out of 31 species were recorded from studied plots. DCA was used to assess gradient in species richness. The incense plants with their different life forms were also regressed against the environmental variables like altitude, RRI, and grazing. Incense species showed a unimodel pattern with altitude and a linear pattern with grazing but it did not show any relation with RRI.

O-EB-1-617

## Phytochemical, Antioxidant and Antibacterial Screening of Selected Medicinal Plants Used in Diarrhoea and Dysentery

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Present study is conducted to explore the phytochemical, anti-oxidant anti-bacterial activity of six plants (*Bridelia retusa, Maesa macrophylla, Pouzolziazeylanica, Scindapsusofficinalis, Vitisjaquemontii* and *Ziziphusmauritiana*) used to treat diarrhoea and dysentery in Dhading district. Samples were collected and grinded into powder. Extraction was done using

methanol by intermittent sonication. These extracts were evaluated for their phytochemical content, anti-oxidant and antibacterial activities. The results obtained from phytochemical screening suggested that the crude extracts were rich in active phytoconstituents like phenols, flavonoids, tannins, saponins, proteins, terpenoids and phytosterols. The antioxidant activities were studied using standard DPPH radical scavenging assay (RSA). IC<sub>50</sub> value ranged from 6.83 to 389. In which B. retusa showed highest level of antioxidant activity having the lowest IC<sub>50</sub> value (6.83). Z.mauritiana (7.26) also showed IC<sub>50</sub> value lower than that of standard ascorbic acid (12.5). Total phenolic content and total flavonoid content were estimated by Folin-Ciocalteu and Aluminium chloride calorimetric method respectively. The Total phenolic content ranged from (59.62 to 304) mg GAE/gm dry weight, among which B. retusa (304) showed highest phenolic content. The flavonoid content ranged from (6.77 to 46.058) mg QE/gm dry weight among which P.zeylanica (46.058) showed highest flavonoid content. For antimicrobial tests, ATCC cultures of clinically important bacteria such as methicillin-resistant Staphylococcusaureus (Gram positive), Escherichia coli and Salmonella typhimurium (Gram negative) were selected and antibacterial screening was done using agar well diffusion method. Antibacterial assay showed that none of the plant extracts were active against gram negative bacteria (E. coli, S.typhimurium), whereas out of six extracts four of them namely, B. retusa, M.macrophylla, V. jaquemontii and Z. mauritiana showed antibacterial activities against S. aureus and MRSA. P. zeylanica and S. officinalis did not show any activity against any bacteria. Correlation analysis showed that phenolic content showed good correlation whereas flavonoid has negligible role in the antioxidant activity.

O-EB-1-699

#### Ethno- medicinal plants used to treat bone fracture from Kaski district, Nepal

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The survey was carried out on indigenous knowledge of medicinal plants for the purpose of treating bone fracture used by local people of five selected settlements viz: Naudada, Armala, Pumdibhumdi, Ghandruk and Kotre of Kaski district. It was an attempt to explore and document the vanishing wealth of traditional knowledge. In total 200 respondents were interviewed randomly by using semi-structured questionnaire. A total of 50 plants species belonging to 22 families were documented used by local people to treat bone fracture. Viscum articulatum and Drynaria propingua were found to the highest use by respondents(28.5%) and it was followed by Periploca calophylla(25 %), Chautajor (23.5%), Ghaikhure(19%) and others. This survey revealed that some local people have still practiced the medicinal plants for treatment of various ailments, however biochemical substances and pharmacological activity of these three plants are still poor understood. Therefore, research is being continued for screening phytochemical and pharmacological activity of three plants among documented viz: Caragana brevispina, Dendrobium transparens and Rhynchostylist retusa to validate medicinal virtue of the traditional medicine practices. This study will help in formulation of new, cheap and effective drugs which would ultimately promote in economics of rural people of Nepal.

O-EB-1-748

#### Mushroom for Food Security and Rural Economy in Nepal

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Mushroom can play an important role to local economy by contributing to subsistence food security, nutrition, and medicine. It has enormous potential to boost up rural and peri-urban economic growth generating additional employment and income through local, regional and national trade. This paper highlights the current status and future prospects of mushroom especially for food security and rural economy in Nepal. Though some parts of Nepal have a long tradition of collecting and consuming the wild mushrooms, there are very few which are used in commercial scale. Many ethnic groups heavily rely on wild mushrooms locally for their diet and additional income source during rainy season. A total of 228 mushroom species are used for food and collection across the country. Besides morels (*Morchella* spp.) and yarsa (*Ophiocordyceps sinensis*) most of them have unexploited international and national market potentials. In many parts, morels & yarsa have become the main source of cash income for the poorest households. Several species that are important on the international market are not traded or only traded locally in Nepal. Species with potential are *Boletus edulis*, *Cantharellus cibarius*, *Craterellus cornucopioides*, and *Lactarius deliciosus*.

O-EB-1-860

# Nutrients of *Termitomyces mammiformis* R.Heim inNepal: An Ethnomycological Approach

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Several ethnic wild foods used by ethnic groups over the generations are known to possess medicinal properties apart from the nutritional ones. It was found that termitomycetes are important source of food and also use for remedy of certain diseases and disorders, during the field survey in 2010-2012. The selection of this species as the termite mushrooms of interest is based on its economic relevance and also medicinal significance among traditional medicine practitioners in the communities. In view of its importance and meagre amount of work on sociobiology, nutritional and nutraceutical aspects, present research problem have been undertaken for investigation. The purpose of this study was therefore to document the proximate analysis and uses of indigenous knowledge. Surveys were done by participatory rural appraisals technique in different ecological belts up to 3000m asl in Nepal. The Fresh samples were analyzed for comparative nutrients analysis of carbohydrate, protein, moisture, ash, fiber, fat and dry matter by Weende analysis scheme and Cu, Fe, Mg, Ca, K, P, Mn, Na and Zn content by atomic absorption spectrophotometer. Those were compared from different physiographic region among the species. Results are reported on dry matter basis. A composition of 21% protein, 48% carbohydrate, 8% ash, 10% moisture, 14% fiber, 1% fat and 90% dry matter and 905 mg K, 170 mg Ca, 42 mg Mg, 62 mg Fe, 6 mg Zn, 8 mg Na, 9 mg P, 6 mg Mn and 4 mg Cu per 100gm was observed. Its concentration varies in order to affect by climatic variation.

### **Invasive Alien Plants (O-IP-1)**

O-IP-1-322

#### Germination Ecology of Three Invasive Alien Plant Species of Nepal

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Invasive alien species are considered as one of the most problematic biotic agents causing loss in biodiversity. Reproductive efficiency of invasive alien plant species (IAPS) is generally high relative to non invasive species. In this research, germination ecology of three IAPS belonging to Asteraceae (Ageratum houstonianum, Chromoleana odorata and Mikania micrantha) which differs in extent of vegetative propagation; were studied. Germination was studied under different conditions in different storage periods. In addition allelopathic interference with native species of the same family- Artemisia dubia was also examined. Germination rate (Timson's index) and percentage including seed longevity was the highest in A. houstonianum which does not propagate vegetatively and least in M. micrantha which propagate extensively by vegetative method in all conditions and period of seed storage. Germination increased till 32 weeks (December) of seed storage and then decline abruptly till 40 weeks (February) with no or very less germination. After that germination increased for certain period (different for different species) and decline again. Leaf mulching of A. dubia had inhibitory effect on germination of test species and effect was highest on C. odorata and least on M. micrantha. The results supported the hypothesis that seed germination and longevity of the species which reproduce entirely by seeds is higher than that of the species which reproduce both by seeds and vegetatively. These traits of invasive species should be considered while developing strategies for the management of IAPS.

> *O-IP-1-456* tion of its Potential

### Impact Assessment of Mikania Micrantha and Determination of its Potential Invasion Sites in Chitwan National Park

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Mikania Micrantha is one of the major invasive alien plant species in tropical moist forest regions of Asia including Nepal. Recently, this weed is spreading at an alarming rate in Chitwan National Park (CNP) and threatening biodiversity. This study assessed its impacts on landcover and determined potential invasion sites in CNP. Primary data for this were presence point coordinates and perceived Mikania Micrantha cover collected through systematic random sampling technique. Rapideye image, Shuttle Radar Topographic Mission (SRTM) data and bioclimatic variables were acquired as secondary data. Mikania Micrantha distribution maps were prepared by overlaying the presence points on image classified by object based image analysis. The overall accuracy of classification was 90% with Kappa coefficient of 0.848. A table depicting the number of sample points in each landcover with respective Mikania Micrantha coverage was extracted from the distribution maps to show the impact. The riverine forest was found to be the most affected landcover with 85.98% presence points and Sal forest was found to be very less affected with only 17.02% presence points. The results of household survey illustrated that this weed has increasing trend and there are no effective means for its control. Maxent modeling predicted the areas near the river valley as the potential invasion sites with statistically significant Area Under the Receiver Operating Curve (AUC) value of 0.969. Maximum temperature of warmest month and annual

precipitation were identified as the predictor variables that contribute the most to *Mikania Micrantha*'s potential distribution.

O-IP-1-561

### Impact Assessment of Invasive Alien Plant Species in the Selected Ecosystems in Chitre, Parbat

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As per the CBD (1992), Invasive Alien Species (IAS) is considered as the second threat after the habitat destruction. They are responsible for the alteration and destruction of the ecosystem and thus ultimately results in the degradation of the ecological services provided by the ecosystem. The failure of timely eradication of any invasive plant is therefore likely require a large manpower, technology, investment, etc. Hence, for the effective management of these invasive plants, the hierarchical perspectives from prevention, control and eradication need to be followed. The methodology involved the field survey of Chitre ward number 9, which basically involved the sites mainly agriculture land, marginal land and the forest land. Ageratum conyzoides and Ageratina adenophora were studied in the agriculture land and forest land respectively. Furthermore, the sites were sub-divided into the invaded and noninvaded land. Thus the study objectives cover the current status, association and the impact analysis of Chitre. In the methodology adapted for the study important value index (IVI) was considered for the status analysis, chi-square test was performed for the association analysis of the two invasive alien plant species whereas impact analysis was analyzed in consideration with the biomass of invaded and non-invaded land in three of the zones. The study bounded in the objectives revealed that the territory expansion by these two species in the low land and the high land has caused a serious threat to the native biodiversity as well as the ecological services offered by an ecosystem.

O-IP-1-566

## Project Update: Assessment of the Effects of Climate Change on Distribution of Invasive Alien Plant Species in Nepal

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Biological invasion is a major component of global environmental changes and one of the leading causes of global biodiversity loss. With globalization of trade and tourism, the problem of biological invasion has been increasing and is likely to increase under future climate change. Due to the varied climatic conditions found in Nepal, species from anywhere of the world can potentially naturalize in Nepal. At least 219 species of flowering plants, mostly from neo-tropical regions, are naturalized in Nepal and about two dozen of them are invasive with ecological and economic impacts. With the financial support from Climate Change Research Grant Program of Nepal Academy of Science and Technology, a research project has been initiated for the assessment of diversity of naturalized and invasive alien plant species (IAPS) across physiographic regions in central Nepal; to prepare distribution map of IAPS under current and future climate change scenarios; evaluate their economic damage; and prioritize IAPS and ecosystems for management. Distribution survey of IAPS has been completed while the vegetation sampling and socio-economic survey are in progress. At least 25 species

of naturalized plants are invasive in Nepal. Distribution maps of major IAPS have been prepared. The highest number of IAPS were recorded in Tarai and Siwalik regions while they were absent in trans-Himalayan regions. Results based on socio-economic survey indicate that IAPS like Ageratum haustonianum, Lantana camara, Chromolaena odorata, Oxalis latifolia and Spermacoce alata have challenged local livelihood through reducing crop production, forage production, and causing health hazards to the livestock.

O-IP-1-619

## Invasive Alien Plant Species in Nepal: Current Status and Prospects for Management

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Biological invasion is one of the major drivers of human-induced environmental changes and a leading cause of the loss of biological diversity. With globalization of trade and tourism, and changing climate the extent and impact of biological invasion are likely to increase across all biogeographic regions. Nepal, lying at the center of Himalaya, has been also facing the problems of biological invasion in recent decades with negative impacts on native biodiversity, ecosystem services, agriculture production, and human and livestock health. At least 219 species of flowering plants, mostly native of Americas, are naturalized in Nepal and 25 of them are invasive. Four of these invasive alien plant species (IAPS) are among the '100 worst invasive species of the world'. Southern half of Nepal with tropical and subtropical climate has the highest number of the IAPS and none of the IAPS has been reported above 3000 m asl and in trans-Himalayan regions. The problem of biological invasion has been acknowledged by the Government of Nepal in biodiversity related strategies and reports. Communities have been involved for the management of IAPS at a few locations but Government's effort at national level remains inadequate. Effective management of invasive species in Nepal requires preparation of national strategy for the management of invasive species by the Government; quantification of the invasive species' ecological and economic impacts by researchers; translation of targets set in National Biodiversity Strategy and Action Plan (2014-2020) into actions by natural resources managers; and voluntary contribution/participation for management by communities.

O-IP-1-622

### Role of Invasive Plants (Green Manure) and Mycorrhizae on Growth and Yield of Different Legumes Crops

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Application of the invasive plants (locally available *Lantana camara* and *Eupatorium adenophorum*) is an essential means to maintain soil fertility, soil structure, increases N, P and K and organic matter. It can stimulate biological activities extensively in the soil. In this present study field trial of Lentil and Rajma were conducted in Kosebali Divison of Rampur, Chitwan district. Mycorrhiza was isolated from agricultural soil by sugar decantation method and mass production with the help of onion plant. Leaves of *Lantana camara* and *Eupatorium adenophorum* were collected and shed dried and grinded in powder form. The treatments with invasive plants and mycorrhizae showed higher yield than the control in case of Lentil field trial. In case of Rajma field trial, length of stems and dry seed formation was higher in *Eupatorium adenophorum* and followed by *Lantana camara*, chemical fertilizer, control and mycorrhiza. The number of mycorrhizal spores were found higher in *Lantana camara* followed

by *Eupatorium adenophorum*, mycorrhiza, compost, chemical fertilizer and control. The percentage of seedless and low seeded pods was found higher on control followed by compost, chemical fertilizer, *Lantana camara*, *Eupatorium adenophorum* and mycorrhiza. The addition of green manure, compost, mycorrhizae is an important way to improve the soil quality.

O-IP-1-683

# Diversity and Distribution of Invasive Alien Plant Species along Road Network in Central Nepal

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Invasive alien plant species (IAPS) are spreading rapidly in Nepal and can have irreversible environmental and economic damage if not managed timely. Detail information on diversity and distribution of IAPS form a basis for managing plant invasion. The road networks act as dispersal corridors and source areas for plant invasion. A detail survey of IAPS distribution was carried out during June-July 2013 along road network in Central Nepal to access the diversity of IAPS, prepare their distribution map, and identify the factors governing their dispersal. IAPS distribution was assessed through systematic location of sample plots (10×10m<sup>2</sup>) at an interval of 10 km in plain and 5 km in hilly areas. Among the 18 species of IAPS recorded from roadside vegetation, Bidens pilosa had the highest frequency whereas Eichhornia crassipes had the lowest. Likewise, Ageratina adenophora was found as most dominant species in terms of coverage. IAPS richness showed unimodal pattern of distribution along the elevation gradient. While comparing the vulnerability of land use type to invasion, grazing and fallow land was more susceptible to invasion in comparison to other land use types (Agricultural land>Shrubland>Forest>Wetland). Middle mountains had greater IAPS richness than other physiographic regions. The study revealed that extensive road networks, land use changes, and open border with India are acting as facilitators as well as dispersal pathways for IAPS in Central Nepal. Plant invasion has been emerging as a serious environmental problem in Central Nepal and timely action needs to be taken to prevent it.

O-IP-1-756

# Growth Attributes and Herbivore of Water Hyacinth, *Eichhornia crassipes* (MART): An Exploratory Study in Different Wetlands and Lakes of Nepal

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Water hyacinth, *Eichhornia crassipes* (Mart.) threatens aquatic ecology of Nepal. Field survey was carried out to determine the growth attributes of water hyacinth and associated herbivore on different lakes of Kaski viz. Fewa, Rupa and Beeshazari and associated lakes of Chitwan in June 2012. The wetlands of eastern terai were also surveyed during September, 2014. Samplings were taken randomly from surveyed site using floatable quadrates of one square meter area. In total, 10 sample unit were taken from each sampling site/station. The growth attributes of water hyacinth showed the threats of invasion of this weed in surveyed areas. The average crude biomass of water hyacinth per square meter was higher in Rupa lake followed by eastern terai, Fewa lake and Bishazari and associated lakes, respectively. The associated arthropod herbivore of order Orthoptera, Coleoptera, Odonata, Diptera, Hemiptera, Hymenoptera, Lepidoptera and Arachnids were collected from surveyed areas, however, the

water hyacinth weevils (Neochetina eichhorniae Warner) short horned grasshoppers, mites Orthogalumna sp were found to be in greater extent with sizeable damage status. Hence, future strategies should be to develop mass rearing technique of promising water hyacinth herbivore, study on their host preference, and their efficacy on controlling target pest. Ultimate goal will be to release these agents and asses impact for sustainable management of Water hyacinth in wetland, submerged Ramsar areas and lakes of Nepal.

### Molecular Markers and Applications 1 (O-ME-1)

O-ME-1-10

### Genetic Diversity Assessment of Acid Lime (*Citrus aurantifolia* Swingle) Landraces of Eastern Nepal using ISSR Markers

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Acid lime (Citrus aurantifolia Swingle) is an important commercial fruit crop, cultivated in 60 out of 75 districts from Terai to high hills of Nepal. New cultivar development having desirable agronomic traits has been urgent to meet its growing demand in Nepal. Assessment of genetic diversity is the key step of plant breeding for elite cultivar/ variety development. An attempt has been made to assess genetic diversity of acid lime land races from three agroecological zones of eastern Nepal using Polymerase Chain Reaction (PCR)-based Inter Simple Sequence Repeats (ISSR) marker system. Twenty one ISSR markers were used to determine the genetic diversity of 60 acid lime landraces collected from the high-hills, mid-hills and terai agro-ecological zones. Out of the 234 amplified bands scored for 60 accessions, 204 (87.18%) were found to be polymorphic. Two major and three minor clusters based on Dice similarity coefficient. The average genetic similarity among the acid lime accessions was observed to be 81% where lowest similarity of 79.33% observed in Terai and highest of 86.02% in the High-hill accessions. Genetic variation at different agro-ecological zones was assessed using Popgene (Ver. 1.32) which revealed 55.13% to 69.66% polymorphism. Shannon's index and Nei's gene diversity showed highest level of acid lime diversity in Terai zone (PPB, 69.66%; H, 0.215; I, 0.325) followed by mid-hill zone (PPB, 66.67%; H, 0.202; I, 0.308). The ISSR-based genetic diversity estimates will be helpful in acid lime breeding program for the development of elite variety for commercialization.

O-ME-1-167

## Molecular Systematics of Butterfly Subfamily Limenitidinae (Lepidoptera: Nymphalidae)

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Butterflies of the subfamily Limenitidinae are distributed worldwide except Antarctica. There are 808 Limenitidinae species placed in 46 genera and four tribes: Parthenini, Adoliadini, Neptini, and Limenitidini. The systematic relationship of Limenitidinae among its genera and tribes is still lacking till date. Thus, we are studying Limenitidinae systematics using molecular methods. Our molecular method includes sequencing and analyzing both mitochondrial and nuclear genes. At this point, we introduce seven new genes (*ArgKin, CycY, Exp1, Nex9, PollI, Prosup,* and *PSB*) that have never been used in butterfly systematics. We sampled 205 Limenitidinae species, spanning 38 genera and four tribes. We sequenced and analyzed 18 genes regions per species. Phylogenetic trees were constructed based on DNA sequences determined, using both Maximum likelihood and Bayesian Inference methods with four

outgroups. The phylogenetic tree indicated seven higher clades corresponding to four traditional tribes as well as an additional clade containing two genera *Harma+Cymothoe*, and two independent lineages leading to *Pseudoneptis* and *Pseudacraea*. Here, we present seven novel genes that can also be used in other Lepidoptera systematics studies. Based on our results, we propose the subfamily Limenitidinae should be classified into five tribes instead of traditional four tribes. In future, we should include underrepresented Asian genera and fine tune the phylogenetic tree to further study Limenitidinae systematics and historical biogeography.

*O-ME-1-22* 

#### **Options to Conserve Agricultural Plant Genetic Resources in Nepal**

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Crops are found up to 4200 m altitude in Nepal. Among the 500 edible plant species, more than 50% are recalcitrant seeds and vegetatively propagated crop species. Agricultural plant genetic resources (APGR) contain the essential buildings blocks that are critical to food security. To develop a new variety, breeders may have to screen thousands of samples in search of a particular trait. Loss of about 50% of traditional varieties from farmers' field demands immediate action to conserve existing landraces. This study has compiled all conservation options available in the country for APGR conservation. APGR exploration, collection and conservation activities have been initiated from 1984 by Agriculture Botany Division, NARC. Community seed bank was first established in 1994. The Government of Nepal has established the National Agriculture Genetic Resources Center (National Genebank) under NARC in 2010. The establishment of the Center has become a milestone in conservation and sustainable use of APGR that ensures the availability of APGR to present and future generations. Based on the conservation strategy, APGR are grouped as orthodox seeds, recalcitrant seeds and vegetatively propagated crops. Three conservation strategies (ex-situ, on-farm and in-situ) have been considered by the Center. Conservation options available in the country are Seed Bank, Tissue Bank, DNA Bank, Field Genebank, Household Genebank, Community Genebank, National Park, Conservation Areas, Wildlife Reserves, Hunting Reserve, World heritage sites, Ramsar sites, Religious Places, Svaldard Global Seed Vault, World Seed Vault and CGIAR Banks. These options complement each other and therefore need to run smoothly in collaboration with relevant stakeholders.

O-ME-1-268

### Molecular Mechanism of Innate Immune Response During Japanese Encephalitis Virus Infection

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Japanese encephalitis (JE) is an arboviral disease which accounts for significant pediatric mortality in Asia and Australia, including Nepal. Encephalitis is merely the result of viral invasion in CNS and pathological consequences. Neuronal loss is the outcome of both JEV infection of neurons and bystander damage caused by activated microglia. Recent studies have shown that micro RNAs (miRs) holds a major platform during JEV infection and modulate cellular pathways to determine the pathological condition. Therefore, the present study was planned to investigate the role of miRs in controlling the IL-10 expression (Th2 response) during JEV infection in macrophages. Using a combination of bioinformatics and molecular approaches, we report that miR-98, miR-27a and miR-106b might have a possible

role in posttranscriptional regulation of IL-10 gene expression during JEV infection. Our *in silico* analysis predicted the novel miRs having potential to bind with the 3'UTR region of IL-10 mRNA. From the predicted miRs, miR-98 and miR-27a were selected on the basis of published article showing their role in regulation of IL-10 expression. Novel micro RNA miR-106b was selected on the basis of free energy and prediction from the software. Normal PCR, real time PCR (RT-PCR) and western blotting was performed to validate the *in silico* data. Our results exhibited the correlation between the expression of IL-10 and three miRNAs mainly miR-98, miR-27a miR-106b during JEV infection. In summary, our result suggested that miR-98, miR-27a and miR-106 might have a role in regulation of IL-10 production during JEV infection.

O-ME-1-270

### Variability and Genetic Parameters of Yield and Yield Attributing Traits in Spring Wheat (*Triticum Aestivum* L.)

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A field research was conducted at AFU. Chitwan in 2014 to evaluate the wheat genotypes for their yield, association and correlation among yield attributing traits and estimation of their genetic parameters. Twenty wheat genotypes were evaluated in alpha-lattice design with two replications. Observations were taken for different traits, viz., days to heading, days to anthesis, thousand grain weight, spike length, plant height, flag leaf area, grain filling duration, harvest index, biomass and plot yield. Highly significant variation (P≤.001) among the genotypes was found for all traits under study. Thousand grain weight, flag leaf area, grain filling duration, harvest index and biomass had highly significant positive correlation with yield suggesting these traits have positive influence on yield. Further, the correlation of these yield attributing traits among themselves was also positive. Based on the study of genetic parameters, flag leaf area and thousand grain weight had better genotypic variability, better broad sense heritability along with better genetic advance which can be considered as good estimates for effective selection of a trait. Biomass, harvest index and grain filling duration also exhibited moderately high values for these genetic parameters. Thus, selection for genotypes with more value for thousand grain weight, biomass, flag leaf area, grain filling duration and harvest index was found necessary for improving yield and hence, simultaneous selection for these traits is important to obtain high yielding wheat varieties.

O-ME-1-65

## DNA Barcoding and Molecular Phylogenetic Analysis of *Ophiocordyceps* sinensis (Berk.) of Nepal

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*Ophiocordyceps sinensis* (Berk.) Sung (Syn. *Cordyceps sinensis* (Berk) Sacc.) is one of the highly prized medicinal fungus distributed in Tibetan plateau of China, high altitude and grassland of Nepal, Bhutan and India ranging from 3000-5000m asl. This study has attempted DNA sequencing of Cytochrome 'C' Oxidase (COI), Internal Transcribed Spacer (ITS) and D1/D2 Domain of nuclear ribosomal DNA 28S Large Sub-Unit (LSU) of different *Ophiocordyceps sinensis* populations to generate barcode sequences for their identification and understanding their phylogenetic relationship. Total 34 samples were collected from four different districts *viz*. Dolpa, Manang, Bajhang and Darchula and genomic DNA was extracted

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both from fungal and insect parts. Polymerase Chain Reaction (PCR) amplification of nuclear ribosomal DNA (nrDNA) ITS, D1/D2 domain of LSU and COI region were carried out using genomic DNA. Sequencing of three loci were able to identify samples at the species level by comparing nucleotide sequences with Genbank database by using bioinformatics tools. The BLASTn search of ITS loci of 26 sample of present study showed 98-100% similarity with *Ophiocordyceps sinensis*. Similarly BLASTn search of 28s LSU of 20 samples of present study showed 98-99% similarity with *Ophiocordyceps sinensis*. Again BLASTn search of COI locus of 11 samples of present study showed 97-99% similarity with *Hepialus* larvae. Overall, all three barcode markers were able to identify *Ophiocordyceps sinensis* and *Hepialus* spp. at species level either individually or in combination. Molecular phylogenetic analysis of *O. sinensis* based on three barcode sequences showed it to be monophyletic and *O. nepalensis* and *O. nutans* to be sister species.

O-ME-1-79

### Genetic Evidence of a Recent Tibetan Ancestry to Sherpas in the Himalayan Region

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Sherpas living around the Himalayas of Nepal are popular as high-altitude mountain climbers but when and where the Sherpa people originated from remains contentious. In this study, we collected DNA samples from 582 Sherpas living in Nepal and Tibet Autonomous Region of China to study the genetic diversity of both their maternal (mitochondrial DNA) and paternal (Y chromosome) lineages. Our study shows that Sherpas share most of their paternal and maternal lineages with indigenous Tibetans, representing a recently derived sub-lineage. The estimated ages of two Sherpa-specific mtDNA sub-haplogroups (C4a3b1 and A15c1) indicate a shallow genetic divergence between Sherpas and Tibetans less than 1,500 years ago. These findings reject the previous theory that Sherpa and Han Chinese served as dual ancestral populations of Tibetans, and conversely suggest that Tibetans are the ancestral populations of the Sherpas, whose adaptive traits for high altitude adaptation were inherited from their ancestors in Tibet.

### Molecular Markers and Applications 2 (O-ME-2)

O-ME-2-904-I

## Use of *in vitro* Culture Strategies in the Development of Plants and Plant Products

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Modern plant biotechnology emerges its development through the roots of plant tissue culture. Plant tissue culture involves the culture of all types of plant cells, tissues and organs such as edosperm, embryo, ovule, anther or single cellprotoplastunder aseptic conditions. Plant tissue culture is a technique that exploits the ability of cells to revert into a meristematic state and regenerate into the desired plant or its products. Though plant tissue culture technique was originally developed for botanical research, it has now evolved into an important application for economic development and commercial practices. It has also become a significant research tool inall-biological sciences related to agriculture, horticulture,

forestry, environmental issues and breeding proposes and has proven as a foundation for the modernbiotechnological approaches. Success of modern biotechnologyis dependent on regeneration of whole plant or desiredcompounds either with or without following genetic modification. Production of disease free plant stocks and production of resistant varieties related to the varieties of environmental stressisanother area of successful application of plant tissue culture. Potential uses of plant tissue culture andbiotechnology will enhance our knowledge of understanding of plant physiology, function, and applicationandcan be useful in resolution of legal issues. There is no doubt thatyet to be imagined applications of plant biotechnology will emerge in the coming centuries. In context of Nepal various future opportunities for the utilization of tissue culture in plant propagation and improvement are discussed.

O-ME-2-884-I

# Molecular Markers for Sustainable Agriculture, Forestry, Environment, Health and Industries

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Molecular markers are making significant contribution to address the problem of food and environmental security in the 21<sup>st</sup> century. Various molecular marker tools have wide applications in different fields of human endeavors including medicine, agriculture, forestry and environment. In agriculture and forestry sectors, in depth research employing various molecular marker techniques on molecular diagnosis of diseases and pests, Marker Assisted Selection (MAS), Gene Assisted Selection (GAS) and Genome Assisted Breeding (GAB) for enhancing qualitative and quantitative traits of agricultural crops, animals and forestry speciesare taking place in various International research institutions throughout the world. However in Nepal, molecular marker - based research activities are mainly focused on characterizing and documenting Nepalese high value plants, animals and microbial biodiversityhaving food, agriculture and forestry significance. At NAST, we areemployingvarious Polymerase Chain Reaction (PCR)-based (RAPDs, ISSRs, SSRs, 16SrDNA) and DNA sequencing based (ITS, D1/D2 of LSU, rbcL, matK, trnL-psbA, COI, 16S rDNA etc.) molecular markers for molecular disease diagnosis (Citrus HLB disease, Kalaazar), population genetics (conservation genetics), DNA barcoding and molecular phylogenetic analyses of rare and threatened medicinal and aromatic plantspecies (Swertiachirayita, Podophyllumhexandrum, Neopicrorhizascrophulariiflora, Rhododendron spp.), cash crops (Citrus aurantifolia, Citrus spp. and Camellia sinensis), soil fungi (micro and macro fungi), insects(Hepialus spp., Ophiocordycepssinensis), animal (Elephasmaximus) and highly valuable microbial diversity (eg. probiotic dairy microbes, Bacillus thuringiensis isolates, hotspringthermophiles etc.). Although our research findings are not as significant as expected, we have been able to successfully utilize various molecular marker tools in characterizing and documenting Nepalese high value biodiversity at molecular level, which will definitely take momentum in due course of time and make greater impact in Nepalese biodiversity conservation, characterization and sustainable utilization.

O-ME-2-470

### Molecular Characterization. Differentiation and Conservation of Tea Germplasm of Nepal using Highly Polymorphic Microsatellite Markers

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Tea (*Camellia* spp.) is highly economical non-alcoholic beverage in the world. Rapid carpeting of tea bushes is taking place in Nepal however exact record on number of tea accessions growing in different tea gardens and their genetic diversity is lacking. In the present study we used 23 pairs of microsatellite markers and estimated genetic diversity of 71 tea accessions of Nepal including reasonable number of representative accessions from India (27) and China (28) from where tea was introduced in the past. A total of 228 (for Nepal) alleles were observed with the average gene diversity ranges from 0.387 to 0.904. Model based Structure analysis, Principal Component analysis and Neighbor-Joining tree strongly suggested three distinct genetic clusters i.e. Camellia sinensis type, C. assamica type and C. assamica subsp lasiocalyx type or Cambod type with substantial number of admix individuals in each of these cluster. Study has revealed short history of tea growing in Nepal but with strong selection practices among tea growers. A core of 43 accessions has been suggested to exploit fully the genetic potentialities through breeding programs. This information will be helpful to develop effective strategy for tea germplasm conservation and utilization, particularly for Nepal Himalaya.

O-ME-2-525

### Computational and System Biology Approach of Gene Prioritization in Identifying Putative Biomarker of Type 2 Diabetes Mellitus (T2DM)

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Type 2 Diabetes mellitus (T2DM) is one of the chronic metabolic disorders which is emerging as epidemic problem that has put additional burden to revenue deprived countries. World Health Organization (WHO) and American Diabetes Association (ADA) criteria are used for screening but still lacks effective cure. Hence, protein prioritization approach has been envisaged in generating functional pathway map in narrowing down the relevant proteins as putative etiological agent in drug target identification. Based on gene ontology (GO) interacting proteins of the proteins reported to be linked with T2DM protein prioritization was done using Max Planck Disease Candidate Prioritizer that uses biological interaction, molecular functioning and cellular component as GO parameters. Disease relevant proteins from OMIM and their interactants from different protein protein interaction databases were prioritized. The prioritized proteins (TES, SDC3, CD300A, BCL7A, and IRS1) were top five proteins showing maximum functional similarity in causing T2DM. The prioritized proteins obtained were interlinked to the disease using reactome and validating through literatures from NCBI. Among these five proteins it is assumed that IRS1 is important for binding of insulin for entering in to the cell. This binding could possibly be regulated by the SDC3 protein because it is directly related to increased obesity. Hence, overexpression of SDC3 could increase free fatty acids and create a layer in plasma membrane hence potentially blocking binding of insulin in IRS1 for symptomatic T2DM. Mutation of promoter region and coding sequence of SDC3 and IRS1 could elucidate the hypothesis and experiments are planned accordingly.

O-ME-2-608 Transcriptome Analysis of Early Responsive Gene in Arabidopsis thalina Induced by 2,3 Butanediol

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The volatile organic compound, 2,3-butanediol is well known to promote plant growth as well as induce plant tolerance to drought stress. In this study, we investigated the early responsive genes that are differentially expressed upon exposure to 2,3-butanediol. Initially, we screened the appropriate concentration of 2,3-butanediol on basis of lateral root development of Arabidopsis. Col-0 plants exposed to 2ng/ml of 2,3-butanediol significantly increased (P < 0.05) the lateral root density compared to plants exposed to the solvent controls. RT-qPCR analyses of the RNA isolated from the root samples exposed to 2,3-butanediol up-regulated the expression of GH3 and the stress-related genes RD29A and RD29B. To obtain a global transcriptional view on early response of 2,3-butanediol on Arabidopsis seedlings, we performed microarray analyses using Agilent's DNA chip with the plant samples collected at 0, 1, 4, and 8 h after volatile exposure. The microarray results showed that genes involved in response to abiotic, and biotic stress, were significantly up-regulated at exposure of 4 h. The insilico results were further experimentally validated and a significant early time-point upregulation in the key drought stress regulators DREB2a, DREB2b, and DREB2c were confirmed. Our results indicate that the early induction of stress tolerant responses in Arabidopsis to the volatile compound 2,3-butanediol is likely mediated by an interplay of the salicylic acid and the abscissic acid pathways.

O-ME-2-670 Genetic Diversity of Maize (Zea mays L.) Inbreds Assessed with SSR Markers

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In the present study, ten simple sequence repeats (SSR) or microsatellite markers, spread across maize genome, were used to measure genetic relationship among ten maize inbred lines. DNA from young fresh healthy leaves was isolated using CTAB method and amplified band product of SSR were visualized by running on 2% agarose gel, following by ethidium bromide staining using 1X TAE buffer and photographed under UV transilluminator with the help of Alpha-Imager Gel Documentation Software. Total of 17 alleles were detected across 4 polymorphic loci with average of 4.25 alleles per locus. Mean value of polymorphic information content (PIC) and expected heterozygosity (He) were 0.52 with range 0.32 (bnlg 1832) to 0.71 (bnlg 1523) and 0.58 varies with 0.40 (bnlg 1832) & 0.74 (bnlg 1523), respectively. The Jaccard's dis-similarity index vary from 0.00 to 0.55. The unweighted pair group method with arithmetic mean (UPGMA) generated dendogram using Jaccard's similarity coefficient divided maize inbred lines into six heterotic groups. Results suggested that SSR primer has good potentiality to discriminate maize inbred lines at molecular level and, hence, crossing between genetically diverse lines definitely would yield high heterotic progenies to enhance grain yield in maize.

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O-ME-2-716

### Computational Biology Approach for Identification of Putative Biomarker and Therapeutic Target of Acute Myeloid Leukemia

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Protein prioritization technique has become a robust method to map biochemical and genetic pathways in a non-conventional fashion for the identification of novel putative biomarker(s) and therapeutic target(s) for polygenic diseases such as Acute Myeloid Leukemia (AML). This approach of Disease-Gene Prioritization, based on functional role, proximity between proteins and protein-protein interaction (PPI), could help in elucidating disease etiology by providing broader dimension of molecular pathways. MedSim prioritizer tool uses statistical and computational methods to rank the large cluster of genes in a disease network according to their likelihood of involvement in the disease genesis. This technique is based on functional comparison of genes involving three Gene Ontology (GO) terms - biological process (BP), molecular function (MF) and cellular component (CC). Taking this tool and data sources from different PPI databases putative etiological pathway has been devised using computational biology and reactome analysis. Our results indicate that the top prioritized genes are involved in cell proliferation, differentiation and apoptosis, defects of which could be responsible for leukemogenesis. The top most prioritized CNPY3 activates TLR/MYD88/NF-kB pathway leading to BCL2 protein family mediated anti-apoptotic mode. In addition, the fifth most JAK2 leads to STAT3 mediated cell proliferation. Moreover, expression of SOCS1 can moderate both TLR and JAK2 mediated pathways. However, SOCS1 promoter is found to be methylated in different cancers including AML and its methylation pattern in Nepalese population would be studied.

O-ME-2-744

# Associations of Gene Pools of the Himalayan Yew (*Taxus wallichiana*) with Environmental Variables, Land-Use Types and Geographic Variables

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To identify the bioclimatic factors which affect the gene pools of Taxus wallichianaZucc. (Himalayan Yew or 'Lauth Salla') and analyze how climate, land-use types and geographic factors affect the gene pools in Nepalese Himalaya, a research was carried out in Manaslu Conservation Area (MCA); Sagarmatha National Park (SNP) and its buffer zone; Kangchenjungha Conservation Area (KCA) regions. Bayesian analysis of population structure was used to determine the number of gene pools; and their relation with altitude, environmental variables as well as geographic variables was tested. Climatic data (air temperature, soil temperature, soil humidity and rainfall) obtained from data loggers in the study area were used. The result from our study showed that the five gene pools (derived from Bayesian clustering) were related to temperature, precipitation and humidity, suggesting that the species might be susceptible to effects of climate change. The gene pools in MCA regions were associated with lower annual temperature, precipitation as well as minimum humidity. Similarly, allelic richness was differed between gene pools. Gene pools in the MCA region exhibited most diversity. General linear models of gene pools with environmental variables and land-use types suggested that the gene pools from MCA requiring high altitude and low temperature could be serious threat in future when climate change leads to increased

temperature and precipitation, as predicted by some studies. This study will aid the development of appropriate conservation measures to mitigate climate change and land-use change effects in one of the highly important medicinal plants of the Himalayas.

O-ME-2-791

### Sac-1004 Prevents Retinal Vascular Leakage in a Mouse Model of Diabetic Retinopathy

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The maintenance of endothelial barrier is critical for the vascular homeostasis and is maintained by the interaction of adherens junction (AJ) and tight junction (TJ) proteins between adjacent cells. This interaction is stabilized by actin cytoskeleton forming cortical actin ring. Here, we developed a novel vascular leakage blocker, Sac-1004 and investigated its mechanism of action in endothelial cells (ECs). Sac-1004 inhibited endothelial hyperpermeability induced by vascular endothelial growth factor, histamine and thrombin via stabilization of cortical actin ring and AJ proteins at the cell-cell junction. The compound inhibited the vascular leakage in retina of mice intravitreally injected with VEGF. And it also significantly reduced the leakage in retina of diabetic retinopathy mice model. Treatment of Sac-1004 in ECs increased cAMP levels and activated Rac, both of which are known to strengthen endothelial barrier. Furthermore, Sac-1004 induced phosphorylation of cortactin and its localization at cell membrane that is essential for the stabilization of cortical actin ring. These effects of Sac-1004 on ECs were significantly abrogated by dideoxyadenosine (adenylyl cyclase inhibitor) and NSC23766 (Rac inhibitor). Taken together, our findings indicate that Sac-1004 blocks vascular leakage by enhancing endothelial integrity via the cAMP/Rac/cortactin pathway and imply the potential usefulness of Sac-1004 in the development of therapeutic means for vascular leakage-related diseases.

O-ME-2-884-I

# Molecular Markers for Sustainable Agriculture, Forestry, Health and Environment

Sangita Shrestha, Jaishree Sijapati, Neesha Rana, Jyoti Majharjan, Ram Chandra Poudel, Deegendra Khadka, Deepa Dhital, Deepashree Rawal, Ram Lal Shrestha, Ranjan Koirala, Kishor Pandey, Jagat Krishna Chhipi Shrestha, Bhim Prakash, Khatri, Surendra Neupane, Rajesh Lamichhane, Gaurav Chandra Gyawali, Nabin Narayan Munankarmi, Sunita Khanal, Dinesh Neupane, Mira Tamang, Rajgir Mahato and Ashok Maharjan

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Molecular markers are making significant contribution to address the problem of food and environmental security in the 21<sup>st</sup> century. Various molecular marker tools have wide applications in different fields of human endeavors including medicine, agriculture, forestry and environment. In agriculture and forestry sectors, in depth research employing various molecular marker techniques on molecular diagnosis of diseases and pests, Marker Assisted Selection (MAS), Gene Assisted Selection (GAS) and Genome Assisted Breeding (GAB) for enhancing qualitative and quantitative traits of agricultural crops, animals and forestry speciesare taking place in various International research institutions throughout the world. However in Nepal, molecular marker - based research activities are mainly focused on characterizing and documenting Nepalese high value plants, animals and microbial biodiversityhaving food, agriculture and forestry significance. At NAST, we

areemployingvarious Polymerase Chain Reaction (PCR)-based (RAPDs, ISSRs, SSRs, 16SrDNA) and DNA sequencing based (ITS, D1/D2 of LSU, *rbcL*, *matK*, *trnL-psbA*, COI, 16S rDNA etc.) molecular markers for molecular disease diagnosis (Citrus HLB disease, Kalaazar),population genetics (conservation genetics), DNA barcoding and molecular phylogenetic analyses of rare and threatened medicinal and aromatic plantspecies (*Swertiachirayita, Podophyllumhexandrum, Neopicrorhizascrophulariiflora, Rhododendron* spp.), cash crops (*Citrus aurantifolia, Citrus spp. and Camellia sinensis*), soil fungi (micro and macro fungi), insects(*Hepialus* spp., *Ophiocordycepssinensis*), animal (*Elephasmaximus*) and highly valuable microbial diversity (eg. probiotic dairy microbes, *Bacillus thuringiensis* isolates, hotspringthermophiles etc.).Although our research findings are not as significant as expected, we have been able to successfully utilize various molecular marker tools in characterizing and documenting Nepalese high value biodiversity at molecular level, which will definitely take momentum in due course of time and make greater impact in Nepalese biodiversity conservation, characterization and sustainable utilization.

### Plant Biotechnology (O-PB-1)

O-PB-1-194

# Effect of Zeatin and Indole -3- Acetic Acid In Vitro Culture of Butea buteiformis Voigt

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Butea buteiformis is a valuable tree with large trifoliate leaves with beautiful flower The seeds were surface sterilized and cultured on half strength Murashige and Skoog (MS) medium. Nodal explants obtained from cultured were subcultured on different concentrations of zeatin (Zin) and Indole-3-acetic acid (IAA). The best proliferation of nodes and shoots were observed on the MS medium supplemented with 5  $\mu$ M Zin and 1.0 M IAA. After 8 weeks of culture the propagated plants were acclimatized and and transferred to the sand box containing 1:1 soil and sand. Well rooted plants were then established in the field. All the data collected were worked out statistically with SPSS, a system of analytical procedure.

O-PB-1-275

# Plant Regeneration through Alginate Encapsulated Protocorm of *Cymbidium aloifolium* (L.) Sw. and RAPD Analysis of Regenerated Plants

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*Cymbidium aloifolium* is one of the highly valuable medicinal orchids of Nepal. The present study was focussed on production, germination and regeneration capacity of encapsulated protocorm of *C. aloifolium. In vitro* grown 21 days old protocorms of *C. aloifolium* were encapsulated by using sodium alginate and 0.2 M calcium chloride solution. Murashige and Skoog (MS) medium (1962) was used as the basal medium for in vitro germination and seedling development of encapsulated protocorm. They were inoculated on three different strength of MS medium i.e. full (1.0), half (½), quarter (¼) and MS media supplemented with 0.5 mg/l BAP (6-Benzyl aminopurine) and 0.5 mg/l NAA ( $\alpha$ -Naphthalene acetic acid). Hormone free full Strength (1.0) of MS medium containing 3% sucrose was found to be the most appropriate condition for efficient germination and plantlet regeneration from encapsulated protocorm. They were successfully stored till 90 days at 4°C. However, the germination percentage was declined with prolonged storage time. Random amplified

polymorphic deoxyribonucleic acid (RAPD) analysis was carried out to check for possible genetic alterations in plants regenerated form encapsulated protocorm. The results revealed more than 90% of genetic stability among the regenerants. The plantlets were successfully acclimatized in potting mixture of cocopeat, clay & Sphagnum moss in 3:2:1 ratio with 85% survival rate. This protocol might be useful to develop easy delivery system, mass propagation and *ex situ* conservation of this valuable orchid species.

*O-PB-1-317* 

### Study of Genetic Fidelity of Micro Propagated Paulownia Plants

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The Paulownia tree, much of Chinese native species has fast growing tendency and high quality wood. It shows a great potential in economy, forestry and environment. Nepal As being recently known as an important tree, the need and demand in the market is much more in the recent years. Thus, our experiment deals with the optimization of medium for rapid propagation of Paulownia plant through nodal culture. The micro propagated plants were then subjected to molecular characterization to check any polymorphism observed which is not desired in micropropagation. Explants was developed for Paulownia tomentosa and Paulowniaelongata from the seed culture to reduce the contamination sub-culture. The Murashige and Skoog medium was supplemented with different combinations of phyto hormones (BAP, NAA). However, Murashige and Skoog medium containing 1mg/l Benzyl amino purine and 0.1mg/l naphthalene acetic acid was found to be best for nodal culture.Qualitative test, Fehling's, Glycosides, Salkowski's, Polyphenols and tannins, Flavonoids, Saponins, Sterols, Terpenoids, Alkaloids and Caumarins test for the screening of phytochemicals present in Paulownia plants were performed where the presence of glycoside, saponins, steroids, terpenoids alkaloids, coumarins was detected while polyphenols, tannins and flavonoids were absent Random Amplified Polymorphic DNA Markers were used to study genetic fidelity of the micro propagated plants of Paulownia tomentosa and Paulowniaelongata via nodal culture as well as the plant from green house. Polymerase Chain Reaction (PCR) with 10 decamer arbitrary OPA primers were performed and the amplified bands were visualized using gel electrophoresis. The RAPD markers OPA 9 and OPA 10 produced good amplification and did not show any polymorphism among the micro propagated plants, to obtain a desire result.

O-PB-1-397

### In-Vitro Management of Four Tomato Fungal Pathogens Using Plant Extracts and Fermented Products

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Fresh plant extract and fermented product of three wild plants (*Agave cantula, Melia azeradach* and *Ageratina adenophora*) traditionally applied to control the fungal diseases on vegetables were compared with the 0.02mg/ml Mancozeb fungicides. *In vitro* control of mycelia growth of four tomato fungal pathogens showed the reduction in mycelia growth of *Alternaria* sp., *Colletotrichum* sp., *Stemphylium* sp. & *Verticillium* sp. by 63.30%, 100%, 74.02% and 58.33% respectively. Furthermore, among the tested samples, both form of *Agave cantula* showed significant inhibitory effect to mycelia growth of three tomato pathogens v.i.z. *Colletotrichum* sp. (100% inhibition at 50% conc. of fresh extract and 100% inhibition at 60% conc. of ferment), *Stemphylium* sp. (83.33% inhibition at 60% conc. of fresh

extract and 80.9% inhibition at 60% conc. of ferment) and *Verticillium* sp. (88.11% inhibition at 60% conc. of fresh extract and 88% inhibition at 60% conc. of ferment). Fresh extract and fermented product of *A. cantula* showed less inhibitory effect to the mycelia growth of *Alternaria* sp. (42.58% inhibition at 60% conc. of fresh extract and 44.29% at 60% conc. of ferment). *Ageratina adenophora* extract and ferment showed least inhibitory effect against mycelia growth of all pathogens. Similarly, ferment form of *Melia azeradach* seems effective at higher concentrations.

O-PB-1-427

# Impact of Aqueous Extract of *Ageratinaadenophora* (Spreng) R.M. King & H. Rob on Seed Germination and Seedling Growth of some Winter Crops and Weeds

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Laboratory experiment was conducted to find out the allelopathic impacts of aquous extract of the vegetative parts (root, stem and leaf) of *Ageratina adenophora* (Syn. *Eupatorium adenophorum*) on the seed germination and seedling growth of some winter crops *Brassica campestris*, *Triticum aestivum* and associated weed like *Bidens pilosa*, *Ageratum conyzoides*, *Galinsoga parviflora* and *Cyperus rotundus*. Extracts of plant parts of *A. adenophora* showed reduction in germination, shoot length and root length of test crops and weed seeds in different treatments. Some of the weed seeds germination were reduced significantly in comparison to the control. The seed germination, shoot length and root length and root length were low at higher concentration. Complete inhibitory effect of leaf extract of *A.adenopha* on the seeds of *Galinsoga parviflora* and *Cyperus rotundus* at 5 and 10% were observed. Seed germination in *B.campestris*, *T.aestivum* and *B.pilosa* were low at 10% concentration. The germination of weed seeds (*Ageratum conyzoides*, *Galinsoga parviflora* and *Cyperus rotundus*) showed less in root and stem extract in comparison to leaf extract of *A. adenophora*.

O-PB-1-469

# Allelopathic Potential of Rice Cultivars Against Barnyardgrass (*Echinochloa crus-galli*) in Laboratory Screening

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Twelve rice cultivars (6 upland varieties: Khumal - 8, Khumal-11, Manjushree, Palung -2, Pokhreli Jetho, Taichung- 176 and 6 lowland varieties: Rampur Mansuli, Sabitri, Ghaiya-2, Mansuli, Janaki and Makawanpur -1) were evaluated for the allelopathic potential on barnyard grass (*Echinochloa crus-galli*) in laboratory. In a bioassay, Taichung-176 cultivars showed the significant weed-suppressing ability against the germination of seed (SG), length of shoot (SL) and root length (RL) of barnyard grass. Manjushree -2 shows least effects on seed germination and root growth; while least inhibitory effect was shown by Palung -2 and Manjushree on shoot growth of barnyard grass. On dry weight, highest allelopathy was shown by Khumal -8 followed by Rampur mansuli and Pokhreli Jetho and least by Manjushree -2. On average inhibition, Taichung -176 showed highest inhibitory effect followed by Ghaiya -2 and Rampur Mansuli on barnyardgrass. Very low inhibitory effect was noticed in Manjushree -2 followed by Sabitri and Janaki respectively.

O-PB-1-635

### Silica Nanoparticles and Silica Solubilizing Bacteria as Efficient Nanobiofertilizer for Drought and Disease Tolerance

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The periodic El niño's effect in Himalavan region has observed periodic great famine every century and 2015 also observed strong El niño weakening monsoon that affected paddy production and its continuity has resulted in low winter rainfall risking productivity of winter crops. The Himalayan region is also observing effect of global warming and rain pattern has changed. This has resulted in changed disease patterns. In addition, excessive use of chemicals has resulted resistant bugs. Thus, drought and disease resistance cultivar are sought, however, use of GMO is restricted hence abiotic and biotic solution has to be identified. Amongst the alternatives use of silica nanoparticle could be an option as it is known to reduce stomatal opening, drought resistance, resist rice blast of Magnaporthe oryzae and induce systemic acquired resistance (SAR) through salicylate and jasmonate coordinated pathway. In addition silica can provide mechanical strength to the plant hence protecting from herbivorous bugs in increasing productivity. Using rice husk biogenic Silica nanoparticle was produced through sodium silicate and subsequently titrating with sulfuric acid. In order to study biological effect of silica nanoparticles in rice germination and controlled infection model of Magnaporthe oryzae is being developed. Similarly, to study the effect in woody plants Paulownia tomentosa tissue culture technique has been established.

O-PB-1-724

### In-vitro Germination and Micropropagation of *Camellia sinensis* (L) Kuntze. (Tea Plant)

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*Camellia sinensis* (L) Kuntze.tea plant accounts a high consumable species of tea. The germination of tea seed carried out in-vitro in basal MS medium. The cotyledonary node of the seedling was excised and cultured in the MS medium with BAP (2mg/l) and NAA (0.1 mg/l) for the proliferation. The cotyledonary cut culture were ready for the 1st subculture in the MS medium supplemented with BAP and NAA at the interval of 3 months. The 1st subcultured plantlets were ready for the for the further microshoot multiplication within the interval of 2 months in the MS medium supplemented with BAP and NAA.

### Plant Biology and Conservation (O-PN-1)

O-PN-1-115

# Modelling Current and Projected Climatic Suitability of Arabica Coffee in Syangja District, Nepal

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There is a consensus that potential impacts of anthropogenic climate change are likely to have detrimental consequences on livelihood of people, especially in mountains. However,

the extent of detrimental impact of climate change is debatable due to limited empirical research. This research aims to assess the potential current and future distribution of coffee by the future climate change. The model showed a mixed impact (positive and negative) of climate change in potential habitat for coffee distribution for three different time periods (2030, 2050, and 2080) under all four future climate change trajectories based on representative concentration pathways (RCPs: RCP 2.6, RCP 4.5, RCP 6.0, and RCP 8.5). The results showed that there would be net gain in the suitable habitat for coffee distribution in all the representative concentration pathways. The most gain in the potential suitable habitat is under RCP 6.0 and RCP 8.5 trajectories of climate change. But there is shrinkage in potential suitable areas with RCP 2.6 and RCP 6.0 in the year 2080 and with RCP 8.5 in the year 2050. However, local extinction of coffee was most likely at lower altitudes.

*O-PN-1-196* 

#### Tree Ring Based Climate Reconstructions from Western Nepal

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Nepal has good dendroclimatic potential due to rich plant biodiversity. Using the fact this dendroclimatological study was carried out at Rara National Park (RNP) area of Nepal Himalaya with aims to reconstruct past climatic history of the region. Tree core samples from Abies spectabilis D. Don, Mirb.were collected and analyzed following standard dendrochronological techniques. One ring-width site chronology spanning from AD 2013 to 1763 was developed, which shows temporal fluctuations in the growth. Response function analysis revealed that the radial growth of A. spectabilis was limited by temperature induced moisture stress during the spring and early summer with a positive relationship with precipitation and negative relationship with temperature. Two growth-climate models between the ring-width chronology and March-June climatic data (temperature and precipitation) were developed and the models were subjected for validation test using leave-one-out cross validation. The March-June average temperature and total precipitation of western Nepal was reconstructed for past over 170 years. The temperature reconstruction identified several periods of warming and cooling. The short cold episodes were observed around 1880s, 1910s while warm episodes were centered in 1870s, 1890s, and 1980s. Similarly, the reconstructed precipitation showed several wet and dry periods with recent decreasing trend. The correlation between the reconstructed temperatures with indexes of sea surface temperature of the equatorial Pacific and extended multivariate ENSO Index revealed a significant negative correlation with monsoon and post monsoons seasons. The relationship with precipitation was opposite direction than that with temperature. This relationship demonstrates that the climate of western Nepal has teleconnection with broad scale climatic variability and circulation model.

O-PN-1-319

### Seasonal Variations in Biomass and Nutritive Value of Two Duckweed Species at Biratnagar, Nepal

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In recent years, the tiny aquatic angiospermic plants "duckweeds" have become prominent because they provide high protein animal feed, organic fertilizers, bio-fuel; control

mosquitoes; and, have great applicability in wastewater purification, toxicity testing, and in basic research and evolutionary model system. The present study deals with seasonal variations in physico-chemical properties of water (temperature, pH, total dissolved solids, nitrogen, phosphorus, potassium) and biomass and nutritive value (protein, phosphorus, potassium) of two duckweed species (*L. aequinoctialis* and *S. polyrhiza*) occurring intermixed in a roadside pool at Biratnagar (latitude N 26<sup>0</sup>20'; longitude E 87<sup>0</sup>16'; altitude 72m, msl), Nepal.

O-PN-1-569

### Taxonomic Study of the Genus Sida L. (Malvaceae) of Nepal

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The Malvaceae family contents 243 genera and around 4225+ species worldwide. Sida L. is distributed in tropical and subtropical regions worldwide, especially in the America. Plants of the genus are generally known as fanpetals or sidas. Four species of Sida is reported in Annonated checklist of flowering plants of Nepal (2000), while in recent publication Catalogue of Nepalese Flowering Plants Vol. II (2011) from Department plant Resources, five species of Sida has been documented and all five were studied for the present work. Taxonomic study of the genera was carried out based on morphology, anatomy, phenology, distribution, and palynology, and all species were studied from the herbarium specimens housed at different herbaria (KATH, TUCH) of Nepal. The main objective of the taxonomic study was to examine the lower taxa of genus and the interrelationship among different species. The dendrogram obtained based on cluster analysis showed two distinct clusters based on the stem and leaf character. Cluster one includes the species *S. cordifolia, S. rhombifolia* and *S. spinosa* and cluster two includes *S. acuta* and *S. cordata*.

O-PN-1-44

#### Plant Life Forms Responses to Predicted Warmer Climate in Central Himalaya

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Following the standard methodology of Global Research Initiative in Alpine Environments (GLORIA) our study aimed to identify plant life form diversity and distribution patterns along a subalpine to nival gradient of Central Himalaya, and to predict climate change led possible distribution patterns at the end of 21st Century. Our analysis revealed that the current alpine environment is dominated by plant life forms that are characteristics of harsh cold xeric climates and of different unfavorable habitats like scree, steep slopes etc. Although, this study is unable to make a detailed account of life form vulnerability under changes in climatic regimes, the available information on elevation amplitudes of plant species representing different life forms suggested that about one fourth of the total documented plant species, mostly of Chamaephytic and Hemicryptophytic (characteristic of harsh climates) life forms are vulnerable to future rise in temperature. Among these most of the species are local endemics (Himalaya endemics). We anticipate vertical range shift of low altitude plant species towards the summit tops as the primary response to deal with rise in temperature. Those species which are unable to shift there ranges and/or adapt to the changed climates are expected to become vanished. Thus a greater attention is needed to assess likely impacts of climate change on species-specific habitats, and to prepare species and habitat management strategies accordingly.

O-PN-1-494

### 309 Years Premonsoon Temperature Variation in Far western Nepal Himalaya Described from Tree Ring Width of *Tsuga dumosa*

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Shortage of long instrument recorded climatic data cannot explain the history of climate over centuries in the Nepal. So, we used the tree ring width as a proxy source to know the climatic variation over past three centuries (1705-2013) in Western Nepal Himalaya. The reconstructed premonsoon temperature indicates no consistence pattern of temperature and showed several warming and cooling episodes. Severe warming periods were 1740-1752 and 1922-1975. Whereas, cooling periods were 1718-1740, 1752-1768 and 1975 to 2006. The period 1740-1752 was the warmest whereas 1718-1740 was observed coolest within three centuries. The present warming is seen only after 2007 AD.

O-PN-1-511

# Impact of Air Pollution in Micro-morphological Characteristics of Broad Leaved Trees in Kathmandu Valley

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To understand the impact of air pollution on tree species growing near roadside, two tree species *Ficus religiosa* and *Cinnamomum camphora* were selected, as these species were available in most of the study sites. To examine the impact of air pollution, micro-morphological characters like specific leaf area, stomata size, stomata density, cuticle thickness and epidermal cell thickness were studied. Leaf samples were randomly collected from three individual trees of each species found at Ratnapark, Lainchore, Dhumbarahi, Balaju (as polluted sites) and Budhanilkantha (as Control). Each and every parameter were measured microscopically using software Image J. Most of the micro-morphological parameters like stomata size, cuticle thickness and epidermal cell thickness decreased significantly (P=0.05), but density of stomata increased in polluted sites than in control sites. This study signifies that the trees grown on road side are under stress due to air pollutants. Consequently, growth and development of road side trees are normal that assists to identify the trees grown in urban area of Nepal.

O-PN-1-518

#### Consequences of Caterpillar Fungus Harvesting on the Population of Alpine Medicinal and Aromatic Plants in the Upper Chamelia Valley, Darchula, Nepal

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*Ophiocordyceps sinensis*, popularly known as caterpillar fungus, supports livelihood of millions of people. Socio-economic contribution of Ophiocordyceps has been well studied. However, the biological and ecological implication of its harvesting is poorly understood.

People involved in its harvesting also collect variety of resources, including fuel wood, food, and medicinal and aromatic plants (MAPs). This study, carried out in upper Chameliya Valley of Darchula district, Nepal aimed at (i) identifying other MAPs people usually collect during the harvesting season of Ophiocordyceps, and (ii) assessing the impact of Ophiocordyceps harvesting on the population ecology of some important high altitude MAPs. Harvesters (n =90), interviewed in 2014 and 2015, enlisted 20 species of MAPs most commonly collected during the harvesting season of Ophiocordyceps. Almost all interviewees reported the collection of Neopicrorhiza scrophulariiflora, Fritillaria cirrhosa and Nardostachys grandiflora for trade; and Dactylorhiza hatagirea, Rheum speciforme and Allium pratii for local use. We studied the population status of Neopicrorhiza and Dactylorhiza along the harvesting gradient. In general, population density of these MAPs greatly declined in areas where people most commonly harvest Ophiocordyceps. Comparatively the impact was much pronounced on Neopicrorhiza, which population density was almost declined in the areas most preferred for Ophiocordyceps harvesting. While the conservation of Ophiocordyceps in itself is a challenge, the side-effects of its harvesting make it even more concerned today. Its harvesting is adding up serious threat to other MAPs. Therefore, management should strictly regulate the flow of harvesters and ban the vulnerable/threatened MAPs for commercial harvesting.

O-PN-1-99

### Community and Ecology Based Adaptation (CEBA) Measures of Agriculture System in Upper Mustang

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Climate change (CC) was negatively affecting the lifestyle and livelihood of residents of Dhye Village, located in Surkhang VDC of Upper Mustang (UM). CC had reduced flow in the draining river called Hyulsa (main water source of Dhye) due to shifting and reducing average precipitation (rainfall and snowfall) of 1 mm/year, and increased evapo-transpiration from the

agriculture fields due to rising average temperature of 0.1<sup>eC</sup>/year. Dhye residents were coping with this problem by negative adaptation trend such as reducing agricultural farming and herd size by more than 50% and seasonal migration to other towns. In the absence of alternative, the Dhye residents were planning to abandon their ancestral village and mass-migrate to a better location. On these circumstances, the objective of project was to develop CC resilient community and ecology based adaptation (CEBA) measures of agriculture system for Dhye residents. The research method involved scientific analysis of long term dry spell nature of range and agriculture land through remote sensing of landsat images and supply and demand analysis of water as well as field visits to verify available secondary data and collection of impact of CC related primary data. This research has concluded that it was better to relocate the whole community to Chawale and Thanchung as the best option for adaptation against the adverse impact of CC although, effective planning will be needed for sustainable settlement.

### Plant Biology and Conservation (O-PN-2)

O-PN-2-915-I

#### Plant Diversity and Conservation

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Plantis one of the most studied taxonomic groups of the living organisms in the world. Yet, a significant number of plant species is to be described. The number of presently unknown

Abstract Book

plant species has been estimated to 10 to 20 % of the number of known plant species. Most of the new species reported in recent decades were from biodiversity hot spot where the rate of loss of biodiversity is also high. As many as half of the world's plant species may qualify as threatened. Major threats to plant diversity are land use change and habitat degradation, biological invasion, climate change, and over-exploitation. Important initiatives to conserve plant diversity includes designation of biodiversity hot spot, establishment of protected areas, landscape and trans-boundary approach for biodiversity conservation, valuing biodiversity and ecosystem services, and seed bank establishment. Major challenges for plant diversity conservation includes 1) overlap of the region of high biodiversity with low economic potential to invest on biodiversity conservation, 2) incomplete database, 3) sustainable harvest of nontimber forest products from wild. Conservationists have recently argued that about half of earth's land surface be maintained in natural (wilderness) condition to effectively conserve biodiversity including plants. Nepal occupiesabout 0.1 percent of the global area, but harbors 3.2 percent of the world's known flora including 284 endemic species. This rich biodiversity is being located at crossroads of six floristic regions and one of the biodiversity hotspots of the world. However, the rich plant biodiversity is threatened by various factors. Nepal has been made several efforts to conserve the rare and threatened plant species.

O-PN-2-559

#### 'Dakchinkali', A Sacred Grove of Kathmandu Valley, Nepal

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'Dakchinkali', a popular sacred grove among the Kathmanduites and the people of the surrounding area is named after the goddess 'Kali' the female deity of supreme power. It encompasses a temple and a dense forest inhabited by a number of important plants species, some of which believed to be more than 100 years old and is situated at about 22 kilometres south of Kathmandu. The two ethnic groups of the region, the Newars and Tamangs have strong cultural beliefs because of which this historical landscape can still boast its rich biocultural heritage. 'Dakchinkali', the goddess, grants the wish of her devotees, hence they flock the temple all year round. Regardless of its immense biocultural significance, the government has almost overlooked the conservation of this sacred grove. The ongoing construction of the highway, which pierces through the middle of the forest, is the major concern for preservation of many important plant species of this area. This submission documents the biocultural beliefs of the Newars and Tamangs and elucidates how these beliefs have been able to preserve the intriguing plant diversity. At the same time, it echoes the common concerns of ethnic groups regarding the continuation of their tradition amongst their successors. The submission is based on personal narratives of members of the two ethnic groups and caretakers of the temple, and is supplemented with photographs.

O-PN-2-565

#### **Biodiversity in the Context of Disturbance**

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Biodiversity stands as a vital component for ecosystem functioning. Both physical and biological agents of disturbance affect the status of biodiversity. Consequently the functioning and ecosystem services become affected. In the present paper effect of landslide, flood, grazing and deforestation on the level of biodiversity is presented. Landslide decreased the

level of Shannon-Wierer index in tree species from 1.66 in mature Sal forest to 1.12 in 15 year-old landslide damaged site. Same trend was observed for herbs and shrubs. Tree species richness also decreased from 1.57 in mature Sal forest to 1.1 in 15 yr-old site. Conversely the index of dominance for tree species was higher in 15 yr-old site and lower in mature Sal forest and the trend was same for herbs and shrubs. Biodiversity recovered together with passage of time. However the diversity of herbs was maximum in 40 yr-old site which may be due to the mixture of early, intermediate and late successional species. Flood also decreased the wetland plant diversity which however showed maximum at moderately disturbed site. Deforestation and gazing also reduced the level of plant biodiversity. It was concluded that restoration of biodiversity was highest in intermediate successional stage under intermediate level of disturbance.

O-PN-2-575

### Conservation of Biodiversity through Urban Sacred Landscape: Vajrabarahi, Lalitpur, Nepal

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Sacred landscapes, with great faith among people are important source of future knowledge, recreational sites, natural laboratories and refuge for forest biodiversity. In-depth understanding of such sites along with their richness, composition, and usage will be crucial to ensure the sustainability of such forests in Nepal and elsewhere. This integrates traditional and scientific approaches in conservation. Thus this study has been undertaken at Vajrabarahi sacred forest, Southern Lalitpur, Nepal.This study measured species richness in a total of 30 plots (10x10 m<sup>2</sup>) in three different disturbance regimes: high, moderate and least disturbed. The species abundance in terms of presence and absence value, their canopycover, litter depth (cm), altitude were measured from each plot. The samples by species data matrix were analyzed by using Generalized Linear Model regression and vegan package of ordination through R. The floristic exploration revealed 84 species of vascular plants under 49 families and 75 genera. The herbs were highest in number (24species) while the tree diversity followed by 23 species. There is a statistically significant linear relationship among total species richness, herb richness and shrub richness withaltitude. Likewise, fern richness showed significant linear relationship with canopy cover. The DCA showed 3.6 SD units length of axis by its first axis. Moderately disturbed plot scores and altitude were two significant CCA first axes and Higher disturbed plot scores and litter-depth variables represented CCA second axis. Highest abundance of Castanopsis indica, Ophiopogon wallichiana indicated moderately disturbed plots. The finding is supported by intermediate disturbance hypothesis.

O-PN-2-621

# Comparison of Early Season Characteristics of Nepalese Forest Fires Retrieved by MODIS and VIIRS

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Satellite fire detection and mapping is advancing day by day and is the need for forest fire management with its greater potentiality. The Visible Infrared Imaging radiometer Suite (VIIRS) sensor on the Suomi National Polar-orbiting Partnership (S-NPP) satellite incorporates fire sensitive channels and provides 12 hours global coverage at spatial resolutions of 375 m and 750 m as a latest advancement. Compared to coarser resolution products of MODIS-1km, the new VIIRS 375 m active fire detection product enables detection

of small fires and improved mapping of large fires. The primary VIIRS data input for active fire detection and characterization is the moderate resolution M13 channel, which encompasses the spectral region between 3.973-4.128 micrometer and the secondary band in the VIIRS fire detection algorithm used to characterize background thermal conditions is M15 at 10.263-11.263 micrometer. Whereas, Moderate Resolution Imaging Spectroradiometer (MODIS) active fire product detects the fires in 1km pixels that are burning at the time of overpass under relatively cloud-free conditions using a contextual algorithm. This study will analyze the early season fire all over the Nepal. Study will make the comparative assessment of the fire frequency and their spatial extent in one hand and their resource management implications in other. The analysis and mapping of fire hotspots were carried out in ArcGIS environment for spatial and temporal comparison. The result shows that the use of VIIRS data has greater scope for the forest fire management through precise fire detection, real time information sharing and mapping.

O-PN-2-646

### Population Structure and Vegetative and Reproductive Traits of Juniperus Indica Bertol Along Elevation Gradient in Manang, Nepal

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Elevation gradients are complex involving different co-varying factors that influence plant population structure and in traits related to life history. Studies pertaining to variation in such traits along the gradient provide opportunities to examine performance of plant populations under a range of environmental conditions. This study aims to assess variations in population structure and vegetative and reproductive traits of Juniperus indica Bertol. along elevation gradient in Manang. The distribution range was divided into lower- (3350-3580 m), mid-(3650-3880m) and higher- (3950-4250m) elevation bands, where populations were sampled in a total of 54 plots of 10m x 10m size. In each plot, we recorded number of individuals of J. indica classified into seedling, juvenile and adult; and vegetative (plant height, trunk diameter, canopy radius and leaf biomass) and reproductive (number of fruits per plant) traits of its adult individuals. Density of seedlings and juveniles was high at mid-elevation band, but adult density was high at lower-elevation band. Density-diameter (d-d) curve for adult J. indica was reverse J-shaped, indicating continuous regeneration. Most of the individuals were of moderate to small size. J. indica showed higher values of all studied traits in lower-elevation band. Trunk diameter, leaf dry weight and fruits set parameters spatially varied within the same elevation band. Regression analysis showed that the canopy area was the strongest allometric variable for predicting total leaf biomass. Population density of J. indica and its vegetative and reproductive traits are influenced differently by the variations in elevation.

O-PN-2-687

# Current Status of Threatened Medicinal Plant *Dactylorhiza hatagarea* (D.Don).Soo in Api-Nampa Conservation Area, North West Nepal

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Dactylorhiza hatagirea is a threatened medicinal orchid occurring in the high himalayan region ranging in elevation from 2800 to 4200 m asl. The present study was carried out to assess its current status and variations in its life history and ecological traits along ecological gradient in

Api-Nampa Conservation Area (ANCA), north-west Nepal. Stratified random sampling method was followed (in plots of the size 3 m x 3 m, n = 36) for recording population data covering four populations in grassland and wetland habitats. Plant density was found to be 2.44 and 1.58 individuals m-2 in grassland and wetland respectively. The population in grassland showed highest density of juvenile (1.68 individuals m-2), but in wetland it showed highest density of adult (0.82 individuals m-2). Plants growing in these two habitats exhibited variations in a number of vegetative and reproductive traits, most importantly in plant height, stem girth, reproductive output (number of flowers), and flower color. All the studied populations were affected to some extend by livestock grazing and illegal harvesting of tuber for local use and trade but the populations in the wetland habitat suffered much with significantly low population density. In addition to these impacts, insect and fungal pathogen infestations were severe in populations where human disturbance was high. We finally conclude that *Dactylorhiza hatagirea* is highly threatened in ANCA and is in verge of extinction if the prevailing anthropogenic disturbances continue to operate.

O-PN-2-757

### Species Composition of Vascular Plant Diversity of Olangchung Gola and Ghunsa River Valleys, Eastern Nepal, as Shaped By The Environmental Variables and Land Use Gradients

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Vascular plant diversity in any area is a function of climatic, temporal and spatial variables. Current study was undertaken during 2011 to 2013 to assess the species diversity and its composition in the two river valleys namely Olangchung Gola and Ghunsa, of the eastern Nepal. The study area ranged from 2200m to 3800m elevation, and 25×2.5m plots were laid at the interval of 400m elevation on the both sides of river. We took four land use types namely forest, exploited forest, meadow and crop land in order to include wild as well as cultivated plants. We analyzed how the environmental variables affect the species composition of the vascular plants. Seven climatic variables and nine topographical variables were taken for analysis. The result showed that most significant spatial variables to shape the composition of the vascular plant species are valley, land use types, altitude, and longitude (F=1.65, 1.74, 3.10, 1.67 respectively, p <= 0.001, perm.=999). Likewise most significant climatic variables included annual mean temperature, minimum temperature of the coldest month and precipitation seasonality (coefficient of variation; F1.57, 1.55, 1.5 respectively, p <= 0.001, perm=999). Upon combining both topographical and climatic variables precipitation of the driest month and land use types were most significant to shape the species composition (p <= 0.001) followed by precipitation seasonality (p <= 0.01), precipitation of the driest and coldest quarter, longitude and slope (p<=0.05). The species richness at the exploited forest was high, followed by meadow, natural forest and crop land in descending order.

### Plant Taxnomy and Ecology (O-PT-1)

O-PT-1-366

### Morphological and Anatomical Variation in *Rhododendron lepidotum* Wall.ex G. Don. along the Elevation Gradients in Nepal Himalaya

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Rhododendron lepidotum has exceptionally wide distribution across elevation gradient (<2000 to >5000 m asl) in the Himalaya. Structural variations in this species were studied at three different elevations of Langtang National Park (3000, 4000 and 4460 m asl) and Sagarmatha National Park (3000, 4000 and 5000 m asl). Ten plant samples were examined from each elevation. Six morphological characters (specific leaf area, leaf area, plant height, internodal length, basal diameter, diameter of ultimate branch) and thirteen stem anatomical characters (pore area, pore diameter, pore density, vessel element length, fibre tracheid length, uniseriate ray height, uniseriate ray cell number, uniseriate ray density, multiseriate ray width, multiseriate ray height, multiseriate ray density, multiseriate ray area, and index of vulnerability to embolism) were studied. All morphological characters had their highest value at the lowest elevation in both study sites. Out of thirteen basal stem anatomical characters studied, pore density and uniseriate ray density increased with increasing elevation and all other parameters decreased as elevation increased. There was trade off relation between pore area and pore density and between uniseriate ray height and uniseriate ray density. However, in both study sites, anatomical parameters of ultimate branch didn't show any distinct pattern in relation to elevation. These structural variations can be an adaptation to harsh environmental conditions at high elevations. Decreased plant height, individual leaf area and specific leaf area, and the existing trade off relationship between pore characters and between uniseriate ray characters could have supported a wide distribution of R. lepidotum in Nepal Himalaya.

O-PT-1-369

### Diversity of Forest Weeds Along Altitudinal Gradient in Central Nepal (Langtang National Park)

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Invasion of weeds is an emerging threat to biodiversity. The diversity of weed flora as well as their association with the natural vegetation is poorly studied in the context of Nepal. This study aimed to understand the diversity and distribution patterns of weed species in Langtang National Park, Nepal. Presence of vascular plant species together with other biophysical variables were recorded in 68 plots (each 3 m x 3 m), established along an elevation gradient (3100-4100 m asl). The vascular plant species were grouped into three categories: native non-weedy (species having no weedy nature), native weedy and exotic weedy. Among 217 vascular plant species recorded in this study, 40 were weedy species (30 native, 10 exotic). Family Asteraceae harbored the highest number of weedy species (5 native, 2 exotic), followed by Ranunculaceae (5, 1) and Polygonaceae (2, 1). Richness of both exotic and native weedy species showed negative linear relationship with elevation and with distance from the nearest trail. The exotic species were not recorded beyond 3900 m asl. The intensity of disturbance was more at lower elevation and near the trail which decreased gradually with increasing elevation and distance from trail. Exotic and native weedy species showed positive

relationships with herb cover and exposed soil but showed negative relationships with shrub cover, moss and lichen cover, and rock cover. These similarities exhibited by the two groups of weedy species indicate their similar biological nature, which favor them to inhabit disturbed habitats.

O-PT-1-550

### Floodplain Succession Pattern in Khorsor Region of Budhi Rapti River, Barandabhar Corridor, Chitwan, Nepal

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Riverine floodplain forms ecosystem that has great significance in ecosystem services. But frequent change in river course disturbed this floodplain. Budhi-Rapti River formed quite stable floodplain ecosystem nearby Khorsor zone (Barandabhar corridor). As such understanding the process of ecosystem development in the Budhi Rapti river floodplain holds great significance. This study was designed to understand plant colonizing pattern, variation in species richness and composition at the floodplain along the distance based gradient from river bank to the mature forest. Plot size of 20 x 20 m<sup>2</sup> (subdivided into 4 subplots) were established along the two transect (200m apart from each other). First plot was set 200m away from the bank of river and each plot were 50 m apart. A total of 20 plots were sampled along one transect thereby altogether 40 plots were sampled. All vascular plants occurred inside each plot was recorded (0 or 1). The species richness and composition was calculated. Richness for each plant life form i.e. herbs, shrubs and trees were also calculated. Altogether 158 plants (60 families and 136 genera) were recorded; Gramineae being richest family followed by Leguminosae, Asteraceae and Cyperaceae. Succession was considered as main variable and measured indirectly through the first axis sample score value after indirect ordination i.e. NMDS. NMDS1 and NMDS2 scores were regressed against species richness as well as species composition variables. Here, total species richness was negatively correlated with the NMDS1 (temporal gradient) which showed convergent pattern of succession. However, herbs and shrubs species richness pattern were negatively correlated with NMDS1 but positive correlation was found with trees and climbers species richness. RDA analysis showed that herbs like Anisomeles indica and Cynodon dactlylon as an early successional species and tree species like Ficus hispida and Bauhinia purpurea as late successional species. This study suggests that flood plain succession is convergent type.

O-PT-1-521 Spatial and Seasonal Variation in Litter Fall. Litter Mass and Its Turnover in Sal

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(Shorea robusta Gaertn.) Forests of Eastern Nepal

Comparative study was conducted to investigate the amount of annual litter fall, seasonal variation, nutrient (N, P and K) return to soil and amount of litter mass and its turnover in Tarai Sal forest (TSF) and Hill Sal forest (HSF) of eastern Nepal. Litter fall samples were collected from the litter traps (1m x 1m) placed randomly on the forest sites at two months interval for one year. Litter mass was collected in each season from 1m x 1m quadrate placed

randomly on the forest floor. The total annual litter fall in TSF (8.82 Mg ha-1) was significantly (p < 0.001) higher than in HSF (7.18 Mg ha-1). There was distinct variation in litter fall. It was maximum during March and April (54% and 47%) and minimum during November and December (5% and 4%) in TSF and HSF respectively. The seasonal pattern of litter fall was higher in the summer during March to June (6.57 Mg ha-1 and 5.05 Mg ha-1) followed by rainy (1.39 Mg ha-1 and 1.41 Mg ha-1) and winter season (0.86 Mg ha-1 and 0.72 Mg ha-1) inTSF and HSF respectively. Nutrient return through litter fall was higher in TSF than HSF. The total amount of nutrient return to forest soil through litter fall was 72.09 kg N ha-1 yr-1 and 54.36 kg N ha-1 yr-1, 6.76 kg P ha-1 yr-1 and 4.85 kg P ha-1 yr-1 and 33.23 kg K ha-1 yr -1 and 22.56 kg K ha-1 yr-1 in TSF and HSF respectively. Litter mass accumulated on forest floor was significantly (p < 0.001) higher in TSF (6.73 Mg ha-1) than HSF (5.63 Mg ha-1). Leaf litter mass was higher in summer season, value gradually decreased with rainy and winter season. The turnover rate for litter mass on the forest floor was higher (0.79) in TSF than HSF (0.70). However, turnover time was higher in HSF than TSF. The difference in litter production between these two forests may be due to differences in climate, soil properties and species composition.

> O-PT-1-531 of Sauraha

# Floodplain Grassland Succession Pattern in Icharny Island of Sauraha, Chitwan, Nepal

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Floodplain grasslands are dynamic due to change in annual flood intensity and various disturbances like grazing, fire and grass cutting. In these grasslands plants in various lifeforms colonize at different stages of floodplain development. This study was conducted using space for time substitution (SFT) method to understand the pattern of colonization by different life-forms along the temporal gradient of grassland developed in Icharny Island, Sauraha, at Rapti River bank, Chitwan National Park, Central Nepal. The fieldwork was conducted in July and October 2014. Two sites were selected and sampled by dividing each of them equally into four transects parallel with each other and with the river flow. The distance between each transect was kept 50m. Six plots of size 5x5m2 at a distance of 200m from each other in each transect and altogether 48 plots (24 plots per site) were sampled. Coverage of every vascular plants enrooted in each plot were recorded. The first axis sample score value obtained after Non-metric Multidimensional Scaling (NMDS) was used as the successional gradient. Total species richness and its derivatives: climber, fern, forbs, graminoid, shrub and tree species richness were taken as response variables and regressed against NMDS1sample score. All response variables in both of the sites (except tree richness in one site) showed decrease in species richness with increasing successional gradient. Hence, the grassland showed convergence pattern of succession.

O-PT-1-570

#### Taxonomy of the Genus Iris L. (Iridaceae) in Nepal

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The monocot family Iridaceae comprises approximately 2050 species distributed among 67 genera worldwide. Iridaceae are usually perennial herbs with sword-shaped unifacial leaves and the flower has only three stamens, each opposite to an outer tepal. About 300 species of Iris are known from the world. Nepal contributes eight species of *Iris* to the world flora. The present study deals with the taxonomy work of all the eight species of Iris (*I. domestica*, *I.* 

collettii, I. decora, I. staintonii, I. kemaonensis, I. germanica, I. goniocarpa and I. clarkei) reported from Nepal. Among them I. staintonii is endemic to Nepal. This paper aims to provide the most important identifying characters of all the species of *Iris* of Nepal on the basis of their morphological studies. Size and shape of rhizomes, leaves, falls (outer and inner tepals) are the key characters for the identification of the species.

O-PT-1-735

### **Development of Nepal Fungal Database**

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Nepal Fungal Database (NFD) is an open access digital database aims to collect, collate, analyze, verify and authenticatethe data/information on fungal science of Nepal.It also aims to build a vibrant and active network among the stakeholders on national, regional and global level.This is of its first kind of fungal internet portal in Nepal that provides various information on fungal species recorded within the territory and other state-of-the-art information in the field of mycology. The database is a national asset and managed by Biological Resource Unit (BRU), NAST.

O-PT-1-863

#### Taxonomic Study of the Amaryllidaceae of Nepal

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Taxonomic study was undertaken using freshly collected and deposited herbarium specimens at TUCH, KATH and E following standard protocols during 2013 to 2015. Amaryllidaceae consists of nine genera and 28 species including five genera and 19 native species to Nepal, comprising some ornamental and agricultural species. Ornamental from four introduced genera includes *Agapanthus*, *Hippeastrum*, *Lycoris* and *Narcissus* which are growing in Nepal but are not known to naturalize. The family is a perennial bulbous evergreen or deciduous herb, often strong smelling with many, slender to tuberous, thick or thin roots. Leaves are alternate, all basal or rarely cauline. Inflorescence is a scapose with flowers solitary or in an umbel or spike. The flowers are bisexual, actinomorphic or zygomorphic with 6 tepals equal or subequal free or united into a tube at the base, rarely with a cupular corona. The Stamens are 6 in number which is inserted on the tube or at base of tepals. The ovary is inferior or superior with axile placentation. Allium has long been used in traditional ethnomedicine having high economic value in Nepal. Hence, further detail ecological, molecular and chemical level studies are needed to verify its definite importance and to follow the possible conservation strategies for their sustainable utilization.

### Soil Microbiology, Ecology and Biochemistry (O-SM-1)

O-SM-1-258

# Soil Carbon Dioxide Emission in the Sub-tropical Forest of Suryavinayak, Bhaktapur

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The effects of environmental factors on monthly variation in soil carbon dioxide (CO<sub>2</sub>) emission were examined in the sub-tropical forest of Suryavinayak, Bhaktapur district of Nepal. Soil CO<sub>2</sub> is produced by the emission of below ground plant parts (roots and rhizomes) and soil microorganisms, which is released from soil surface into the atmosphere. Field measurements of soil carbon dioxide emission were conducted using a closed chamber method with an infrared gas analyzer at monthly intervals from August 2015 to Januarv 2016. There was an exponential relationship between soil CO<sub>2</sub> emission and soil temperature, and the soil temperature accounted for 78% of monthly soil CO<sub>2</sub> emission variability. Moreover, a positive exponential relationship between soil CO<sub>2</sub> emission and soil water content was detected at 64%. The average highest monthly soil CO<sub>2</sub> emission was estimated at 701.68 mg  $CO_2$  m<sup>-2</sup> h<sup>-1</sup> in September and the lowest soil  $CO_2$  emission was estimated at 152.45 mg  $CO_2 \text{ m}^{-2} \text{ h}^{-1}$  in December. The soil temperature was highest at 22.6°C in August and lowest at 11.6°C in December, and the soil water content was highest in August (31.28%) and lowest in January (5.17%). The litter collected from August to January was averaged at 729.04 g dwm-2. This result suggests that the effects of soil temperature and soil water content on soil CO<sub>2</sub> emission might be important factors to understand the carbon dynamics of the forest of Nepal.

O-SM-1-267

# Effect of Environmental Factors on Soil Respiration in the Grassland of Annapurna Conservation Area (ACA), Nepal

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Present investigation deals with the effects of temperature and moisture on soil respiration in the grassland of Annapurna Conservation Area (ACA). Soil temperature and soil moisture enhances soil respiration by increasing root activity and decomposition of organic matter by micro-organisms. Field measurements of soil respiration were conducted using a closed chamber method with an infrared gas analyzer in the month of October 2015. The mean (n=3) soil respiration rate ranged from 45.31 to 963.42 mg CO<sub>2</sub> m<sup>-2</sup> h<sup>-1</sup> and the soil temperature ranged from 12.15 to 21.3°C. The soil water content and photosynthetic photon flux density (PPFD) lies between 23.3 and 59.6%, and 51.68 and 1526 µmol m<sup>-2</sup> s<sup>-1</sup>, respectively throughout the measurement period. A positive relationship (y=0.067x3.054, R<sup>2</sup> = 0.46) between soil respiration and soil temperature was detected. Moreover, the relationship between soil respiration and soil water content was estimated at 40%. Result shows that the soil temperature and soil water contents are the factors which determine the soil respiration in the grassland ecosystem.

O-SM-1-320

### Nutrient Profiling of Bed Sediments from Phewa Lake of Pokhara Valley, Western Nepal

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Lakes are sensitive to increase in nutrient concentration and urban lakes are more prone to nutrient loading and eutrophication caused by watershed development. The lake sediment acts as a sink as well as source for the nutrients to the lake. The nutrients concentration in the bed sediment has substantial influence on the trophic status of the lake. Thus, regular monitoring of nutrient concentration in the lake sediment is essential. In Phewa Lake such studies seems to be scanty. In the present study, nutrient status in the bed sediments of Phewa Lake was assessed by collecting the representative samples from different locations using grab sampler. Nutrients like nitrogen and phosphorus in the sediment samples were determined using the standard methods. The result revealed that maximum value of total phosphorus (TP) in the lake sediment is 5.3 g/kg dry weight. Among the total, available phosphorus is 0.8 g/kg dry weight and organic phosphorus is 4.9 g/kg dry weight. Similarly, the minimum value of TP was found to be 3.7 g/kg dry weight, in which available phosphorus is 0.14 g/kg dry weight and organic phosphorus is 3.2 g/kg dry weight. The average value of TP in the lake sediment is 4.59 g/kg dry weight. The result showed higher level of available phosphorus towards the inlet side of the lake and lower level towards the outlet side. However, a higher level of organic phosphorus was found towards the outlet side and lower towards the inlet side. Among the phosphorus, organically bound P accounted for >50% of TPs at all sites. With respect to nitrogen, the result revealed TKN (Total Kieldahl Nitrogen) range from 9.8g/kg dry weight to 30.8 g/kg dry weight with average value of 20.3 g/kg dry weight. The higher concentration of nutrients in sediment may hinder restoration effort in the lake. Thus, further detailed study about internal loading of nutrients from sediment is critically important for the sustainable management of the lake.

O-SM-1-358

# Study on the Corrosivity of Soil Sample Collected from Bharatpur Municipality Area of Chitwan Valley, Nepal

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Present work was focused to estimate six important soil parameters of thirty soil samples collected from different localities of Bharatpur municipality area of Chitwan valley, Nepal using ASTM and other standard methods. The soil corrosivity of the samples towards the buried galvanized-steel or cast-iron pipes were qualitatively done on the basis of the analyzed data. Concentrations of the six soil properties estimated in this study were found as: moisture content (9.7-47.8 %), pH (4.3-8.2), resistivity (1149-27777 Ohm.cm), oxidation-reduction potential (158-345 mV vs SHE), chloride (32-199 ppm) and sulfate (4-283 ppm). These results indicated that most of the soil samples collected from the present study areas are considered to be mildly corrosive and less corrosive nature towards the galvanized-steel and cast-iron pipes those are buried to supply the drinking water. Based on present findings, it can be advised to the related authorities or local people that simple modification of the soils using cheapest non-conducting materials like gravel or sand around the buried pipelines before

undergrounding them in soil is very beneficial to increase their life time. Details of the results will be discussed during the presentation in the conference.

O-SM-1-448

# Carbon Stock on Forest Floor and in the Soil of Tropical Moist Forest of Sunsari District, Eastern Nepal

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The present study was conducted in tropical moist forest of Sunsari district, Eastern Nepal. The main objective of this study was to estimate the carbon stock on forest floor i.e. litter mass and humus layer. Quadrat sampling method was used for sample collection. Different components of litter mass and raw humus were collected from the forest floor whereas the soils were taken from 15cm soil depth. The litter mass was categorized into four components such as fresh leaf, fresh non-leaf, partially decayed leaf and partially decayed non-leaf litter. The soil of the study area was sandy loam. The mean values of soil physicochemical properties were; soil moisture (24.7%), water holding capacity (70.84%), bulk density (1.18 gcm<sup>-3</sup>), soil porosity (54.23%), pH (5.7), organic carbon (2.81%), total nitrogen (0.23%) and soil organic matter (SOM) 4.85% . On average, soil organic carbon (SOC) stock in 15cm depth was 50.48 t/ha. The carbon stock in litter components and raw humus showed significant seasonal variations. The total litter production and carbon stock were 6.17 t/ha and 2.48 tC/ha respectively. On average of three seasons 13.78 t/ha of raw humus, 0.33t/ha of humus stock and 0.81t/ha of carbon stock in raw humus was revealed by this study.

O-SM-1-595

### Altitudinal Variations of Soil from Eastern Forest Land, Nepal

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This study assesses the variation in physiochemical properties of soil from the forests of Angejung section of Tamor watershed of Panchthar district, eastern Nepal. Field study was conducted in September 3 to December 15 after post monsoon, 2014. Composite soil sample was collected from the center of each plot of 20 × 20m<sup>2</sup>. Each sample was taken from below 15cm depth. Four plots were taken from one altitudinal level, representing a forest each. Another sampling was taken after 100 m increase in altitude. This forest soil sampling started from 600 to 2500 m asl. Thus soil from a total of 82 random plots each taken and packed into airtight polythene bags with proper labeling. Parameters such as pH, moisture, organic matter, nitrogen, potassium, phosphorus, and particle size were analyzed in Regional soil test laboratory, Jhumka, Sunsari after following standard protocols. Soil texture varies from clay to sandy clay with an intermediate sandy clay loam when we move from lower altitude to higher altitude. The elevation gradient has found significant relation ( $p \le 0.05$ ) to soil parameters. Soil pH, soil moisture, leaf area index, total solar extraterrestrial radiation, canopy cover and soil nutrients(NPK) show statistical significant correlation with altitude ( $p \le 0.05$ ). Aspect and slope did not show significant relation to altitude. The best fit line regression results for pH and available phosphorus showed decreasing trend with increasing altitude likewise moisture, organic matter and nitrogen were increased with increasing altitude at  $p \le 0.01$ . Soil available potassium throughout landscape was greatly varies and not normally distributed.

O-SM-1-611

#### Effect of Leaf Litter Treatment on Soil Microbial Biomass

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Soil microbial biomass is an active, living and labile fraction of soil organic matter. Leaf litters (Leguminous and Non-leguminous) were collected from surrounding areas of Biratnagar. The leaf litters alone and in combination were kept in earthen pots at the sub-surface lavers of the soil and were covered with soil for three months to regulate the decomposition process. Chloroform fumigation extraction method was performed in laboratory to determine the soil microbial biomass Carbon and Nitrogen. From the experiment, it was observed that non leguminous leaf litter treatment (Shorea robusta; Terminalia alata) showed minimum microbial biomass carbon and nitrogen while leguminous (Cassia siamena) leaf litter treated soil showed maximum value. Similarly, C: N ratio was found maximum in Tectona grandis and minimum in Lagerstroemia+Cassia. ANOVA suggested that the variation in soil microbial biomass Carbon and Nitrogen with leaf litter of leguminous, non-leguminous, non-leguminous shrub and aquatic macrophyte is significantly different than that of control ( $p \le 0.001$ ). The result further suggested that there is a distinct relationship between soil fertility and soil microbial biomass. This research concluded that the substrate and their nutrients help the soil microbial biomass in improving the soil fertility as it plays a central role in nutrient cycling. It facilitates to raise the level of soil nutrients so it is used as indicator of soil fertility.

### Wildlife Biology and Conservation-1 (O-WB-1)

O-WB-1-129

### Effects of Sublethal Doses of Pesticides on Learning and Memory in Honeybees

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Bees, including honeybees, bumble bees, and solitory bees, are prominent and economically important groups of pollinators worldwide; 35% of the world food crops production depends on pollinators. Decline of pollinators, specifically the honeybee (Apismellifera) in several parts of the world, has grown over the last decades. This may consequently lead to a parallel decrease in plant species or vice versa. The aim was to understand effect of sublethal doses of pesticides on learning and memory of foragre bees. Two types of insecticides namely, fluvalinate (pyrethroidmiticide) and imidacloprid (neonicotinoid insecticide); 0.1, 1.0, 2.0 uL/bee, and 0.00025, 0.0025, and 0.025 uL/bee respectively were topically applied on the ventral side of the abdomen on anesthesia nurse bees (< 7 days), foragers (<25 days), and old bees (>30 days). Present study shows that mortality in three different doses (0.1, 1.0 and 2.0 uL/bee) of fluvalinate was statistically different (One-way ANOVA F(2,24) = 5.143, Sig. = 0.014) but not statistically different in mortality of bees treated with three different doses (0.00025, 0.0025 and 0.025 uL/bee) of imidacloprid (One-way ANOVA F(2,24) = 8.027, Sig. = 0.045). Furthermore nurse bees were found highly sensitive to fluvalinate and imidacloprid compared to the old bees. PER results show that there is significant differences between in odor responses. In conclusion, imidacloprid caused deficiency of dopaminergic neurons in foragers. As a consequence, the forager lose their memory.

O-WB-1-155

# Roosting Sites and Threat Assessment of the Indian Flying Fox (*Pteropus Giganteus* Brünnich, 1782) in Lowlands of Eastern Nepal

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The Indian Flying Fox (Pteropus giganteus) is a large, social, colonial and known fruit bat species of Nepal. Population estimation of the species was carried out in spring, summer and autumn season in Sunsari, Morang and Jhapa districts of eastern Nepal in 2012. I used exact count method for small population (< 300). branch estimation for larger population (< 300), and identification of trees of roosting. Threats to the animal were identified with discussion with the local and indigenous people near the area. Altogether, five colonies of the Indian Flying Fox were reported, one each in Sunsari (Army Camp Eastern Division, Ithari) and one in Jhapa (Kerkha), and three in Morang (Dangra-4, CDO office and Golchha house in Biratnagar). The highest number of the Indian Flying Fox was observed in Army Camp area and the least in CDO office. There was significant difference ( $\chi^2$ -116, df=104, P<0.01,  $\alpha$ =0.05) in populations of the Indian Flying Fox in different lowlands sites of eastern Nepal. Similarly, seasonal variation was also insignificant ( $\chi^2$ -30, df=28, P>0.3,  $\alpha$ =0.05). The mean tree height was moderately correlated (r = 0.59) with the mean number of roosting bats of the area. Eleven species of trees (10 in Kerkha, eight in Army Camp Eastern Division, nine in Dangra, six in Golchha hosue and two in CDO office) were used for roosts, where Sisoo (Dalbergia sisso), Simal (Bombax ceiba), Teak (Tectona grandis), Peepal (Ficus religiosa), Litchi (Litchi chinensis), Mango (Mangifiera indica) and Jamun (Eugenia formosa) were common in all areas. Habitat destruction and human disturbances were the major threats to the Indian Flying Fox. Besides pesticides, electrocution, hunting for meat and medicine were the serious threats to the survival of the Indian Flying Fox. More detail and comprehensive study is needed to explore the current status of the Indian Flying Fox from different parts of Nepal.

*O-WB-1-206* Performance of Cattle x Yak Hybrids Grazing High Aititude Pastures in the Himalayan Mountains

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The cattle × yak hybrids (Dimjo chauries) have similar high altitude tolerance and have the advantages of heterosis in comparison to pure bred yaks. Effects of grazing by season, the parity on milk yield as it relates to the composition of Dimjo chauries, are unknown in the Kanchenjunga Conservation Area (KCA) of Nepal.Therefore a common transhumant route was identified at 4100 m a.s.l which was grazed both during upward (summer-July) and downward (September-early winter) herd movement. Milking Dimjo Chauries of 2nd, 4th and 6th parities each having six lactating animals were selected at similarity in daily milk yield, and days of parturition within each group. Daily milk yield and milk composition were analyzed for

7 days by following a 7 days long adapatation period at both measuring periods. Daily milk yield, energy corrected milk yield and fat content were significantly affected (P<0.05) by season and parity and their interactions. Highest daily milk yield was obtained from 6<sup>th</sup> parity hybrids (5 kg/day) in July and the least was observed for 2<sup>nd</sup> parity groups in September (1.5 kg/day). Milk fat content was highest at September for 4<sup>th</sup> parity hybrids (about 8%). Milk protein and lactose content was higher at July (3.32% protein vs. 4.67% lactose) than at September (3.22% protein and 4.54% lactose) respectively as expected due to advancing lactation and vegetation. Research results revealed that Dimjo Chauries above 4<sup>th</sup> parity could be promising for commercial herding as has been shown from their higher daily milk yield and daily outputs of milk constituents.

O-WB-1-216

### Bats are Good Pollinators but Facing Conservation Challenges - Evidences Shared from Thailand and Nepal

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The members of pteropodid bats are vegetarian in food habit. They feed on ripe fruits, nectar, pollen, leaf and twigs. The dawn nectar bat Eonycteris spelaea, a cave living bat that specialized for nectar and pollen diet is widespread along Indo-malayan region. We presents foraging movement of E. spelaea in agricultural habitat of southern Thailand. We radiotracked 17 individuals for five to 19 nights over a three month period. They traveled between one and 17.9 km ( ± SD: 4.4 km ± 5.07) from their roosting cave to food sources. The mean size of foraging areas by the bats measured 14.26 ha (100% MCP), that accounted for 21.9% of their home-range size. The bats foraged in one to three foraging areas each night. The greatest distance between feeding trees varied between 0.25 and 8 km (mean 1.25km ± 2.19). The movement pattern of E. spelaea while foraging showed efficient dispersal of pollen between conspecific trees. The bats were feeding on flowers of Durio zibethinus, Parkia spp., Oroxylum indicum, and Musa spp. The trees represent economically important crop of farmers in the region. In Nepal, we confirmed E. spelaea foraging at flowering patches of Nepalese butter plant called Chiuri Diploknema butyraceae (Roxb.) H.J.Lam at Chure range of Chitwan District in Nepal. The bats presumed to pollinate D. butyraceae but the locals hunting the flower visiting bats ignorantly. Bat hunting is an emerging conservation challenge for ending illegal wildlife hunting mission of Nepal.

O-WB-1-243

### Fuel Wood Use in the Traditional Cooking Stoves in Buffer Zone of Shuklaphanta Wildlife Reserve, Nepal: Assessing the Implications in Health and Climate Impacts

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Biomass is considered as the primary source of energy in terms of cooking and heating as three-fourth of the total population in Nepal still depends on it (NEEP, 2015). The traditional cooking stove creates indoor air pollution (IAP) with the emissions of Green House Gases (GHG) which poses a threat to both human health and environment (SREP, 2011). This paper explores the understanding of socio-economic, health and environmental impacts of traditional cooking stoves.

We conducted in-depth interviews using stratified random sampling procedure and direct observations of meal preparation and traditional cook stove use of 204 households in two

month period. Despite general similarities in cook, cooking place, cooking meal per day, maintenance of stove and number of dish in research site, we identified locally distinct opinion on like and dislike of traditional cooking stoves and interest for improved cooking stoves. Traditional stoves are designed to accommodate specific cooking styles, types of fuel, and available resources for maintenance and renovation. Our data show that the average consumption of fire wood was 4.93 tonne per year per household and was the major source of cooking fuel. Each household were using traditional cook stove since 24 years. Female family members of household were responsible for firewood collection primarily from the from the wildlife reserve. It has been figured out that the incomplete combustion of biomass in the traditional cooking stove poses severe environmental, health and economic consequences. The study also showed that 93.6% of the respondents would prefer improved cooking stoves over traditional cooking stoves.

O-WB-1-266

### Spatio-Temporal Variation in Fish Assemblage Structure of the Seti Gandaki River Basin, Nepal

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Spatio-temporal variations of fish assemblages in the Seti Gandaki River, Nepal, are described from five study sites, three along the main channel and two in tributaries. Fish sampling was done using a cast-net and an electric shocker. Altogether 30 species belonging to nine families, and a longitudinal pattern of distribution and species richness from upstream to downstream sites were recorded. Cyprinids were predominant followed by silurids, balitorids, channids, mastacembelids, belonids and cobitids. The abundance of species was higher during spring and autumn seasons, and lower during summer and winter. Average total density during the spring was 320.28/0.1 ha at the lower tributary (Site D) and 138.64/0.1 ha at the urban site (Site C), during autumn 220.28/0.1 ha at Site A and 104.30/0.1 ha at Site C, during summer 161.29/0.1 ha at Site A and 84.28/0.1 ha at Site C, and during winter 138.00/0.1 ha at Site A and 74.30/0.1 ha at Site C. Cluster Analysis (CA) based on occurrence of species revealed similarity of assemblages among the sites. It produced four viz., AB, CD, ABCD, and ABCDE clusters. The cluster AB had a Euclidean Distance (ED) value of 1.20 which represented maximum similarity but less dissimilarity, with probability of Automatic Unbiased (AU) value (AU=0.99), the cluster CD had ED value of 2.80 with AU value 0.68, the cluster ABCD had ED value of 3.00 with AU value 0.52 and the cluster ABCDE had an ED value of 3.35, which showed more dissimilarity than other clusters. These sites were also clearly separated into two axes in Non-metric Multi-dimensional Scaling (NMDS). The species formed 18 clusters of fish assemblages.

O-WB-1-328

# Ecological Study of the Tributaries of Glacial-fed River (Tamor) and Rain-fed River (Kamala) in Nepal, and the Comparison of their Vital Characteristics

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Headwaters and their tributaries serve important ecosystem functions including water quality and biodiversity hotspots. They are often the indicators of ecological health of rivers.

Headwater dynamics in glacial-fed and rain-fed rivers may vary in terms of source of origin, climate, biogeography, geology and physico-chemical parameters, which may affect the biotic assemblages of these ecosystems. This study was carried out in March 2015 to compare the fish and macroinvertebrate assemblages in the tributaries of glacial-fed (Tamor) and rain/spring-fed (Kamala) rivers in order to assess the differences in ecological roles of these tributaries. Standard electrofishing gear was used for fish sampling and macroinvertebrates were sampled qualitatively from different habitats. Selected physico-chemical parameters such as pH, DO, temperature and conductivity were also measured in the field using multiparameter probes. Fish species and abundance was observed to be lower in glacial-fed tributaries (9 species; 19-52/10 minutes) compared to rain/spring-fed tributaries (15 species; 92-115/10 minutes). Barilius bendelisis and Garra gotyla gotyla were found common to both categories of tributaries. Similarly, 37 families of macroinvertebrates were observed in the study with molluscs and crustaceans exclusively in rain/spring-fed tributaries. One way ANOVA revealed pH to be higher for glacial-fed tributaries while conductivity and temperature was found to be higher for rain/spring-fed tributaries. The study has shown that both the fish and the macroinvertebrate assemblages were found to vary between the glacial-fed and rainfed tributaries. The results from this study could in turn be used as baseline information for future studies including climate change.

### Wildlife Biology and Conservation-2 (O-WB-2)

O-WB-2-910-I

#### **Biodiversity Conservation in Nepal**

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Nepal, a Himalayan country, relatively small in geographical area, is disproportionately rich in biodiversity and culture. Nepal has been pioneering and advocating principles of sustainable resources management through various conservation practices. The concept of Community Forest, pro-poor leasehold forest, conservation of keystone species and community-based conservation are well recognized achievements worldwide. In addition, Government of Nepal has been proactively adopting the emerging concept of landscape approach evolving through protected area management, buffer zone concept to landscape level conservation and developmental practices. These initiatives have created a unique opportunity to showcase and learn from socio-ecological, cultural and environmental transformations. The paper highlights the how Nepal has achieved success in conservation as well as presents emerging challenges and threats for conservation. It concludes with some policy recommendations.

O-WB-2-444

### Status, Habitat Preference of Vulture and Conservation Role of Vulture Restaurant in Lowland Nepal

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This study was focused on the status, habitat preference of vulture and conservation roles of vulture restaurant in the lowland Nepal. The study was conducted by dividing the whole study area into two study blocks- Chitwan and Nawalparasi districts. The research was aimed to find out the status and conservation challenges of vulture by using 18 birding routes, personal communication with conservation experts, general public and park officials respectively. The

study was mainly concentrated in and around the vulture restaurant. Altogether 154 individuals of 5 species of vultures were recorded in the study area. White rumped vultures were the most abundant (72) followed by Himalayan griffon vulture (68), Egyptian vulture (13), Red headed vulture (3) and slender billed vulture (3). As much as 22 nests were recorded nearby the vulture restaurant. Among these nests, 21 nests were belonged to white rumped vulture and one nest was belonged to Egyptian vulture. However, there was no record of nests of vultures from other parts of the study area. These vultures highly preferred the riverine mixed and *Bombax ceiba* forest. The study further revealed that there was a great role of vulture restaurant in providing the safe diclofenac free carcass for vultures in regular basis. Likewise, local people and conservation experts working in the area said that the numbers and species diversity of vultures have been increased after the establishment of the restaurant.

O-WB-2-455

### Crop Diversity Maintained in farmers field: Case from Api-Nampa conservation area of far western Nepal

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This Paper examines the crop species diversity and their status in farmers' field of Api-Nampa Conservation Area of Kailash Sacred Landscape area of Far-western region of Nepal. Diversity fair of local crop species, semi-structured interviews, direct observations and Focus Group Discussions were employed to collect data. Overall crop species diversity is measured from the species inventories. A total of 190 different crop species were recorded through diversity fair however; the varietal diversity for *Dolichos lablab* was reported highest among other species. This study suggests diversity are purposively maintained by the local people for diverse product harvesting and are the major contributor for household level food and nutritional security. Farmers reported that 4 crop species have been lost for last 10 years and 5 species are in the verge of extinction from the area. Land use changes, out-migration, introduction of new varieties, and poor agricultural production system were the major causes associated to this trend. Despite of species erosion, self-saved seed and informal seed supply system among the villagers helped to maintain the crop species diversity on farm.

O-WB-2-459

### Population Status, Occupancy and Distribution Modelling of Cheer Pheasant (*Catreus wallichii*) in Dhorpatan Hunting Reserve, Nepal

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The Cheer pheasant (*Catreus wallichii*) is a globally threatened species listed as vulnerable in Word Conservation Union (IUCN) Red list and legally protected by the Government of Nepal. The conservation of this species is of great importance worldwide and regular monitoring of its status and distribution are necessary. This study was done to assess the population status, estimate occupancy patterns in Dhorpatan Hunting Reserve, as well as to identify potentially suitable habitat of Cheer in Nepal. The study was conducted during the breeding season i.e. May and October, 2013. Dawn call count method was used to obtain the population status and detection and the non-detection survey was done to estimate the occupancy of Cheer. The occupancy data was analyzed in the program PRESENCE. Habitat suitability was predicted throughout Nepal using a MaxEnt modeling approach, combining presence-only data. Population data revealed that Dhorpatan valley still supports the significant population of

Cheer with an overall density of 7.08 pairs/Km<sup>2</sup>, but the population is in declining trend. The total population size of the species was found to be 143-156 pairs. Occupancy modeling revealed that the distance to water had greater weight in determining occupancy. Distribution modeling indicated smaller area (1.20%) was most suitable for the species occurrence in Nepal. Most of the habitat of Cheer is discontinuous mostly occurred in patchy habitat in the Western Nepal. Thus, Community-based conservation program, regular monitoring, survey in potential habitat and its protection will be crucial to achieving the conservation goal.

O-WB-2-502

# Cross Infection of Gastro-intestinal Tract Parasites between Red Panda (*Ailurus fulgens* Cuvier, 1825) and Livestocks in Community Forest of Illam, Nepal

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Red Panda is endangered species of Nepal and its numbers are declining day by day. Present study was conducted to assess the possible parasitic sharing between Red Panda and livestocks population sharing the same pasture land. A total of 55 fresh fecal samples were collected by using line transect method and opportunistically from the elevation range 2200 to 4800m, which includes Red Panda(14), Cow(20), Buffalo(1), Yak(2), Horse(5), Goat(9) and Sheep(4) from Illam community forest area of Nepal. The collected fecal samples were preserved in 2.5% potassium dichromate and microscopically examined using direct smear and concentration methods. Prevalence of protozoan and helminth parasites were found to be 100% in Red Panda and almost equal prevalence of protozoan (82.92%) and helminth (87.82%) parasites were recorded in livestocks. The recorded common protozoan parasites includes Eimeria sp., Entamoeba sp., and Balantidium sp. with 64.28%, 57.14% and 14.28% in Red Panda and 60.97%, 21.95% and 7.31% in livestock respectively. Among the helminth, common parasites includes Oxyuris, Ascaris, Trichostrongylus, Strongyloides, Trichuris and Hookwormwith proportion 100%, 57.14%, 50%, 50%, 42.8% and 35.7% in Red Panda and 87.8%,60.97%, 41.46%, 53.65%, 31.70% and 39.02% in livestock respectively. However Crenosoma (42.85%) was recorded only in Red Panda while Moniezia (14.63%) and Paraphiostomum (2.43%) in livestock only. Comparing the morphologically similar parasites, there were not statistically significant differences. However, some parasites were Red Panda specific and some were livestocks specific.

O-WB-2-628

# Identification and Mapping of Risk Area of Rhino Poaching; A Geospatial Approach (A Case Study from Chitwan National Park, Nepal)

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Nepal has a proud history of rhino conservation with significant proportions of Asians' rhino population protected and managed within the protected areas. Poaching risk map promises early warning and a way to target preventive action, which can safeguard both human and ecosystem. This study was designed to identify and map risk areas of rhino (*Rhinoceros unicornis*) poaching within and around eastern sector of Chitwan National Park. A multi criterion GIS method was used to analyze and derive the risky zone. A binary logistic regression and export consultation were done to finalized variables and risk rating then

weighted sum index model was performed in ArcGIS to derive risk zonation map. Presence/poaching and pseudo absence data were dependent variables and distance to guard post, settlement and road network from poaching events, land cover, population density, slope and elevation were predictor variables for logistic regression model.Poaching events were observed to be spatially distributed around the park except in the south part. Among the seven predictable variables five variables, except terrain (slope and elevation) had statistically significance at p<0.1. The poaching risk map indicates that areas near to roads, far from the guard post, and densely populated area of grasslands are potential areas for rhino poaching. The GIS based maps will be practical and strategical to wildlife managers in CNP to facilitate decision making on intervention programs and how best to direct law enforcement patrols within and around the park.

*O-WB-2-648* 

# Status of Snow Leopard and Livestock Depredation in Api-Nampa Conservation Area

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The Snow Leopard -SL (Panthera uncia), mountainous species of the Central Asia and Himalayas, is categorized as endangered species by IUCN. Human-SL conflict issues are poorly known and documented although livestock herders are confronted with substantial stock losses. Quantifying livestock depredation and documenting their retaliatory killing are fundamental for implementation of management actions. Scat analysis was carried out using standard micro-histological method to identify livestock proportion in SL diet. One way ANOVA, Pearson correlation and linear regression were used to analyze data. Kalapathar block is the best potential habitat with 12.85 signs km-1 and 9.45km<sup>-1</sup> on average in the site. There is possibility of 3-4 snow leopards 100km-2. The average livestock holding HH-1 is 30.44 where sheep and goats formed the majority accounting for 89.50% of total holdings. Wolf covered the highest 45% followed by snow leopard 22% of total depredation of livestock amounting to US\$ 35,637.63 and US \$16,202.57 respectively. Total mean loss HH-1 year-1 by wild predation on livestock amounted to US\$ 394.52. Mean loss HH-1 year-1 by snow leopard was US \$84.83. Sheep(18%), goats(15%) and horses(5%) were represented in SL diet accounting for 4:3:1 proportion. Compensation schemes for livestock loss should be implemented and alternative benefits from community-based ecotourism, livestock husbandry, and sustainable harvesting of NTFPs should be explored to generate attitude towards snow leopard conservation.

O-WB-2-673

#### Distribution and Composition of Urban Birds in Kathmandu Valley, Nepal

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Urbanization affects biodiversity. Birds being the most habitats specific get severe threats due to urbanization than other taxa. Urbanization is rapidly increasing in Kathmandu valley but urban birds are not monitored yet. As such Bird Conservation Nepal has initiated long term urban bird monitoring program in Kathmandu valley to record the birds found in different gradients of Kathmandu valley and to find the possible impact of urbanization in birds in near future. Kathmandu valley was divided into three gradients: rural, sub-urban and urban and

1X1 km grid was laid on it. Altogether 24 transect/grids were selected purposively: two grids in each gradient and in each aspect (east, west, north and south). First phase of bird count was carried out in winter season (26-28 January, 2016) by different volunteers. During the count, 6509 individuals of birds belonging to 84 species were recorded. Species richness of birds increased from urban to rural gradients, however the abundances decreased simultaneously. Resident species were recorded more than migratory species. Forest species were also recorded in the urban gradients. Rock Pigeon, followed by House Crow, House Sparrow, Common Myna and Barn Swallow were the top five abundant birds during the survey. Similarly species richness was highest in north aspect whereas lowest in west aspect, however, abundance was highest in east and lowest in north aspect. This study shows that if high quality corridor/habitat is maintained within the sub-urban gradients, bird migrate from rural to urban gradients and vice versa, however, long term study is necessary.

### Wildlife Biology and Conservation-3 (O-WB-3)

O-WB-3-679

### Lesson Learnt from Conserving American Crocodiles in Panama, Central America: An implication for Crocodilian Conservation in Nepal

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Conservation programs can make successful by reconciling the interests of policy makers, researchers and local communities. 'Participatory Research and Education' (PRAE) approach provides an effective platform to reconcile interest of such relevant stakeholders. Based on our experience in conserving American crocodiles (Crocodylus acutus) in Coiba National Park of Panama by studying various aspects of their ecology and genetics. PRAE approach has proven to be both a viable and a valuable practice. Success on conserving American crocodiles in Panama using PRAE has, thus, encouraged us to initiate efforts to conserve threatened Gharials (Gavialis gangeticus) and Muggers (Crocodylus palustris) in Nepal using this approach. To fill in knowledge-gap that has long existed for crocodilians in Nepal, Biodiversity Conservancy Nepal has recently started a long-term project to collect scientific information on the status of population, habitat, and threats acting on crocodilians in Nepal. We have started this project from the Bardia National Park (BNP) and the PRAE has been our fundamental approach. We are conducting population survey, characterize crocodilian habitat, and assess current threats in addition to conducting conservation education programs and trainings. Policy makers, students, researchers and local communities will have active participation in designing and execution of this project. Upon successful completion of this project, we will design a 'Conservation Action Plan' for the first time for crocodilians in Nepal which will serve as a road map for future research on crocodilians thus safeguarding their long-term conservation in Nepal.

O-WB-3-682

# Ecological Monitoring and Conservation of Critically Endangered Vultures for Five Years in Arghakhanchi, Nepal

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The conservation and ecological monitoring of critically endangered White-rumped vulture, Egyptian vulture, Himalayan Griffon and Lammergeier vulutre have been done for last five

Abstract Book

years in Arghakhanchi district. The nest number of White-rumped Vulture. Eqyptian Vulture and Himalayan Griffon is increased by 38.46%, 133.33% and 39.28% respectively where as the nest number of Lammergeier is decreased by 50% from 2010 to 2014. The rate of breeding success (based on active nest) of White-rumped Vulture, Egyptian Vulture, Himalayan Griffon and Lammergeier is 53.84%, 50%, 65% and 100% respectively in 2010 and 71.42%, 60%, 65.71% and 0% of respective species in 2014. This is a pioneer study about three vulture species association in their nesting cliff Gherabhir, Arghakhanchi. The advocacy with stakeholder and community awareness trigger up the community initiative to save the critically endangered vulture species feeling ownership. Community forest user groups plan to include vulture conservation activities in their forest operation plan aiming to sustain conservation programme practically as well as legally. Massive sensitisation work was carried out in schools, communities, among veterinary groups and widely through mass media. Key activities of the project were done in coordination with government line agencies and local conservation groups which have helped widen the implication of the project. There is handover of knowledge and skills to the community so that they can continue carrying out activities like nest monitoring, monitoring of vulture population and NSAIDs survey.

O-WB-3-743

# Persistence and Stability of Macroinvetebrates Change Along The Altitudinal Gradients in The Central Himalaya

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This study aims to examine the persistence and stability in macroinvertebrate assemblages in three river basins in central Himalaya over a 2 year period (2012 and 2013). Macroinvertebrates and associated local environmental parameters were sampled from 28 streams along altitudinal gradients between1500 and 4100 m asl during pre-monsoon each year. We assessed the persistence (similarity in taxa assemblages between years) and stability (similarity in relative abundance of taxa between years) of the macroinvertebrates by using Bray-Curtis distance along the altitudinal gradient. Non-metric multidimensional scaling (NMS) was performed for differentiating communities. Decrease in dissimilarity coefficients based on relative abundance and presence/absence of macroinvertebrate community along the altitudinal gradient revealed that persistence and stability of macroinvertebrate community gradually increased from lower altitudes to higher altitudes (p > 0.001). The dissimilarity of physical habitat conditions between 2012 and 2013 increased from 1500 m to 2500 m asl and then progressively decreased from 2700 m to 4100 m asl. The result showed that high variability in physical habitat increased high variability in dissimilarity coefficients of macroinvertebrates community. NMS analysis revealed that the sites of consecutive years did not significantly separate in the ordination plot (MRPP: A= -0.005; p=0.93), however, well separated among altitudinal climatic zones (MRPP: A=0.14; p<0.001). The study sheds light on how persistence and stability of macroinvetebrates change along the altitudinal gradient. The outcomes help to better understanding of community composition and their changes under climate change.

#### *O-WB-3-745* Identification and Characterization of Asian Elephant Ivory Using Schreger Lines

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Elephant ivory is one of the excessively priced illegally traded articles and its identification as well as characterization has always been difficult. A total of 21 Asian elephants tusks stored at the Office of Chitwan National Park, Kasara, Nepal were morphometrically studied with aim to characterize elephant ivory using Schreger lines. All samples were cleaned and their Schreger lines captured and angle measurements were measured using a protractor. A total of 120 Schreger angles data from both outer and inner area were obtained resulting both concave and convex appearance. The observed maximum and minimum Schreger angles values were 50° and 125° respectively. The mean Schreger angle was found to be 95.60° (±14.23). Schreger lines were present in all studied samples. Thus, concluding that the presence of Schreger line as the identifying feature of elephant tusk.

O-WB-3-762

### Spatial and Temporal Patterns of Wildfire Occurrence in Forest Types of Nepal

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The study was examined the spatial and temporal patterns of wild fire occurrences in different types of forest in Nepal during the period of 16 years (2000-2015 A.D). The data of fire occurrences were derived from the products of MODIS satellite. It was analyzed by point count method to quantify the spatial pattern of wild fire occurrences and distribution pattern through using average nearest neighbour function of Arc GIS. Total 39,296 numbers of fire occurrences were detected in the given period across the Nepal. Among these, higher numbers of fire incidences occurred in 2005, 2009 and 2012 with numbers counted of 3,596, 3,591 and 3,557. The highest numbers of wildfire occurred in the Alpine Pasture Forest (23.40%), which was followed by Hill Sal Forest (19.73%), Navil zone (15.02%) and Chir Pine Forest (10.57%) respectively. The Alpine Pasture Forest is found to be more prone to wild fire than other forest types due to higher fire combustible materials in grasslands and rangelands often associated with juniper thickets, rhododendron bushes and cushion formations. The mosses and lichens are found in scattered locations in Navil zone and Needle and resin in Pine Forest that are higher fire combustible materials which contribute to fire ignition. The findings are expected to be use full for land-use planning, and formulation of wildfire management strategies in Nepal and other developing countries with similar ecological and socio-economic conditions.

O-WB-3-784

### Predicting Suitable Habitat of Blackbuck Antelope Cervicapra in Low-land Tarai of Nepal

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Understanding and predicting wildlife-habitat relationship and identifying and protecting suitable ecological areas and landscapes to ensure the viability of wild populations is a

foundation of wildlife management. Predicting and mapping of potentially suitable habitats for endangered and threatened species is crucial because such species tend to exist in small fragmented populations. The near threatened Blackbuck Antelope cervicapra is one of the critically endangered mammals of Nepal whose natural distribution is restricted to a single location within the 16km<sup>2</sup> Blackbuck Conservation Area at Khairapur of Bardia. We used 113 geo-referenced presence points and sets of environmental variables for MaxEnt algorithm to predict ecologically feasible habitats in lowland terai of Nepal. Annual mean temperature, land cover, temperature seasonality and temperature annual range were the major predictive variables for suitable species habitat. Approximately 1135.5km<sup>2</sup> area of Nepal was identified to be suitable. Most of the suitable habitats occurred outside the protected areas. In Bardia, areas in and around Blackbuck Conservation Area, Gangapur Jamun, Shivanagar and Mainapokhar to Khairi and Bansgadi to the border of India are highly suitable while in Kanchanpur, grassland between Rani taal and Chaudhara river inside Shuklaphanta Wildlife Reserve and Chandani and Dodhara VDCs moderately favorable. In Banke, Khajura, Bhoj Bhagwanpur and floodplains at south of Rapti are suitable. The map of potential suitable habitat will facilitate expansion of the conservation area as well as prioritization and preservation of such potential areas for future of increasing blackbucks in Nepal.

Effects of Land Use and Land Cover on Occurrence of Barn owl (*Tyto alba* Scopoli, 1769) in Kathmandu Valley, Nepal

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Barn Owl (Tyto alba) is nationally threatened in Nepal. It is a flagship species of healthy grassland and is closely associated with farmlands. Beside distribution records, there are no ecological studies on Barn Owl in Nepal. This study was conducted from July 2014 to July 2015, including post-earthquake scoping survey, to map the Land Use and Land Cover (LULC) features of Kathmandu valley, to determine Barn Owl occurrence and to assess the effects of the LULC features on its occurrence. Observational survey was done by walking through the trails aided with play-back recording. LULC mapping was done on IKONOS image in ArcGIS. The effects of LULC on the species were determined by a comparison of broad plot level attributes and species occurrence. Site-level attributes were modeled to determine their influence on presence of the species. One-way ANOVA revealed that the occurrence of Barn Owl was significantly affected by built-up level [F(2,14)= 5.049, p<0.05]. Occupancy modeling in program PRESENCE revealed that tree cover had greater weight in determining occupancy at plot-level. Barn Owl occupancy was positively correlated with temple (1.55 ± 1). Built-up has strong positive association with its occupancy at both plot-level  $(1.25 \pm 0.69)$  and sub-plot level (8.871 ± 5.177). The earthquake in April, 2015 has negatively affected potential Barn Owl sites. Rapid urbanization may affect these potential sites and prey abundance. This should be studied in detail to understand Barn Owl occupancy and attributes supportive for its survival in Kathmandu valley.

O-WB-3-797

### Analytical Chemistry (O-AC-1)

O-AC-1-347

### Investigation on the Corrosivity of Soil Collected from Lalitpur Areas of Kathmandu Valley

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Six parameters (moisture, pH, resistivity, oxidation-reduction potential, chloride and sulfate) of twenty three soil samples were analyzed using ASTM standards to investigate their corrosive nature towards the buried galvanized-steel and cast-iron pipes used in Tikathali, Imadol-KA and Imadol-KHA areas of Lalitpur district of Kathmandu valley. Amounts of these six soil parameters in the collected twenty three samples were found as; 11-37% moisture content, 6.1-8.4 pH, 0.3330 ×  $10^4$  - 4.7620 ×  $10^4$  Ohm.cm resistivity, 317-553 mV (SHE) oxidation-reduction potential (ORP), 14-75 ppm chloride and 56-176 ppm sulfate. Results indicated that most of the soil samples collected from the study areas of Lalitpur district are found to be mildly corrosive and less corrosive nature on the buried galvanized-steel and cast-iron pipes used for the supply of drinking water in the study area. It can be advised to the related authorities and local people that a simple modification of the soil using cheapest non-conducting materials like gravel/sand around the buried-pipes, before burying them in the study areas, seems to be effective from the corrosion point of view. The details of the results will be discussed during the presentation in the conference.

O-AC-1-396

#### Physicochemical and Biological Studies of Gaultheria fragrantissima Oil

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An attempt was made to study the physicochemical properties, anti-microbial activity, brine shrimp bioassay and anti-inflammatory property of volatile oil of *Gaultheria fragrantissima*. Physicochemical properties (specific gravity, GC-MS, acid value, refractive index, saponification value, boiling point) of the volatile oil, obtained through hydro-distillation, were evaluated. GC-MS analysis revealed that the existence of methyl salicylate (87.77%) as the major constituent. The anti microbial activity of 100%, 50% and 25% oil was evaluated against *Escherichia coli, Streptococcus aureus, Proteus mirabillis, Klebsiella pneumonia*. The study demonstrated that Gaultheria oil have remarkable anti-microbial effects against *P. mirabillis, K. pneumonia* than the control (Cephalexin, Tetracycline, Ampicillin) used.Brine shrimp bioassay revealed that the oil was mildly toxic with LC<sub>50</sub> value of 95.05  $\mu$ g/mL. Investigation of *in vivo* anti-Inflammatory activity revealed that the oil has potent anti-inflammatory activity than the control (Diclofenac) used.

O-AC-1-406

# Studies on Thermal, Mechanical and Biodegradation Properties of Chitosan Based Biodegradable Blends

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Chitosan, an important biomaterial is fabricated with synthetic biodegradable copolyester i.e. poly(butylene adipate-co-terephthalate), PBAT (Ecoflex). The biopolymer was melt-mixed with

a commercially available biodegradable polymer, the poly(butylene adipate-co-terephthalate) (PBAT). The biodegradability of these samples was carried out by two methods: soil burial and vermi composting method. The blend films were characterized by Fourier transform infrared (FTIR) spectroscopy, thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). The glass transition temperature ( $T_g$ ) and melting point of the materials remained unchanged implying the complete incompatibility of the blend components. As the thermal properties of all the samples were found to be identical, it was conclude that there was no effect of the added chitosan on the crystallization and melting behavior of the PBAT, further supporting the notion of absence of interactions among the blend components. The biodegradability of blends was studied by physical appearance, weight loss measurement and FTIR spectroscopy. Biodegradation test under soil and compost indicate the biodegradability of blends were improved by the addition of chitosan to the polymer (PBAT).

O-AC-1-477

### Conservation and Domestication of Picrorhiza Kurrooa, a Threaten Medicinal Plant Species through Assessment of its Chemical Variability Grown in Myagdi District

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Picrorhiza kurrooa Royle ex Benth (family Scrophulariaceae), locally known as Kutki, is a medicinally revered herb used extensively in traditional as well as modern medicinal systems of India, China, Tibet, Nepal and Sri Lanka for various immune-related diseases. A research was focused on altitudinal variation of P-I and P-II content in population of P. kurrooa grown at different altitudes in Myagdi and to identify the chemical superior plant among the existing populations. Discussed herein P-I and P-II content determined in various populations to identify the chemically superior plants among the existing populations, herein is a report on the bioactive marker content determined in populations grown in the district (3829 to 4295 m). A study was conducted on the thirty populations' grown at different altitudes. The rhizomes were shade dried, milled, defatted, and extracted with methanol. The extract was analyzed by TLC densitometric technique and bioactive marker compound were quantified using the validated method. Separation and quantification of P-I and P-II was achieved on precoated silica gel 60F254 aluminium plates using mobile phase of CHCl3:CH3OH (75:25, v/v) and densitometric scanning at 254 nm in UV absorbance mode and good separation with R<sub>f</sub> (0.41, P-II and 0.55, P-I). The variability in the contents of the marker constituent with the altitude was observed. P-I and P-II were found in the range of 1.69-4.27% and 1.7-8.57% respectively, with an increase and decrease in the altitude. There is no earlier attempt made on the quantitative determination of the bioactive marker constituent P-I and P-II in the population lines of P. kurrooa grown in Myagdi. Thus, the altitude variation with respect to marker constituent P-II is shown.

O-AC-1-52

# A Comparative Qualitative and Quantitative Study of the Wild and Cultivated Rhizomes of *Rheum australe* (Padamchal)

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Wild and cultivated rhizomes of *Rheum australe* D. Don (synonym *R. emodi* Wall. Ex Meisn), collected from western and eastern Nepal, were comparatively investigated. Anthrquinones (chrysophanol, emodin and physcion) were isolated from the plant material. Microscopic

examination showed the presence of calcium oxalate crystals and starch grains scattering in the parenchymatous cells. Extractive value was found higher in the wild variety. The rhizome constituted flavonoids, anthraquinones, polyphenols, glycosides, carbohydrates, saponins, terpenoids, fatty acids, etc. A comparative fluorescence analysis of the rhizome power was carried out to establish genuineness of the plant material. Proximate composition of ash contents, different elements, fats, protein and carbohydrate were determined. Total flavonoid contents in both wild and cultivated samples were found nearly close (2.77-2.97 g quercetin equivalents/100 g dried mass). A low phenolic content was estimated in the rhizomes of cultivated variety (102.82 mg gallic acid equivalents/100 g dried mass) as compared to wild variety (738.00-766.52 mg gallic acid equivalents/100 g dried mass) providing a tool for their differentiation.

O-AC-1-534

# Quantification of Picroside I-II in the Rhizome Extract of *Neopicrorhiza scrophulariiflora* (Pennell) Hong from Different Zones of Nepal, and Evaluation of Antioxidant and Antibacterial Properties

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*Neopicrorhiza scrophulariiflora* (Pennell) Hong, also known as Kutki, is a high valued medicinal plants. It is a high altitude plant and is entirely distributed around Himalayan Range. The major constituents of this plant are Picroside I and Picroside II. Methanolic extract was prepared from rhizome of *N. scrophulariiflora* collected from three different geographical locations viz Manaslu Conservation Area (MCA), Langtang National Park (LNP) and Kanchenjunga Conservation Area (KCA). The active constituents of *N. scrophulariifora*, Picroside I and Picroside II, were quantified using High Performance Liquid Chromatography (HPLC). Picrosides I and II contents were found to be high (678.705 µg/mL and 2015.947 µg/mL) in the rhizome extract from MCA followed by KCA (426.501 µg/mL and 1029.281 µg/mL) and LNP (203.623 µg/mL and 751.637 µg/mL). These extracts were further investigated for their antioxidant and antibacterial potentials. The highest antioxidant properties were found in methanolic extract from LNP with IC<sub>50</sub> value (1.0742 µg/mL) followed by KCA (2.0398 µg/mL) and MCA (4.141 µg/mL). All methanolic extract of *N. scrophulariiflora* were active against *Staphylococcus aureus*, *Klebsiella pneumoneae* and *Pseudomonas aeruginosa*. The effectiveness of the crude extract confirmed its use in traditional medicines.

O-AC-1-709

### Study of Morphological and Mechanical Behavior of Ethylene/1-Octene Copolymer (EOC) Based Nanocomposites Fabricated with Fillers of Different Dimensionalities

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Nanocomposites of ethylene/1-octene copolymer (EOC) have been fabricated with fillers of different dimensionalities (such as carbon nanotubes, one dimensional (1D), layered silicates
(2D) and boehmite (3D) by melt mixing process in order to investigate the influence of nanofillers on morphology and mechanical behaviors of the nanocomposite. Morphologies of EOC nanocomposites were characterized *via* scanning electron microscopy (SEM), and transmission electron microscopy (TEM) whereas mechanical properties were investigated by microhardness measurement, tensile test and cyclic tensile test. The tensile strength of the samples was studied via universal tensile tester. Similarly, cyclic tensile test is used to measure elastomeric property. The result of microhardness measurement showed that the hardness is increased with the addition of filler. Likewise, results of tensile test and cyclic tensile test revealed that tensile strength and residual strain is improved significantly in the nanocomposites compared to that of pure. On comparing the mechanical properties of three different types of nanocomposites, it is found that the carbon nanotubes, 1D filler have highest reinforcement effect. SEM and TEM micrographs showed homogeneous dispersion of nanofillers with mixed morphologies in the nanocomposites. Further, thermal stability of the samples was investigated via thermogravimetry using TGA 209 which revealed that nanocomposites have higher thermal stability.

### Nano Chemistry (O-NC-1)

O-NC-1-898-I

Nanoparticle Self Assembly under Various Conditions Studied with Stimulated Emission Depletion Microscopy

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Self assembled nanostructures have demonstrated many promising applications. This talk will focus on study of self assembly behavior of different sized polymeric nanoparticles under wet and dried conditions. Under wet conditions and in presence of various ionic strength, such particles show unique structures very different from dry conditions. The self assembled patterns are imaged with homebuilt Stimulated Emission Depletion (STED) microscopy; a form of optical nanoscopy that was awarded 2014 Nobel prize in Chemistry. The advantage of such imaging mode with other high resolution modes will be provided. The possible causes for formation of various self assembled patterns will also be discussed.

O-NC-1-143

# Effect of Optical and Electrical Properties, After Plasma and Nitrogen Treatment of Fluorine Doped Tin Oxide (FTO) Transparent Thin Films

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An investigation on the effects of a low temperature plasma treatment on electrical and optical properties of Fluorine doped Tin Oxide (FTO) films annealed in a nitrogen environment was performed using two probe method and spectrometric reflectometry. The films were prepared by using a homemade spray pyrolysis setup and precursor solution of stannous chloride (Sncl<sub>2</sub>.2H<sub>2</sub>O) and ammonium fluoride (NH<sub>4</sub>F) in distilled water. Substrate and oven

temperature were set to ca. 550 ( $\pm$ 10) <sup>o</sup>C during both the film synthesis and calcinations processes. Then, the electrical and optical properties of FTO before and after the plasma and nitrogen treatment films prepared with various molar ratio of Sn to F were measured. The films fabricated by spraying the precursor solution for 30 minutes with Sn to F ratio of 1.81:0.85, yielded the lowest electrical resistance and maximum transmittance.

O-NC-1-156

## Effect of Dopant Concentration on Structural and Optical Properties of ZnO Film

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The thin film (such as TiO<sub>2</sub> and ZnO) based solar cell technology has been considered promising for harvesting solar energy. In the present study, Co and Fe doped ZnO films were prepared by spin coating and hydrothermal growth. The structural properties studied using Xray diffraction showed that the doped ZnO films were polycrystalline. The surface morphological studies from SEM depicted uniformity of the films with mostly free of voids and cracks, which showed the nanocrystalline grains on the surface. The surface morphology of all the films found to be similar even increasing dopant concentration which indicates that it is independent of the dopant species. From the optical studies, the reflectance of the doped samples shows the oscillatory behavior and gradually falls with increasing wavelength range 450-850 nm. The observed value of transmittance within the range 300-1100 nm was found to be more than 70% which indicates that the films are highly transparent and are of good quality. All the films show gradual fall in transmittance below 750 nm because of band edge absorption. The optical band gap found to be 2.81 and 3.21 for the Co and Fe, which implies decreased in band gap after doping. With solar radiation intensity of 930 W/m<sup>2</sup>the highest value of the photo-voltage (Voc) and photocurrent (Isc) from DSSCs with Co:ZnO and Fe:ZnO were 198mV, 30.4 µA and 189.2 mV, 29.9 µA, respectively.

O-NC-1-382

#### Completely Biodegradable Composites Based on Copolyester

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In this work, microcrystalline cellulose (MCC-JG) was extracted from a series of thermochemical and mechanical treatments on agricultural waste, wheat stalk. The MCC-JG compounded with poly(butylenesadipate-co-terephthalate), PBAT, biodegradable polymer, *via* melt mixing using Brabender Plasticorder followed by compression moulding. The samples were characterized by Fourier transform infrared spectroscopy (FTIR), tensile test, microindentation technique (HM), thermogravimetric analysis (TGA) and differential scanning

calorimetry (DSC). The degradation behaviour of the composites was measured by microbial incubation and soil composting. Cellulosic filler were found homogeneously dispersed in the composites. The composites possessed low ductility with good thermal stability. Tensile reinforcement of the PBAT/MCC-JG composite was studied with respect to yield stress and young's modulus with the variation of MCC-JG content. The reinforcement was observed up to 40 phr MCC-JG content in the composites. These composites were found to be degrading under soil composting and showed biosensitivity on microbial incubation by colour change.

O-NC-1-597

## Structural and Optical Properties of Thin Films of Tin Sulphide Prepared by Spray Pyrolysis Setup

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Thin films of tin sulphide (SnS) were prepared on glass substrates at temperature  $290^{\circ}$ C from the mixture of 0.1 M of SnCl<sub>2</sub> and 0.08 M thiourea and homemade spray pyrolysis system. The films were characterized to study its structural and optical properties. The X-ray diffraction (XRD) study of the SnS film shows orthorhombic polycrystalline structure and hence calculated its grain size. The band gap of SnS thin film was calculated using optical transmittance spectra captured in the wavelength range 400-1100 nm. The band gap was found to be 1.49 eV. The effect of film thickness on band gap of SnS thin film was also studied in this report. Our results show that the direct band gap of SnS decreased with increase in thickness.

O-NC-1-680

### Critical Micelle Concentration of Sodiumdodecyl Sulphate in Presence and Absence of NaCl, KCl, KBr and NaBr in Pure Water and in Methanol-water Mixed Solvent Media by Conductometry at 323.15 K

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Precise measurements of conductance of solutions of sodiumdodecyl sulphate (SDS) in the presence and in the absence of monovalent salts (NaCI, KCI, NaBr and KBr) in pure water and in methanol-water mixed solvent media containing 0.1, 0.2, 0.3, and 0.4 volume fractions of methanol at 323.15 K are reported. Plotting specific conductance of SDS solution against concentration, it is found that specific conductance increases with increase in concentration at studied temperature. The specific conductance increases with addition of all studied salts and decreases with addition of methanol in SDS solution in both absence and in presence of salts. The conductance further decreases with increase in percentage of methanol in methanol water mixture. The conductivity of solution in presence of salts is in the order KCl > NaCl > KBr > NaBr. Such order of conductivity is due to smaller size of hydrated ion of potassium than sodium and smaller size of chloride ion than bromide ion. With the help of specific conductance against concentration curve, critical micelle concentration of SDS in presence and absence of monovalent salts is calculated. The value of critical micelle concentration (cmc) of SDS are found less in presence of salt than in pure water as well as in methanol water mixture. The value of cmc of SDS is found more in methanol-water than in pure water. The value of cmc further increases with increase in percentage of methanol in methanol-water mixture in presence as well as in absence of salts. The order of cmc of SDS in studied monovalent salts is NaCl > KCl > NaBr > KBr.

O-NC-1-816

## Doping of Polyaniline by Rare Earth Metal Ion for Application in Supercapacitor

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The properties of Polyaniline (PANi) formed onto metal surface can be influenced by metal ions. The presence of metal cation has direct interaction with PANi polymer. So, it can be used to improve the surface morphology, conductivity and electrochemical properties. Metal ion doped PANi can have enhanced efficiency for its practical use. For the present study, oxalic acid has been used as electrolyte for electrochemical polymerization of PANi. Rare earth metal salts Ce(IV) is used to tailor PANi film deposited on steel surface under various electrochemical conditions. The Ce(IV) was found to interact with PANi. The Ce (IV) doped PANi has been tested for its charge storing capacity for its application in supercapacitor.

O-NC-1-835

## Synthesis of Silver Nanoparticles from Aqueous Extract of *Centellaasiatica* and *Swertiachirayita* and Study of their Antibacterial and Antioxidant Activities

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Green synthesis of silver nanoparticles (AgNPs) has gained special attention because of it being environment friendly, low cost to operate and requirement of low energy. This work is focuses on the preparation of AgNPs *via* green method and screening of their antimicrobial and antioxidant activities. AgNPs were synthesized by reducing silver nitrate with the aqueous extracts of two different plants *Centella asiatica* and *Swertia chirayita*. Synthesis of AgNPs was monitored by UV-Vis spectrophotometer. The morphological features of the nanoparticles hence formed were characterized by scanning and transmission electron microscopy. The UV-Vis spectrum showed the peak between 320-340 nm for AgNPs synthesized from *C. asiatica* while for *S. chirayita* synthesized AgNPs, the peak was observed between 360-380 nm. The antibacterial activity of AgNPs has been assayed whereby the AgNPs synthesized from both extracts showed significant antimicrobial activity. Both AgNPs showed highest zone of inhibition against *Klebsiella* and *Bacillus* followed by *E. coli*. In contrast, the plant extracts showed 73% inhibition of DPPH free radicals while same amount of *S. chirayita* showed 80% inhibition.

### Natural Product Chemistry (O-NP-1)

O-NP-1-113

## Phytochemical Screening, Evaluation of Antioxidant and Antibacterial Activity of Selected Medicinal Plant

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Bambusa arundinacea, Buddleja asiatica, Eulaliopsis binata, Sambucus adnata and Sida rhombifolia were selected according to their traditional and ethnomedicinal uses for their

Abstract Book

antioxidant and antibacterial activities. The methanolic extracts obtained by modified maceration method were screened for the presence of flavonoids, alkaloids, tannins, saponins and anthraquinones. The antioxidant activity was tested by DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical scavenging assay. Similarly, antibacterial activity was tested by disc diffusion method against *Staphylococcus aureus* and *Escherichia coli* and Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) were also determined. The results suggested that *B. asiatica* leaf and bark possess potent antioxidant activity with  $IC_{50}$  values 34.75 µg/mL and 59.73 µg/mL, respectively. The radical scavenging activity of *B. arudinacea, E. binata* and *S. rhombifolia* were remarkably low. However, inflorescence of *S. adnata* showed moderate antioxidant activity with  $IC_{50}$  value 106.67 µg/mL. In the antibacterial assay, the node of *B. arundinacea* showed highest antibacterial activity against *S. aureus* with MIC and MBC values 10 mg/mL and 30 mg/mL, respectively. This study supports the traditionally used medicinal plants possess valuable antioxidant antibacterial properties.

O-NP-1-166

## Insulin Secreting Activity of Compounds Isolated from Scoparia dulcis Linn. of Nepalese Origin

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Ethno-botanical inspired isolation from plant *Scoparia dulcis* Linn. (Sweet Broomweed) yielded eight compounds, coixol (1), glutinol (2), glutinone (3), friedelin (4), betulinic acid (5), tetratriacontan-1-ol (6),  $\beta$ -sitosterol (7) and sigmastanone (8). Their structures were identified using mass and 1D- and 2D-NMR spectroscopy techniques. Compounds 1-6 were evaluated for their insulin secretion activity on isolated mice islets and MIN-6 pancreatic  $\beta$ -cell line, and compounds 1 and 2 were found to be potent and mildly active respectively. Compound 1 was further evaluated for insulin secreting activity on MIN-6 pancreatic  $\beta$ -cell line. Compound 1 was subjected to cytotoxicity assay against MIN-6 and 3T3 cell lines that was found to be non-toxic. The insulin releasing activity of compounds 1 and2supported the ethno-botanic uses of *S. dulcis* as an antidiabetic agent.

O-NP-1-230

## Antioxidative Phytochemicals from the Florets of Amriso (Thysanolaena latifolia)

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*Thysanolaena latifolia* (Roxb. ex Hornem.) Honda belonging to family Poaceae is distributed in tropical and sub-tropical regions of south and south-east Asia. *T. latifolia* is important non-timber forest product known as tiger grass or broom grass. It is referred as Amriso in Nepal. It

is a tall, perennial grass with solid reed-like culms, broad leaf blades and terminal spike. The spike contains minute stalked spikelets in large branched cluster which flowers during July-August. In search of bioactive compounds the dried florets of *T. maxima* were extracted with 80% MeOH. The concentrated extract was successively partitioned with EtOAc, *n*-BuOH, and H<sub>2</sub>O. The repeated silica gel, ODS, Diaion HP-20 c.c., Sephadex-G15 and Sephadex LH-20 column chromatographic separations of the EtOAc and *n*-BuOH fractions led to the isolation of 35 compounds. The antioxidant capacity values of bioactive compounds were obtained using 2,2-diphenyl-1-picrylhydrazyl (DPPH) measured by electron spin resonance (ESR) spectrometry. Among compounds, DPPH radical-scavenging potential was in decreasing order of orientin-2"-*O*-*a*-L-rhamnopyranoside > luteolin > luteolin 8-*C*-*b*-D-glucopyranoside > 6"-O-cafetoyl-D-glucopyranoside > butyl protocatechuate. Their IC<sub>50</sub> values were 2.3, 4.2, 7.8, 15, 18.6, 20 and 21.6 µM, respectively. Therefore, the extract from the florets of *T. latifolia* with a potent antioxidant activity could be useful in pharmaceutical, food, and cosmetic industries.

O-NP-1-309

# Phytochemical Investigation and Biological Activity of Nepalese Medicinal Plant *Anaphalis busua*

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*Anaphalis busua* is a medicinal plant used in Nepalese traditional medicine for various purposes. It is not well investigated phytochemically and pharmacologically. So it could be a rich source of medicinally useful compounds for the development of drugs, cosmetics and other devices. In the present study, the hexane extract of the aerial part of *A. busua* (Buch.-Ham. ex D. Don.) inhibited the growth of gram-positive bacteria. Bioassay directed fractionation and purification of the hexane extract led to the isolation of a flavanone: pinocembrin (1), and three flavone derivatives: alnusin (2), 3,5,7-trihydroxy-8-methoxyflavone (3) and 3,5-dihydroxy-6,7,8-trimethoxyflavone (4). Their structures were established by spectroscopic methods such as <sup>1</sup>H, <sup>13</sup>C, DEPT-135 and ESI-MS and comparison with the literature data. Pinocembrin showed significant antibacterial activity. These compounds were isolated for the first time from *A. busua*.

O-NP-1-450

### Isolation of Pyranone Derivatives from Engelhardia spicata Lesch ex Blume

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Phytochemical investigation of the methanolic extract of the barks of *Engelhardia spicata* Lesch ex Blume afforded 5-Hydroxy-4-(hydroxymethyl)-pyran-2-one 1, Gallic acid 2, Quercetin-3-O- $\alpha$ -L-ramnopyranoside 3, Astilbin 4, Myrictrin 5, Quercetin-3-O- $\beta$ -glucopyranoside 6, 3,3'-Di-O-methyl ellagic acid-4-O- $\beta$ -D-xylopyranoside 7, 3.3'-Di-O-methyl ellagic acid, terpenoids and gallic acid were elucidated with the various modern spectroscopic data.

Compound **1** was first time reported from plant kingdom and has exhibited moderate immunomodulatory activity with oxidative burst inhibition by 27.34%.

O-NP-1-487

## Bioactive Cycloartane Triterpenoids from Aerial Parts of *Caragana sukiensis* Schneid

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*Caragana sukiensis* Schneid belongs to family Fabaceae, distributed in the Asia and Eastern Europe. Out of its eighty species spread all over the world, fourteen species are found in Nepal. These species are used in the traditional Chinese, Mongolian and Tibetan medicines for the treatment of a wide range of ailments including fevers, inflammation, wounds and infections, dizziness, headache, hypertension, female disorders, arthritis and cancer. Ehthanolic extract of *C. sukiensis showed* antimicrobial activity against *Cryptococcus neoformans* has been reported. In the present study, plant sample was collected from the altitude of 2249 m Prok VDC, Manaslu Conservation Area. The sample was air dried, grinded and extracted with different solvent using a Soxhlet extractor. Three new cycloartane triterpenoids (1-3) were isolated by repeated column chromatography of the chloroform and *n*-butanol fractions and their structures were fully established on the basis of detailed spectroscopic (especially 2D NMR and Mass) analysis. Their structures were determined by using <sup>1</sup>H NMR, <sup>13</sup>C NMR, and LC-MS technique. Compounds 1-3 were evaluated against five selected human tumor cell lines. Compounds 1 and 3 showed activity against Prostate cancer cell line (PC<sub>3</sub>) with percentage of  $26\pm4.9$  and  $16\pm0.9$  respectively.

O-NP-1-867

### Phenolic Constituents from Nepalese Medicinal Plant: Aconogonon molle

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Medicinal plants are one of the major sources of drugs all over the world. People have been using medicinal plants as traditional medicine, rationale herbal drug or as a source of therapeutically pure compounds. The Nepalese biosphere has developed high biodiversity of medicinal plants between 60 m and 8848 m (Mt. Everest). On the basis of traditional uses, availability, ethnomedicinal uses and chemical and biological virginity, a Nepalese medicinal plant; *Aconogonon molle*, has been selected and studied. Chemical isolation of leaves, flowers and roots of this plant has been performed. Three new glycosides: **thotneoside A**, **thotneoside B** and **thotneoside C** together with 16 known compounds were isolatedfrom the

leaves of *Aconogonon molle*. Similarly, 16 known compounds from the flowers and 11 known compounds from the stem were also isolated.



Figure: Structures of new compounds isolated from A. molle

### Pharmaceutical chemistry (O-PC-1)

*O-PC-1-127* 

#### Screening of Selected Medicinal Plant Extracts for their Antioxidant Activity

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Many herbal plants contain antioxidant compounds which protect the cell against the damaging effects of reactive oxygen species. Reactive oxygen species play crucial role in the development of aliments such as arthritis, asthma, dementia, mongolism, carcinoma, Parkinson's diseases etc. Present research was undertaken to appraise the antioxidant property of selected medicinal plants from two districts of Nepal. The methanolic extracts of plants were prepared and their radical scavenging abilities was evaluated by using 2,2-diphenyl-1-picryl-hydrazyl assay using ascorbic acid as reference compound. Among the plant sample analysed, bark extract of *Ficus religiosa* exhibited high antioxidant potential with  $IC_{50}$  value 12.13 µg/mL. The present study reveals that selected medicinal plants would exert several importances by virtue of their antioxidant property.

O-PC-1-135

#### Wound Healing Properties of Ethanolic Extracts of Nepalese Propolis

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Propolis, a resinous substance, collects by honeybees from different parts of plants, use propolis to seal cracks, crevices and entrances of hives. Propolis has bioactive compounds called caffeic acid phenethyl ester (CAPE), shows antioxidant activity, antibacterial activity, and antifungal activity. The main purpose of this study was to determine wound healing properties of propolis. Cutaneous wounds are a common problem amongst horses. These wounds cannot be easily treated and take a long time to heal due to the formation of exuberant granulation tissue. Nine wounded horses, aged on average 14.3±4.4 years, had 6-9 months old wounds, were used in this experiment. No artificial wounds were created on these experimental horses. Each experimental horse received topically 30% of ethanolic extract of propolis (EEP) two times per day. Wound bed tissue color and wound areas were

used to evaluate the wound healing status. The wound infection bacteria were isolated from the wounds, and were tested for susceptibility by disc diffusion method. The results showed that after topical application of 30% EEP, neck wound became dry and changed into necrotic tissue. By day-85, the wound healed. Subsequently, hock wounds completely healed within 14 days, fetlock wounds healed on 26 days and inner cannon wounds healed within 32 days. Formation of exuberant granulation tissue was not observed. Wound infection bacteria, S. saprophyticus, S. haemolyticus, and S. intermedius were sensitive to three different concentrations, 5, 20 and 30% of EEP. S. haemolyticus and S. saprophyticus was found highly sensitive compared to S. intermedius. The efficiency of three different concentrations of EEP was not statistically different (p<0.103), but was statistically difference only with betadin (p<0.001). In conclusion, the Nepalese propolis has potent selective inhibit wound infection bacteria.

O-PC-1-198

### Evaluation of Phytochemical Content, Antimicrobial Properties and Cytotoxic Activity Present in Punica granatum, Camellia kisii and Ficus religiosa

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Plants have found to contain various bioactive compounds with medicinal and curative properties. The present investigation focuses on phytochemical analysis, antioxidant potential, antimicrobial properties and cytotoxic effect of methanolic leaf extracts of Punica granatum, Camellia kisii and Ficus religiosa. In addition the bioactive compounds present in P. granatum was also identified. The total phenolic and content were estimated spectrophotometrically using Folin-Ciocalteu and aluminium chloride colorimetric methods respectively. DPPH (2,2-diphenyl-1-picryl hydrazyl) assay was carried out to evaluate the antioxidant activity. The antimicrobial activity was tested against Gram positive (S. aureus) and Gram negative (E. coli) bacteria and fungi (S. cerevisae and Pichia sp.). The preliminary test for compounds with anti-cancerous activity was performed using brine shrimp lethality assay. The highest phenolic and flavonoid content was observed in P. granatum (228.73±10.56 mg) and F. religiosa (57.49±0.60 mg) respectively. F. religiosa also showed a very antioxidant property (13.87±0.53 µg/mL). The methanolic extract inhibited S. aureus whereas S. cerevisae and Pichia sp. were inhibited by C. kisii only. All the extracts showed high cytotoxicity with LC<sub>50</sub> value 4.26±0.00 ppm. GC-MS analysis was performed using Shimadzu QP 2010 for bioactive compound identification. GC-MS of P. granatum showed the presence of different compounds like pentadecanoic acid 16.73%, cis-vaccenic acid 15.85%, 03027205002 flavone 4'-OH,5-OH,7-di-o-glucoside 14.90% and 1,3,4,5-tetrahydroxycyclohexanecarboxylic acid 12.75%. The preliminary study showed the presence of important bioactive compounds.

O-PC-1-331 Antioxidant Ability, Total Phenolic and Flavonoid Content of Selected Wild **Edible Fruits from Far Western Region** 

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Wild edible fruits with commercial importance not only contribute in rural development but also play important role in biodiversity conservation. Wild fruits can reduce food insecurity and are vital sources of income to rural communities. Fruits contain various kinds of antioxidant

compounds, including phenolics and flavonoids which can contribute to human health in many ways. Despite rich biodiversity, very little scientific information exists on the health and nutritional benefits of many wild fruits in Nepal. Climatic, genetic and edaphic factors can affect the total phenolic concentration of wild foods and their antioxidant activity. In the present study antioxidant activity, total phenolic and flavonoid content of methanol extracts of eight wild edible fruits from midhills of far west region was evaluated. It was found that the fruits differ in their antioxidant ability and contained a range of total phenolic and flavonoid content. Among the tested samples extract of *Phyllanthus emblica* showed the strongest antioxidant activity and possess the highest phenolic and flavonoid content.

O-PC-1-412

# Antioxidant activity, Antimicrobial and Cytotoxicity of *Dendrobium longicornu* Lindl.

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Dendrobium is the second largest genus in the family Orchidaceae used in traditional Chinese medicines. Important compounds, such as phenolic compounds, bibenzyl, phenanthrenes, phenanthraquinone, lignin glycoside, have been isolated from Dendrobium longicornu. But biological activities of this species still unknown. In this report, we selected D. Longicornu, collected from Daman, Makawanpur, on the basis of presence of important compounds. The plant extracts were prepared from stems by Soxhlet's extraction in organic solvents, hexane, chloroform, acetone, ethanol and methanol successively. The phenolic and flavonoid contents were determined in different solvent extracts by Folin-Ciocalteu's reagent and Aluminium chloride methods respectively. Antioxidant activity was determined using DPPH free radical scavenging method has been expressed in IC<sub>50</sub>. The antimicrobial activity was assessed against 7 bacteria including methicilin-resistant Staphylococcus aureus. The cytotoxicity of extract was evaluated against HeLa and U251 cells using MTT assay. The highest total phenolic and flavonoid contents were found in chloroform and acetone extracts significantly different with other extracts. The lowest IC<sub>50</sub> (i.e., highest antioxidant) was found in the chloroform and acetone extracts. These extracts also showed the antimicrobial activities against all bacteria except S. aureus, in some cases comparable to that of control used. High antioxidant-rich choloroform and acetone extracts also showed the highest cytotoxicity activity against the cell lines used. This study explores potential sources of natural antioxidants and pharmacological uses of this species.

O-PC-1-445

## Antibacterial and Antioxidant Property of Medicinal Plants used in Diarrhoea and Dysentery

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Diarrhoea and dysentery are common infections in developing countries like Nepal because of improper sewage disposal and lack of effectively treated water supplies. Nepal, being an excellent repository of cultural heritages for diverse ethnic groups, has a long tradition of folk practices of medicinal plants especially in diarrhoea and dysentery. Present study is conducted to explore the anti-bacterial and anti-oxidant activity of seven plants (*Adiantum philippense, Anemone vitifolia, Bergenia ciliata, Callicarpa macrophylla, Campanula pallida, Pyracantha crenulata, Rubus ellipticus*) used to treat diarrhoea and dysentery in Daman, Makwanpur district. The samples collected were chopped into small pieces, air-dried and

grinded into powder. The samples were extracted in methanol using percolation with intermittent sonication. Agar well diffusion method was used for anti-bacterial activity test using two Gram +ve (*Staphylococcus aureus* and *Bacillus subtilis*) and two Gram -ve bacteria (*Pseudomonas aeruginosa* and *Escherichia coli*). DPPH free radical scavenging method was used for antioxidant analysis. All the plants showed Zone of Inhibition (ZOI) against at least one bacterium showing their efficacy to treat the disease. Three of the samples showed activity against all the tested bacteria at 50 µg/mL and 100 µg/mL showing their greater efficacy in the treatment of the disease. IC<sub>50</sub> value ranged between 40.56 to 105.77 indicating high antioxidant capacity of two, moderate capacity of four and low antioxidant capacity of one sample. The phenolic content ranged between 14.73 and 90.56 mg GAE/g while flavonoid content ranged between 1.78 and 21.19 mg QE/g dry plant. Correlation analysis showed that flavonoid has negligible role in the antioxidant activity while phenolic content, however, showed poor correlation.

O-PC-1-53

### *In vitro* and *In vivo* Pharmacological Activities of the Extracts of *Rheum nobile* Rhizome

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Rhizomes of *Rheum nobile* Hook. F. & Thomson (Polygonaceae) was extracted with 95% ethanol and then fractionated with hexane, dichloromethane, ethyl acetate and *n*-butanol. The ethyl acetate and butanolic extracts significantly inhibited the growth of both Gram-positive and Gram-negative bacteria. In the brine shrimp lethality assay, the ethyl acetate and butanolic extracts displayed  $LC_{50}$  values of 53.70 and 8.31 µg/mL, respectively. Next, the rhizomes were separately extracted with 80% ethanol. The ethanolic extract showed sedative effect in mice (ED<sub>50</sub> = 100.32 mg/kg). The extract inhibited 66.60% and 81.49% of acetic acid-induced writhes in mice at doses 250 and 400 mg/kg, respectively (p<0.0001). In the hot plate assay, the extract increased the reaction latency up to 774.59% at dose 400 mg/kg showing a potential analgesic affect compared to standard paracetamol. Albumin-induced paw edema of rats was greatly reduced by administering the extract. The extract also showed hypoglycemic activity by lowering blood glucose level in normoglycemic rats and dose dependent fetal loss in pregnant rats. Total phenolic content in all the extracts was estimated to rationalize the observed pharmacological activities.

O-PC-1-707

### Biological, Phytochemical and Pharmacological Studies of Different Antidiabetic Medicinal Plants of Nepal

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Medicinal plants are potent source for various active ingredients that are further used by the scientist for the discovery of the drug. Naturally, plant comprises various bioactive compounds which on study has led to the discovery of various drugs that used for the treatment of various

heart diseases, cancer, infections and also used in diabetes. The antidiabetic effect of ethanolic extract of *Mormodica charantia*, *Allium sativum*, *Crateva unilocularis* and *Curcuma longa* were investigates in normal and hyperglycemic rats. In the present study, alpha amylase inhibition assay was performed and oral administrations of ethanolic extract of these plants (1000 mg/kg) on the blood glucose level in hyperglycemic rats were evaluated. Oral administration of ethanolic extract of these plants significantly decreased the blood glucose level in the hyperglycemic rats. A comparison was made between the action of ethanolic extract and glipizide, the known antidiabetic drug. The antidiabetic effect of the extract was as effective as that observed with glipizide. These plants also showed the alpha amylase inhibitory activity which means these plants may essentially contain the enzyme inhibitory activity leading to the decrease in the blood glucose level in the hyperglycemic rats. It is concluded that these plants must be considered as excellent candidate for future studies on diabetes.

O-PC-1-97

## Phytochemical Screening and Biological Activities of Flowers and Leaves of Grevellia robusta

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The main aim of this study was to screen hexane, chloroform, ethyle acetate and methanolic extracts of leaves and flowers of Grevellia robusta collected from Nakhkhu area of Lalitpur, Nepal for their preliminary phytochemical screening, antimicrobial and cyototoxic activities. The methanolic extract of leaves showed the highest yield (22.4%) and lowest yield was obtained from hexane extract (11.8%) while the extractive value of flowers was found to be highest (29.1%) with ethyl acetate and lowest (11.8%) in hexane. Each extract of leaves and flowers was subjected to preliminary phytochemical analysis by color reactions with different reagents and detected alkaloids, glycosides, terpenoids, tannin, carbohydrate and saponin in ethyl acetate and methanolic extracts but flavonoid in all the extracts. The methanolic extract of leaves showed more antimicrobial sensitivity at the concentration of 25 mg/mL and 50 mg/mL against the human pathogenic bacteria: Escherichia coli (25 mm and 50 mm), Salmonella typhi (18 mm and 43.33 mm), Pseudomonas aeruginosa (20 mm and 50 mm), and Staphylococcus aureus (13.33 mm and 43.33 mm) than same extract of flowers. Leaves possessed more antimicrobial activity than flower with E. coli and P. aeruginosa at all these three concentrations. The highest larval (Artemia salina Leach) mortality was found with chloroform extract of flower with  $LC_{50} = 245 \,\mu g/mL$  and hexane extract of leaves with  $LC_{50} =$ 210 µg/mL in 24 hours.

### Polymer Chemistry (O-PL-1)

O-PL-1-889-I

## Education, Research and Innovation with Polymers: Our Challenges and Opportunities

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Materials are directly related to life. Polymeric materials or plastics, indeed, have evolved during the last century as an inseparable part of everyday life. The scientists nowadays do not

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think about the well being of the life without the use of polymeric materials. Polymers have driven and are still driving several innovations and are leading new technological revolutions. The challenge, however, is in the proper management of the synthetic materials so that these do comply with sustainability of human activities in harmony with environment and other forms of life on earth. These thoughts have given rise to development of green ways of developing plastics and their application and management. In the first part of this paper, we will present a brief overview of ongoing polymers related education and research activities in our country emphasizing on polymeric nanomaterials and highlighting the promises of the new polymer industries that are yet to emerge. In the second part, we will discuss the ways towards creating sustainable materials based on naturally occurring vegetable resources and highlight the uses of such biobased materials as construction and engineering appliances, drug delivery vehicles, and tissue engineering substrates etc. The fundamental issue this paper attempts to address will be: how can innovations in polymers help to make our dream to prosperity a live experience?

O-PL-1-179

#### Synthesis of Geopolymer from Coal Fly Ash

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In the present work, geopolymers have been synthesized from coal fly ash (CFA) using NaOH and Na<sub>2</sub>SiO<sub>3</sub> as activators. Some parameters like alkali concentration, amount of Na<sub>2</sub>SiO<sub>3</sub> and curing time have been varied in order to improve the quality of geopolymeric product. The geopolymerization process has been performed using 3-8 M NaOH solutions, Na<sub>2</sub>SiO<sub>3</sub> to CFA mass ratios of 0.25-1.25 and curing time variation from 5-15 days. The curing temperature was fixed at 40°C in all cases. In the variation of NaOH concentration, the maximum compressive strength of 2.3 MPa was obtained with CFA treated with 6 M NaOH solution. Similarly during the variation of amount of Na<sub>2</sub>SiO<sub>3</sub> to CFA mass ratio of 1.25. Furthermore, the compressive strength was found increasing up to 20.3 MPa with increasing curing time.

O-PL-1-287

## Utilization of Construction and Demolition Waste (CDW) through Geopolymerization

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Due to rapid urbanization in developing countries, activities such as new construction, renovation and demolition of buildings and other construction structures are taking place which generates several million tons of construction and demolition waste (CDW) globally. India is generating 10-12 million tons of such waste per year. Recently in Nepal after Gorkha earthquake on April 25 and its aftershocks, a total of 4,784 public and 531,266 private buildings were either destroyed or damaged. Such a large deposit of wastes imposes economic burden as well as environmental pollution. This disaster compelled for the complete utilization of these wastes generated for sustainable development due to the diminishing natural resources. The recycling and utilization of CDW would be a significant contribution to the environment and sustainable development towards the adoption of "zero waste" principle. One of the promising technologies to convert industrial waste into value added product is geopolymerization and it involves a chemical reaction between solid alumino-silicate and

alkaline activator solution at ambient or slightly elevated temperatures. The product thus obtained has high mechanical strength. In the present study, construction and demolition waste mainly brick dust was considered. A maximum compressive strength of geopolymer products were found 7.18 and 19.60 MPa at 28 days of curing at room temperature. It was found that the physico-mechanical properties of geopolymers obtained from CDW were comparable with the properties of equivalent building materials. The structural changes in the geopolymer were studied using XRD, FTIR and SEM-EDX.

O-PL-1-819

## Photo-electrochemical Deposition of Metal Silver on Polypyrrole as Conducting Polymer

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Composites of organic polymer and metal are promising to be applied to various fields of electronics, catalyst, sensor, etc. by taking advantages of their characteristics such as conductivity and flexibility. For improvement of the composite's characteristics, it is important to control formation rate and structure of the composites obtained by simultaneous metal deposition and polymerization under photo irradiation. Thus study reports on the effect of UV radiation and dopant type on the photo-electrochemical deposition of silver. Cathodic polarization curves for silver deposition on polypyrrole doped with different types of anion at different intensity of UV light were compared. Deposited particles were evaluated by statistical analysis. The experimental results showed that silver deposition on polypyrrole was enhanced by UV introduction and depended on the dopant type.

*O-PL-1-834* 

### Reinforcement of Epoxy Resin with Saccharum spontaneum Flowers Fibers

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This work deals with reinforcement of epoxy resin with flowers fibers (FF) of *Saccharum spontaneum* fiber reinforced polymer composites with special reference to the structure, physical and mechanical properties of the composites. Natural fibers of *S. spontaneum* were strengthened by using epoxy resin and hardener. For the preparation of composites materials of the epoxy resin with various amount of flower fibers (1% fiber, 2.5% fiber, 5% fiber, 7.5% fiber and 10% fiber), calculated amount of dry FF were added to the mixture of toluene and epoxy resin prior to the curing procedure before addition of the hardener solution. From the optical images of composites there seems to be proper and well bonding between the resin and fibers and FTIR shows the clear shift of peaks in composites. TGA shows that the epoxy resin with 10 wt% fibers sample is more stable than the resin. Among the composites, the composite of resin with 2.5% of the fiber is highest, however the compressive strength of the care shift of peaks shows hardness value is also at maximum as for compressive strength at 2.5 wt% of filler. In this way, it was possible to tune the morphology of the composites of the epoxy resin.

O-PL-1-850

# Experimental Study of Polymers Surface Modification by Atmospheric Pressure Argon/Oxygen Plasma Jet

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Atmospheric pressure plasma jets have been established as suitable sources of lowtemperature and non-equilibrium plasmas. In this paper, an atmospheric pressure plasma jet sustained in oxygen/argon mixture has been used to modify the surface properties of polyethyleneterephthalate (PET) and polypropylene (PP). The surface properties of the untreated and plasma treated PET and PP samples were characterized by using a ramhart contact angle goniometer. Two different test liquids distilled water and glycerol was used and the surface energy of the PET and PP samples were determined by Owen wendt kadble method. The effect of frequency of applied voltage, the distance between sample and nozzle, and treatment time was investigated. Result showed that the water contact angle on PET and PP reduces from  $77^{\circ}$  and  $85.2^{\circ}$  of control sample to  $25^{\circ}$  and  $40^{\circ}$  after 120s of plasma exposure. Moreover, it was found that, the best plasma treatment can be obtained with applying 27 kHz frequency of the source and a distance of 3.5 cm between PET/PP samples and nozzle of the jet. Chemical modifications of the PET and PP surfaces were investigated with Attenuated Total Reflectance Fourier Transform Infrared (ATR/FTIR) spectroscopy. FTIR analysis of the plasma-treated PET/ PP films showed that plasma treatment introduces hydrophilic functional groups on polymer surface. Thus APPJ in oxygen/argon can effectively modify the surface property of the polymers leading to enhance hydrophilicity.

O-PL-1-853

## Effect of Epoxidation Degree of Block Copolymer on Morphology and Mechanical Properties of Nanostructured Epoxy Resin Blends

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In this work, we investigate the effect of epoxidation degree of copolymer on its blends with epoxy resin. The block copolymer was used as template for nanostructured resin, the former being obtained by epoxidation of polystyrene/polybutadiene block copolymers having various chain architecture using *meta*-chloroperoxybenzoic acid (MCPBA) as an epoxidizing agent. The thermoset system formed by a diglycidyl ether of bisphenol-A (DGEBA) epoxy resin and methylene dianiline (MDA) hardener was chosen to ensure the miscibility of most of the epoxidized block copolymer with the matrix. The epoxidation of the block copolymer was characterized by Fourier transform infrared (FTIR) spectroscopy while the morphology and mechanical behavior of the blends was analyzed using electron microscopy and recording microindentation technique respectively. The block copolymer consists of epoxy-philic and epoxy-phobic blocks and will form regular nanostructures within the epoxy matrix that persists

after curing as shown in the TEM micrograph. In this way it was possible to design the nanostructured blends having tailored mechanical properties.

O-PL-1-856

# Study of Morphology, Mechanical, Thermal and Water Absorption Behaviour of Natural Fiber Based Polymer Composites

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Natural fibers (such as bamboo, sisal, wood fibers etc.) from various sources were subjected to different kinds of chemical modifications (such as mercerization, bleaching, silvlation, acetylation etc.) and their textures were investigated using Fourier transform infrared (FTIR) spectroscopy and scanning electron microscopy (SEM). This work deals with the comparative study on compatibility of neat and delignified natural fibers reinforced polymer composites based on isotactic polypropylene (iPP; Moplen PP562N, commercial product of Basell) and aliphatic-aromatic copolyester (Ecoflex<sup>®</sup>, commercial product of BASF, SE). The delignified fibers were prepared by using caustic soda followed by bleaching and was confirmed by the removal of characteristic peaks at 820 cm<sup>-1</sup>, 1250 cm<sup>-1</sup> and increase in peak intensity at 3400 cm<sup>-1</sup> and 1050 cm<sup>-1</sup> in FTIR spectra. The acetylation and silylation on natural fibers in ionic liquids were also confirmed by appearing strong C=O stretching peak at 1740 cm<sup>-1</sup> and stretching and bending peaks of Si-OCH<sub>3</sub> at 1250 cm<sup>-1</sup> and 840 cm<sup>-1</sup> respectively. The different composition composites were prepared by melt mixing followed by compression molding. Results obtained by Fourier transform infrared spectroscopy, scanning electron microscopy, tensile testing, thermogravimetric analysis and water absorption tests were compared. In neat fiber loaded composites, the weak fiber/matrix interface adhesion acts as defects for deformation and are responsible for increased water absorption. Chemically treated fibers were found to be more compatible with matrix compared with neat fibers. In case of polypropylene composites the addition of maleic anhydride grafted polypropylene was found to be positive to enhance the filler matrix interfacial compatibility.

### Physical Chemistry (O-PY-1)

O-PY-1-330

# Study of the Removal of Methylene Blue by Clays Deposited in Kamerotar Area of Bhaktapur, Nepal

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The removable of methylene blue (MB) from aqueous solution by the Kamerotar clays with and without grinding was studied using Langmuir as well as Freundlich adsorption isotherms at room temperature (301±1 K). The bulk clay sample was collected from the Kamerotar area of Madhyapur Thimi municipality of Bhaktapur, Nepal and was used in the present study composed of vermiculite and muscovite type mica minerals in additions of feldspars and quartz with considerable amounts of iron as well as magnesium oxides. The removable

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capacity of the MB by the bulk clay sample at 301±1 K with and without dry grinding was interpreted using Langmuir and Fruendlich isotherms. The maximum removal efficiency of the MB by the clay sample was observed at pH 7-12. The removable capacity of the clay sample was increased with dry grinding for 4 hours. The maximum amount of the MB removed by the modified clay sample was found in the ranges of 16.2-23.3 mmole/g. Present study showed that the dry grinded bulk clays have a good potentiality to remove the MB from wastewaters as an eco-friendly low cost adsorbent.

O-PY-1-357

### Preparation of Activated Carbon from Waste tire Rubber for the Active Removal of Cr(VI) and Mn(II) lons from Aqueous Solution

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The activated carbon adsorbent was synthesized from waste tire rubber through pyrolytic technique and characterised by CHNS elemental analysis, BET, XRD, FESEM-EDX and FTIR spectra. The adsorption of Cr(VI) and Mn(II) ions on thus obtained adsorbent was investigated separately by varying experimental parameters such as pH, adsorbent dose, contact time, adsorbate ion concentration and temperature. The adsorption processes were found to be the best fitted in Langmuir adsorption isotherm model controlled by pseudo-second-order kinetics. The Cr(VI) and Mn(II) ions adsorption capacity of AC were 14.45 and 3.04 mg/g respectively. The rate constants for the adsorptions of Cr(VI) and Mn(II) ions were 5.88  $\times 10^{-1}$  and 3.95  $\times 10^{-1}$  g mg<sup>-1</sup> min<sup>-1</sup> respectively. The thermodynamic study revealed the adsorption processes were spontaneous.

O-PY-1-577

# Study on the Soil Corrosivity towards the Buried Metallic Pipes Used in Manohara Town Planning Area of Bhaktapur, Nepal

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Six parameters (moisture, pH, resistivity, oxidation-reduction potential, chloride and sulfate) of fifteen soil samples were analyzed using ASTM standards to investigate their corrosive nature towards the buried metallic pipes used in Manohara Town Planning area of Bhaktapur district of Nepal. From the estimated amounts of these six soil parameters, it was concluded that most of the of the soil samples collected from the present study area of Bhaktapur district are found to be mildly corrosive and less corrosive nature towards the buried metallic pipes used to supply of drinking water in the area. There was also found to be a good correlation between the moisture, chloride and sulfate contents in soil samples with soil resistivity. The soil resistivity was found to be increased linearly with decreasing the moisture, chloride and sulfate contents. It can be advised to the local authorities that a simple modification of soil using cheap non-conducting materials like gravel or sand around the buried-pipes seems to be effective from the corrosion point of view.

O-PY-1-593 of Activated Carbon Prepared

## Effect of Activating Agents on the Surface Area of Activated Carbon Prepared from *Areca Catechu*

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Using three different activating agents, zinc chloride, phosphoric acid and sodium hydroxide, a series of activated carbons were prepared from Supari nut (*Arecacatechu*) in nitrogen atmosphere at 400°C. The adsorption capacities of these activated carbons were evaluated by determining iodine and methylene blue numbers. Scanning electron microscope (SEM) revealed that all the activated carbons are mainly nanoporous (micropores and mesopores). X-ray diffraction and Raman spectroscopy indicated that the activated carbon is amorphous in nature with micro- and meso-pores. Surface functional groups were determined by FT-IR spectra which show the presence of oxygenated surface functional groups. The specific surface areas of the activated carbons were determined by BET adsorption isotherm. Among the three activating agents, the activated carbon obtained by using  $H_3PO_4$  as activating agent has the highest surface area, highest iodine and methylene blue numbers. The mechanism of development of nanopores in activated carbon by phosphoric acid will be discussed.

O-PY-1-814 Adsorptive Removal of Cd(II) and Ni(II) from Aqueous Solution Using Modified Sugarcane Waste

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Chemically modified bioadsorbent was prepared by using locally available sugarcane waste. The bioadsorbent was characterized by TGA/DTA, elemental analysis and point of zero charge value. The maximum adsorption capacity for Cd(II) and Ni(II) were 226 and 123 mg/g at their optimum pH 6 and 5, respectively. The experimental data followed Langmuir isotherm and pseudo second order kinetic model. The adsorption equilibrium time was found to be 30 minutes that means the prepared adsorbent is efficient. The result showed that the modified bioadsorbent may be a good alternative to commercial adsorbent for the heavy metal removal.

O-PY-1-820

## Effect of Extract of stem of *Mahonia nepalansis* plant on Corrosion Inhibition of Mild Steel of Nepal

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Accepted practice for the control of corrosion of metals and alloys is the use of inhibitors. Due to toxic and carcinogenic nature of  $Cr^{6+}$  based inhibitors, which has been used for over 100 years, is limited and banned now. Organic compounds are studied as alternate inhibitor as the compounds especially those with N, S and O showed significant inhibition efficiency. But,

these are also toxic and expensive. So, these days phytochemical compounds obtained from plants products are being used to develop green corrosion inhibitor as these are environmentally friendly, less toxic, cheap and also due to their molecular and electronic structures bearing close similarity to those of conventional organic inhibitor. *Mahonia nepalansis* extracts in methanol was studied as corrosion inhibitor in 1M H<sub>2</sub>SO<sub>4</sub> by electrochemical method (Potentiodynamic polarization) and weight loss method for mild steel. Corrosion efficiency of methanol extract in acid solution was found 95.03% for mild steel sample and it was 98.44% when extract was adsorbed on sample in acidic medium. Electrochemical method showed that the efficiency increases with increase in concentration. Efficiency varied from 95.2% (for 200 ppm) to 98.44% (for 1000 ppm) in electrochemical method. Weight loss method and 89.83% (for 200 ppm) to 95.12% (for 1000 ppm) in weight loss method. Weight loss method showed that efficiency increases with increase in time and temperature. Efficiency varied from 93.01% in 3 hours to 94.65% in 12 hours for 1000 ppm solution and efficiency ranged from 92.93% at 25°C to 97.08% at 45°C for 1000 ppm solution in 6 hours.

O-PY-1-821

#### Effect of Back Contact on the response of Ni(II) Ion-Selective Electrodes

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Monitoring the environment for the presence of compounds which may adversely affect human health and local ecosystems is a fundamental part of the regulation, enforcement, and remediation processes which are required to maintain a habitable environment. For determination of the metallic ions in real samples, an electrochemical potentiometric sensor offers interesting advantages such as speed, simplicity, low cost, relatively fast response, wide linear dynamic range, and ease of preparation and procedures. Also lon selective electrodes (ISEs), on the other hand, have found various applications in monitoring applications, and have been well established as simple, fast and yet accurate and precise tools for the analytical procedures. In this study, Ni(II) sensors has been fabricated from coprecipitate of NiS and  $Ag_2S$  and the effect of back contact on the response of the sensor has been studied. The back contact has been made by using silver, copper and carbon. The back contact of the sensor has been found to affect the intercept of the potential response. The pH region over which the response of the sensor was not affected also depended on the back contact.

O-PY-1-823

## Pogostemon benghalensis (Rudilo) as Green Inhibitor Corrosion Inhibition for Mild Steel in Acidic Medium

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Natural products have recently attracted attention as green corrosion inhibitors. Nepal is blessed with large varieties of plants which have not been explored for its anti-corrosion properties. This study, reports on *Pogostemon benghalensis* (commonly named as Rudilo) as green inhibitor for mild steel in aerated 1M H<sub>2</sub>SO<sub>4</sub> solution. The corrosion parameters have been characterized by weight loss method and electrochemical measurements of open circuit potential and potentiodynamic polarization. Open circuit potential measurements showed that Rudilo extract acted as cathodic inhibitor. The polarization behavior of mild steel showed that the inhibition efficiency was maximum (99.39%) at 1000 ppm inhibitor solution when

immersed for 24 hours. The mild steel coupons showed the highest corrosion resistance properties in  $1M H_2SO_4$  solution containing 1000 ppm of Rudilo extract. The weight loss of mild steel in inhibitor solution was found to be nearly 100 times lesser than the weight loss in mild steel in  $1M H_2SO_4$  solution. From the weight loss measurement, the inhibition efficiency was found to be almost constant with time of immersion. The FTIR spectra indicated formation of iron-extract complex on the surface of mild steel dipped in  $1M H_2SO_4$  solution containing *P. benghalensis* extract (1000 ppm).

O-PY-1-824

### Optimizing the Performance of Pb (II) Sensor Prepared by Co-precipitation in Alkaline Medium

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Ion selective electrodes offer a simple and fast yet cheap alternative to low level analysis of heavy metal ions. There are extensive researches on the fabrication of such sensors with emphasis on the improving detection limit and life of the sensor. This study introduces new method for fabrication of  $Pb^{2+}$  ion sensor by co-precipitation in alkaline medium. The effect of composition on the surface texture, bulk resistance of the membrane and its response towards  $Pb^{2+}$  ion concentration has been studied. The active materials for sensor were prepared in the mass ratio of 1:1, 2:1 and 1:2 PbS and Ag<sub>2</sub>S. Morphological and phase characterizations were carried out using scanning electron microscope and X-ray diffractometer respectively, while bulk resistance was measured with the help of four probe method. The response of the sensor has been characterized by analyzing Nernstian slope, detection limit, interference by other cations and effect of pH.

### Synthetic Chemistry (O-SC-1)

O-SC-1-277

# Coordination Chemistry and Antimicrobial Screening of Ni(II) and Cu(II) Complexes of Asymmetric Schiff Base of Streptomycin and Aniline

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Ni<sup>II</sup> and Cu<sup>II</sup> complexes of asymmetric schiff base ligand derived from streptomycin and aniline were synthesized and characterized by elemental analysis, conductance measurement, <sup>1</sup>H NMR, FT-IR, ESI-MS and electronic absorption spectral studies. On the basis of these techniques, it is proposed that the ligand is bounded to metal center through imine N-atom and other N-atom of methyl substituted N-methyl-L-glucosamine unit of streptomycin and revealed ML<sub>2</sub> type stoichiometry. The two ligand molecules have cemented with Ni<sup>II</sup> ion in hexa-coordination fashion with the involvement of two water molecules and exhibited octahedral geometry. Similar study revealed tetrahedral geometry for Cu<sup>II</sup> complex. Three d-d transition bands at 783, 698 and 398 nm in the electronic absorption spectrum of Ni<sup>II</sup> complex are in support of its octahedral geometry. The electronic absorption spectrum of Cu<sup>II</sup> complex displayed only one d-d transition band at 650 nm, corresponding for tetrahedral geometry. The cell dimensions as suggested by X-ray powder diffraction study unveils triclinic crystal system with P1 space group for the ligand and orthorhombic crystal system with P222

and Imam space groups for the Ni<sup>II</sup> and Cu<sup>II</sup> complexes. Particle size calculation by Scherrer's formula indicates their nano-crystalline nature. Molecular structure of the complexes has been optimized by MM2 calculations and strongly supports the concerned geometry of the complexes. Microbiological assay has been examined by measuring the inhibition zone against three bacterial pathogens *viz., Escherichia coli, Streptococcus pneumoniae and Proteus vulgaris.* The results showed their promising antibacterial activity against all the bacterial pathogens.

O-SC-1-329

## Antioxidant Capacity of Chalcones that Synthesized *via* Crossed Aldol Condensation between Arylmethyl Ketones and Aromatic Aldehydes

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Chalcones (1,3-diaryl-2-propene-1-ones) belong to the flavonoid family. They are abundant in edible plants possessing a broad spectrum of pharmacological activities like antiproliferative, antioxidant, anti-inflammatory, anticancer, antibacterial, antifungal, antiprotozoal, etc. They are key precursors in the biosynthesis of many biologically active heterocycles such as flavone, flavanone, benzothiazepine, pyrazoline, etc. We have synthesized a number of differently substituted chalcones *via* crossed Aldol condensation between arylmethyl ketones and aromatic aldehydes using ethanolic NaOH at room temperature in moderate to high yield. The product structures were ascertained by UV-Vis and NMR spectroscopy. Antioxidant activity of the synthesized chalcones was then evaluated through 2,2-Diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay and IC<sub>50</sub> values were calculated.

O-SC-1-55

### Acetylation: a Classical Reaction withNew Perspective

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In 1880s, Schotten and Bauman independently reported amidation of amines and esterification of alcohols with acyl halides or anhydrides in the presence of aqueous base. In 1895, Fischer reported esterification of alcohols in the presence of strong acid catalyst and this method was later adopted for commercial synthesis of acetyl salicylic acid (Aspirin). With advancement of chemical transformations, today, the majority of acetylation reaction is conducted in aprotic organic solvents employing acyl halides or anhydrides in the presence of inorganic base (e.g. NaOH, KOH, Na<sub>2</sub>CO<sub>3</sub>, NaHCO<sub>3</sub>), organic base (e.g. pyridine, DMAP, Et<sub>3</sub>N, PPh<sub>3</sub>), protic acid (e.g. H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>) and/or Lewis acid (e.g. Sc(OTf)<sub>3</sub>, Bi(OTf)<sub>3</sub>, TMSOTf) etc. Generation of carbon, oxygen, nitrogen or sulphur nulceophiles by abstraction of acidic hydrogen using a base and activation of acetylating agent by acid generating an electrophile for subsequent attack are the main variations in the involved transformations. Herein, we present unprecedented magnesium catalysis for highly efficient acetylation that proceeds through entirely new mechanistic pathway.

O-SC-1-643

#### Preparation and Characterization of Hydroxyapatite

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Hydroxyapatite (HAp)  $[Ca_5(PO_4)_{10}(OH)_2]$  was prepared in laboratory by Wet Chemical Precipitation method using calcium hydroxide (1 M) and ammonium dihydrogen phosphate (0.58 M) in water and ethanol medium. The prepared material was characterized by X-Ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM) and Electron dispersive X-Ray studies (EDS). The prepared material in different reaction temperatures were also sintered to 800°C. The XRD analysis showed that the prepared material was found to be poorly crystalline in nature but after sintered to 800°C, the crystallinity increased. The FTIR spectrum reaveled O-H stretching band at 3562.41 cm<sup>-1</sup>, PO<sub>4</sub><sup>3-</sup> absorption band at 1039.53 cm<sup>-1</sup>, 564.70 cm<sup>-1</sup> and CO<sub>3</sub><sup>2-</sup> asymmetric stretching band at 1421.36 cm<sup>-1</sup>. These bands revealed the presence of O-H, PO<sub>4</sub><sup>3-</sup> and CO<sub>3</sub><sup>2-</sup> functional groups in the prepared hydroxyapatite material. Similarly, SEM studies showed the surface morphology of prepared hydroxyapatite. The EDS analysis of sample revealed the Ca/P atomic weight ratios in between 1.52 to 1.56 which was in good agreement with the reported value of 1.667.

O-SC-1-714-I

### The Art of Designing Synthetic Strategies to Bioactive Molecules

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Total synthesis of natural products or bioactive molecules by designing new strategies is an art. While a designed strategy may not always work (dead ends), detours (new strategy) become inevitable for a target oriented synthesis. Our endeavour toward the synthesis of a few natural products demonstrating new strategies will be presented in this lecture.

O-SC-1-718

## UV-vis Investigation of Methyl Red in Presence of Sodiumdodecyl Sulphate/Methanol/Ethanol/Butanol/Water System

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The precise measurements of methyl red absorbance in presence of sodiumdodecyl sulphate /methanol/ethanol/butanol/water systems at room temperature by UV-vis technique are reported. The concentrations of sodiumdodecyl sulphate were varied from 0.00001 to 0.12 mol/L. Methyl red concentration in quvette during UV-vis spectrum registration was 0.001 mol/L. Sodiumdodecyl sulphate forms normal micelles in water and reversed micelles in methanol, ethanol and butanol. Presented results involved on comparison the interactions of methyl red with sodiumdodecyl sulphate normal and reversed micelles. UV-vis spectrum

of methyl red is solvent dependent. Obtained results showed a noticeable decreasing of methyl red absorbance as a function of sodiumdodecyl sulphate concentration. The water presence in sodiumdodecyl sulphate reversed micelles on studied systems:  $R = [H_2O] / [SDS]$  will be presented as R = 0, 10, 20 and 40. Obtained results will be discussed in the context of binding constant and distribution constant in studied systems.

O-SC-1-76

#### Synthesis of Quercetin Derivatives and Evaluation of their Bioactivities

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Dietary flavonoids are considered as powerful antioxidants since they act as radical scavengers, metal chelators and enzyme inhibitors, and produce beneficial health effects. In the past two decades, structure-activity relationship of flavonoids has sought to be established and hydroxyl substitution pattern in flavan nucleus has anticipated a major role in displaying bioactivities. However, the roles of chemical structure and underlying molecular phenomena have stayed elusive. Quercetin (3,3',4',5,7-pentahydroxyflavone) is a well known antioxidant agent that we consume daily as food (most often in glycosidic form). In this work, we have prepared a number of quercetin derivatives. Reaction manipulations in acetylation, methylation and/or benzylation of commercially available guercetin afforded several quercetin derivatives viz. quercetin 3,3',4',5-tetraacetate; 3,3',4',7-tetraacetate; 3,3',4',5,7pentaacetate; 3'-methyl ether; 5-methyl ether; 3',5-dimethyl ether; 3,4',7-trimethyl ether; 3,3',4',7-tetramethyl ether; 3,3',4',5,7-pentamethyl ether; 3,4',7-tribenzyl ether; 3,3',4',7tetrabenzyl ether; 3,4',7-tribenzyl-3'-methyl ether; 3,4',7-tribenzyl-3',5-dimethyl ether; and 3,3',4',7-tetrabenzyl-5-methyl ether. Structures of these derivatives were established by UV-Vis spectrophotometry using various shift reagents and determination of melting point. Thus synthesized guercetin derivatives were used for biological assays.

*O-SC-1-808* Synthesis, Characterization and Applications of Polyaniline as Anti-corrosion Coating

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On the of extensively studied areas as applications of conducting polymers are anti-corrosion coating for active metals such iron, zinc, aluminum among others. Among conductive polymers, polyaniline has been extensively studied due to ease with which it can be electropolymerized and its redox state can be controlled. Electro-polymerization of aniline onto inert surface like platinum and graphite is easy because these surfaces do not undergo dissolution under anodic polarization. But its polymerization onto oxidizable surface is difficult task as oxidation potential of mild steel is negative than the oxidation of aniline. Therefore it is necessary to find the suitable electrolyte that will provide less dissolution of metal and more electro-polymerization. To date, different approaches have been adopted to coat adherent Polyaniline (PANi) onto metal surface. Doping anion has direct role in the formation of PANi state. In imine nitrogen, it resides as anion and maintains electro-neutrality. The presence of type of anion has direct influence on PANi morphology, conductivity, electrochemical activity and the polymerization itself. Doping degree depends upon the type of acid used. Solvent plays important role in the formation of different form of PANi. The concentration of aniline and electrolyte, and deposition time affect polymerization. This study reports on the suitability

of various methods for the formation of PANi onto mild steel surface and its application as anti-corrosion coating on mild steel of Nepal.

### Climate Change Adaption and Mitigation 1 (O-CC-1)

0-CC-1-897-I

### **Climate Change Mitigation in Nepal: Challenges and Opportunities**

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Climate Change Mitigation refers to efforts to reduce emission of Green House Gases (GHG) through reduction of GHG sources and or by increasing carbon sinks. Protecting and increasing natural carbon sinks like forests and the eco-system in general or creating new sinks through green agriculture are some of the elements of mitigation. UNEP takes a multifaceted approach towards climate change mitigation in its efforts to help countries move towards a low-carbon society. The continued accumulation of greenhouse gases in the atmosphere is expected to severely impact the earth's natural resources and agriculture. Greenhouse gas emissions from the developing world are rising faster than those from other countries, and many studies have noted that it would not be possible to stabilize climate change without reducing the growth of these emissions. Can this be achieved without affecting economic growth and social fabric in these countries particularly in Nepal? This is where the challenge to scientific community lies. Mitigation studies clearly indicate that if energy efficiency and forestry options are implemented judiciously, emissions can be reduced significantly without affecting economic growth. The studies also suggest that renewable technologies are the most viable and desirable option to address the increasing carbon balance. Nepal's global share of GHG emissions is comparatively very negligible only about 0.027% (SNC, 2012)<sup>1</sup>. The net Greenhouse Gas (GHG) emissions from Nepal, in the base year 2000 were 24877 Gg CO<sub>2</sub> equivalent (eq) of which 2894 Gg were emitted as CO<sub>2</sub>, 663 Gg as CH<sub>4</sub> and 26 Gg as N<sub>2</sub>O (SNC,2012). The two largest contributors were found to be (i) agricultural sector which accounted for 68.0% and (ii) energy sector which accounted for 27.4 % of net CO2-eq emissions. On the other hand forest acting as a good sink for CO2 removed 27618 Gg of CO<sub>2</sub>. The first five emission sources in the list of key emission sources in Nepal, together accounting for 90% of emissions, are: Enteric Fermentation (38%), Agricultural Soils (28%), Residential (15%), Road Vehicles (4%) and Manure Management (4%). The studies show that the aggregate mitigation potential in the forestry sector is very high. The studies also show that while framing the plans and policies in forestry, agriculture and energy sectors prime consideration is to be given to carbon sources and sink issues. For a country like Nepal, the importance of climate change mitigation policies is secondary in the national policy agenda as its policies are necessarily to be focused on fundamental issues such as alleviation of poverty and creating basic conditions for human development. Therefore, in order to gain even primary attention of policy makers, the greenhouse gas mitigation strategies have to be integrated with national development plans rather than go ahead it alone. The present work has highlighted mitigation flexibility in Nepal across gases and sectors and therefore provides a policy linkage with national priorities such as control of local pollution, energy and infrastructure plans. Ample opportunities for Nepal are at present there in the global financial basket to address global warming issues for which Nepal has to utilize these opportunities for overall development of the nation.

*O-CC-1-14* 

## Climate Change and its Impacts on Tourism and Livelihood in Manaslu Conservation Area, Nepal

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The Hindukush Himalayan region including Nepal, a country reliant on tourism, is particularly sensitive to climate change. However, there are considerable gaps in research regarding tourism, livelihood and climate change in Nepal. The present research assesses the impact of climate change on tourism and livelihood in the Manaslu Conservation Area of Nepal. Seventy-six households were interviewed followed by three focus group discussions and five key informant interviews. The empirical data collected at the site are complemented by secondary data on climate and tourism. Correlation, regression and graphical analysis was carried out for the presentation of data. Local people perceived that temperature and rainfall have been increasing in the study site as a result of climate change. Socioeconomic variables such as marital status, size of household, education and landholding status had positive effect on tourism participation while livestock-holding status and occupation of the household had negative effect on tourism participation. Number of visitors is increasing in MCA in recent years, and tourism participation is helping local people to earn more money and improve their living standard. In response to gradually warming temperature and decreasing snowfall, there seems an urgent need for tourism promotional activities in the study area. Also awareness and education related to tourism, gender empowerment of women, advertisement and publicity on tourism promotion, adequate subsidy and training on ecotourism and skill development trainings on handicraft are recommended.

### O-CC-1-209 Perception of Western Terrain Rural Communities of Nepal on Effect of Climate Change in Agriculture Sector

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Climate change is one of the threats to availability, accessibility, utility and sustainability of food production in the developing countries where agricultural production is climate dependent. In this study Betahani and Sonpur VDCs of Banke district of Nepal were studied. Data was obtained through questionnaire survey from a total of 319 households and verified by Key Informant Interview (KII), Focus Group Discussion (FGD) and transect walks. Secondary climate record and crop yield trends almost matched the respondent's perception of increasing temperature and drought, changing precipitation pattern and depleting natural resources. Diseases and pests in livestock and crops, drought and flood respectively were remained the top ranked hazards across the survey sites. Although, access to food increased since last ten years due changing agronomic practices i.e. use of hybrid seeds (63.6%) and increased use of irrigation facilities (30.1%), and change of cultivars. In future, the cost of production thus would be increased at cost of climate change. The outcomes of the present study recommends the pragmatic strategies in short term and policy advocacy on land use systems in long term for prospective community based adaptation of climate change together with consideration of the social factors in another hand.

### Mountain Tourism in the Era of Climate Change

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Climate Change Induced Disasters (CCID) creates severe problems in mountain tourism sector. The main objective of this paper was to assess the impacts of climate change on mountain tourism research in Manaslu region. Participatory survey design, interview, literature review and hydrological and meteorological data from secondary source were collected. The major climatic variables are temperature, precipitation, wind behavior and fog, and climate change induced disaster like landslides, floods, avalanche, dense fog in High Mountain, draught are major disaster impact to the mountain tourism. The perception and response found that maximum peoples from community know about the climate change and that is warming coincides with authorized meteorological data which depicts that the mean annual temperature is increasing and average annual precipitation is decreasing. The response was that climate change impacts experienced by the people, results show that the impacts of climate change are decrease in agricultural production, loss in biodiversity, decrease in local resources and increase in climatic hazards were the impacts observed. The second research question is how the people were adapting to the changing climate and the response local peoples about adaptation strategies like change in cropping system and practices; they used local knowledge in feeding, route guide, hospitality, conservation of biodiversity, natural healing system, herbal medicinal practices etc. the finding of research is that climate change induced disaster impact to the tourism in mountain region and local peoples create the new way to combat Climate Change induced disasters for their livelihoods.

*O-CC-1-421* 

#### Climate Change Impact and Adaptation Measures in Upper Mustang

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The CC is posing a threat to the survival of Dhye Village in Upper Mustang, Nepal, as a community to sustain their livelihood (subsistence farming and animal husbandry). The spring discharge is decreasing, evapotranspiration is increasing, rainfall and snowfall seasons have decreased and shifted, and soil moisture is decreasing. The Dhye residents are coping with CC by reducing agricultural farming, reducing herd size by selling more animals, and increasing seasonal migration to towns for day jobs, despite unsustainability of these measures. Several household have abandoned Dhye, and in 2010, unanimously decided to abandon Dhye and mass-migrate to a different location, in effect, becoming CC refugee. A study was conducted to evaluate suitability of existing adaptation measures against CC. Analysis of primary and data, collected through field visits in 2015 and regular contacts local residents, and secondary data, showed that the trend of soil moisture decline is likely to continue and the agricultural productivity is going to further reduce, unless advanced technologies can be implemented, which is unlikely to succeed even if attempted, given the remoteness of Dhye, low level of socio-economic status and access to public fund, and competing demands for government resources. The Dhye residents have initiated steps for permanent resettlement in Thangchung at Dhye River bank, by establishing an apple orchard and constructing houses. Based on analysis of multiple factors, to protect Dhey residents' livelihood, culture, and social fabric, the best CC adaptation measure for Dhye residents is resettlement from Dhye to Thangchung.

*O-CC-1-598* 

### Local Peoples' Perception and Adaptation to Climate Change Impacts

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This study has been conducted in Kabilash and Shaktikhor VDCs of Chitwan. There is an increasing trend of precipitation with 8.04 mm per year. Local people are aware of this trend and also have experienced erratic rainfall affecting crops during the sowing and harvesting seasons. The number of rainy days has increased in the recent past years with increase in rainfall intensity. The maximum and minimum temperatures are increasing at 0.056oC and 0.098oC per year respectively. Due to these changing trends in rainfall and temperature, they have perceived that the changing weather and climate have adversely affected their crop yields and livestock, increase in pests and caused health problems with diseases due to sanitation problems with drying up of water sources. The local people are aware of climate change from media and also from the training and aids from NGOs/INGOs. To combat the adverse effects of climate change, people are following some adaptation strategies like afforestation, construction of small dams to store water for irrigation and domestic purposes and construction of check dams, gabions and spur to reduce landslides, erosion and floods downstream. They are using more fertilizers and pesticides. Invasive vegetal species are being used for fodder and are also weeded out from farm lands.Kabilash VDC was aided by INGO (Practical Action) for the adaptation strategies, whereas people of Shaktikhor VDC practiced their own local adaptation measures. The poverty and illiteracy are the main causes of inability to implement the adaptation measures they are aware of.

*O-CC-1-677* 

# Climate Variability and Livelihood of the Rural Farmers in Chisapani, Ramechhap of Nepal

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Agriculture is the mainstay of livelihood of the people in rural areas of Nepal. Any perturbations in agriculture stemming from climatic and/or non-climatic factors can affect their livelihood significantly. An exploratory study was done in one of the most vulnerable districts of Nepal, Ramechhap district. By selecting 91 farm households using purposive random sampling and by collecting information through semi-structured guestionnaire along with key informant interviews and focus group discussions to assess the effects of local livelihood owing to climatic variability. Historical weather data, particularly of rainfall, were analyzed to see the rainfall pattern and linked to agriculture production over time. Almost nine out of 10 farm families were marginal farmers and 60 percent of the households face food deficit half a year. Most of the respondents reported changes in climate and agriculture production practices. Historical rainfall data confirmed that the rainfall trend is declining by 13.77 mm per year. Since rain-fed farming predominates in the area, drought events have negatively affected agriculture and local livelihoods. Cold spells along with increasing foggy days aggravated the occurrence of pest and diseases affecting winter crops far more than what it used to be. Adoption of new crop varieties, crop rotation, rainwater harvesting and use of plastic tunnel in vegetable farming were the major new practices introduced in the area which have a greater potential for out- and up-scaling. However, strong institutional supports are required to build stakeholders (including farmers) capacity to experiment with adaptive strategies.

0-CC-1-838

# Climate Change Policy: A Tale of Two Nations (Comparing Climate Change Policies of Nepal and Morocco)

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Nepal is economically, culturally and environmentally highly vulnerable to climate stimuli including variability and extreme events. It is particularly vulnerable to the effects of climate change and associated extreme weather conditions because of its geographic location, fragile ecosystems and weak socio-economic and institutional context. As a Party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, Nepal is implementing number of climate change related activities in the recent year. The Government of Nepal has issued the Climate Change Policy, 2011 that includes number of policies to address the impacts of climate change, and make the development climate-friendly and resilient. Recently, Nepal has developed and submitted "Intended Nationally Determined Contributions" (INDCs) to UNFCCC for showing its assurance to meet the long-term goal of holding the increase in global average temperature below 2°C above pre-industrial levels. Numbers of UNFCCC's member countries have already submitted INDCs to help to achieving the objective of the Convention. In this study, it has compared the climate change policy and INDCs of two countries i.e. Nepal and Morocco, to highlight the strength and weaknesses, which might be helpful to improve the Climate Change Policy & INDCs according to UNFCCC requirement for achieving its goal within a given timeframe.

### Climate Change Adaption and Mitigation 2 (O-CC-2)

0-CC-2-916-I

#### **Ecosystem Based Adaptation: Nepal's Prescription for Climate Resilience**

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The impacts of climate changeinfiltrate beyond human dimension, more appropriate to summarize that they destabilize the total ecosystem, of which humans are one just member. We also obtain benefits from the ecosystemsthat are broadly categorized into four ecosystem services:(i) provisioning, such as the production of food and water,(ii) regulating, such as the control of climate and disease, (iii) supporting, such as nutrient cycles and crop pollination, and (iv) cultural, such as spiritual and recreational benefits. As the severity of climate change increases these services deteriorate threatening the lives depended on them. Interestingly, theseecosystem services can also be treated as natural infrastructures to build our resilience to the impending climatic stresses. This approach called Ecosystem-based Adaptation (EbA) promotes conservation, sustainable management and restoration of natural ecosystems to help people adapt to climate change. The concept of EbA was first introduced in the international policy arena by the United Nations Framework Convention on Climate Change in 2008, and since then it has widely been advocated by scientific communities and the champions of biodiversity conservation and environment management. Nepal has experience of at least six decadesof scientific exploration to enrich the understanding of ecosystems. Mainly based on the vegetation or the natural habitats, it has established that there are 118 types of ecosystemcovering from warm tropical in the south to the alpine in the north. In 2012, Nepal became one of the three pioneering countries to implement a pilot project of the EbA for mountain ecosystems. Implemented in the Panchase area, encompassing three districts

Kaski, Parbat and Syangja, this initiative also included research studies and preparation of a strong scientific information base which is the fundamental requirement to carry out long-term study in climate change impact and ultimately to prescribe good adaptation practices.

*O-CC-2-161* 

#### Fluxes of Methane in Intensified Agricultural System in Mid-Hills of Nepal

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In many south Asian countries, intensified cropping systems are replacing the subsistencebased traditional farming system in order to meet the increasing demand for food production. Soil disturbance due to intensive cultivation may alter ecosystem functions and hence affect the emission of greenhouse gases. We measured fluxes of CH<sub>4</sub> with a closed chamber technique from fields in both Upland (*Bari*) and Lowland (*Khet*) on which intensified crop production (IC) had been practiced for the last 20 years, and adjacent fields having traditional crop production (TC) practices. The measurements were done every one to two weeks over a period of 12 months covering two to three cropping periods. The results showed that in *Khet* land, there was a net emission of CH<sub>4</sub> from the soil to the atmosphere to the soil. The emission was significantly higher during rainy season than in other seasons (p<0.05). For both the land-uses (*Bari* and *Khet*), the emission of CH<sub>4</sub> was significantly higher in intensified agricultural system than in traditional agricultural system (p<0.05). It is concluded that frequently flooded soil is major source of CH<sub>4</sub> emission.

*O-CC-2-353* 

### Bridging Information Gaps Between Farmers, Researchers, Extension Staff and Policy Makers on Climate Change Adaptation and Mitigation Strategies in Developing Countries

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The continuing poor living conditions of large portions of the world's population can be traced back to many factors, among them being ineffective national development strategies and policies; unfavorable international economic relations, and high rates of population growth. Policies and strategies have focused separately on research groups and technology transfer. Despite large investments in research and technology transfer over the last four decades in developing countries, many areas are still afflicted by poverty and hunger. Farmers are still using old-fashioned technologies in areas where recent scientific innovation offer attractive new possibilities. The need for improved technologies is particularly acute in dry areas where, farming resources have deteriorated mainly due to climate change, overpopulation, overgrazing, and overexploitation of natural resources. When it comes to technology, resource-poor farmers in developing countries areas are in a difficult position. First, their farming systems are usually complex and diverse, yet the span of technologies available to them is narrow. They also lack the capacity to test and adapt technologies themselves, and they have little or no power to exert pressure on policymakers in order to widen the spectrum of technologies relevant to their needs. It is the interaction between researchers and extension groups that largely determines whether resource-poor farmers can gain access to technology; and whether that technology is relevant. Good linkages between the two are essential. Unfortunately, for many years the significance of linkages has been overlooked

because of the overriding influence of other policy issues such as pricing on the performance of the agricultural sector. The challenge facing agriculture in developing world is how to transfer the successful technologies generated by researchers to more people and more quickly. Low adoption of technologies is a major constraint to adaptation and mitigation to climate change. This paper identifies how the gaps can be bridged to overcome technology transfer barriers in order for farmers especially developing countries can adopt technologies for adaptation and mitigation to climate change more quickly.

O-CC-2-693

# Unsustainable Agricultural Practices and Climate Extremes Lead to Agricultural Vulnerability in Far-West Region of Nepal

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Eight sites comprising of adjacent plots with traditional cropping system (TC) and intensified cropping system (IC) of Chuha and Bhajani VDC of Kailali district were selected randomly, in order to make a comparative soil physico-chemical assessment. Soil samples were collected from each site at 0-15 cm of ploughing depth. Soil physico-chemical parameters were analyzed using standard methods. Key informants' interviews and participant observation were performed to collect data and types of fertilizers used, perceptions on soil productivity and weather events. This study revealed that the amount of total nitrogen and available phosphorus were higher in IC in comparison to TC. Soils under IC are acidic compared to soils under TC. The significantly low values of soil pH (p< 0.05) and higher values of soil total nitrogen and available phosphorus in the IC has been attributed to high input of fertilizers, mainly urea and di-ammonium phosphate. The bulk density of soils under IC was significantly higher compared to TC as the frequency of tractor use for ploughing was higher in IC. According to key informants' interview, the frequency of occurrence of severe weather events especially flood has been increasing as precipitation is intense and lasts for short period. They also mentioned that the shift in the timing of monsoon rain, flooding away of soils and drought is directly affecting crop plantation and production. Our study concluded that food production is vulnerable due to current agricultural practices and the climatic extremes that have occurred in Far-West Region.

O-CC-2-703

## Hunting for Oceanic Extracellular Electron Transfer Bacteria in Landlocked Nepal to Combat Power Shortage

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Tectonically built Hindu Kush and Tibetan plateau is the youngest mountain range in Earth that arose from uplifting of the seabed of Tethys Ocean around 2 million years ago. Nepal being part of the Hindu Kush mountain range it could be assumed that oceanic marine bacteria could have been embedded in its topography. Shewanella oneidensis MR-1 and Geobacter sulfurreducens are reported to be novel extracellular electron transfer bacteria capable of producing electricity. Tremendous efforts have been laid by different scientific communities in generating power from lignocellulosic biomass using these bacteria. However,

the limitation on use of lignocellulosic biomass is its calcitrant nature, lactate and acetate as carbon source for Shewanella oneidensis MR-1 and Geobacter sulfurreducens, respectively. Hence, syntrophic growth of microorganism that has ability to break lignin, hydrolyse cellulose and hemicellulose and ferment reducing sugar to lactate and acetate is sought. Lignin degrading and cellulose hydrolyzing *Paeniibacillus polymyxa* to release fermentable sugar, *Lactobacillus lactis* for producing lactate that would be used by *Shewanella oneidensis* MR-1 in generating proton and electron giving acetate which can be subsequently used by Geobacter sulfurreducens giving additional proton and electron. Thus, optimizing syntrophic growth of these bacteria would allow use of lignocellulosic biomass for theoretically double amount of electricity than monoculture in making commercially viable. From the Goruwale Bhanjyang area of Ilam, Nepal, soil samples collected above 2,700m ASL putative Paenibacillus polymyxa, Shewanella oneidensis MR-1 and Geobacter sulfurreducens have been isolated employing carbon catabolite repression characteristics and biochemical/genetic confirmation is planned.

O-CC-2-720

## Shared Learning Dialogue for Assessing Options for Ecosystem Based Adaptation

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The viability of ecosystem is dependent on water, agriculture and forest. Both climate and non-climate stresses affect this with implication on the services generated. The Changes has implications on functions of local systems as well as livelihood. The assessment of the changes including identification and implication of options for restoring the ecosystem requires scientific as well as local knowledge. This paper presents the process of Shared Learning Dialogue (SLD) used in such an effort in Nepal's Panchase Mountain Ecological Region (PMER). SLD is a process of enhancing resilience and building adaptive capacity of the vulnerable community. Shared learning brings together stakeholder with different perspectives, information, knowledge and power to a common platform for developing common understanding. It is an innovative approach to participatory problem solving and incorporates benefits of sharing, learning, respect, feedback and evaluation. In PMER, SLD helped to generate discussion and inspire innovations based on understating of new risks.

O-CC-2-728

## Step Towards Carbon Friendly Agriculture: Use of Mineral Rocks and Biological to Substitute Chemical Fertilizer

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Tectonically built Nepal must have seen initial vegetation by the works of microbes embedded in its soil and nutrients such as nitrogen, phosphorous, potassium and others including trace elements. However, supply of these embedded nutrients from bedrock would require weathering hence it is assumed that initial vegetation must have been supplied with microorganisms. Hence, nitrogen fixing and potassium solubilizing bacteria were screened from soil sample from around Goruwale Bhanjyang of Ilam, Nepal above 2,700m ASL. Putative Azotobacter vinelandii (AV) was screened in nitrogen limited media while Frateuria aurantia was double screened based on carbon catabolite repression and insoluble

potassium. Among the isolates some have shown biochemical characteristics of AV with exogenous nitrogen fixation of around 250g dissolved ammonium per liter. Similarly, putative Frateuria aurantia could grow in aniline as sole carbon source and potassium from aluminium potassium complex of AIKSO<sub>4</sub> indicating it solubilized the potassium from the complex. Sample 4 of putative Azotobacter vinelandii have been used in plant tissue culture model that lacked nitrogen source and Paulownia tomentosa plantlets survived indicating that it could be developed as biofertilizer. Trapping of soluble ammonium would potentially be a substitute to present day urea. Developing syntrophic growth model of nitrogen fixing, phosphate solubilizing and metal mobilizing would be a step towards carbon neutral agriculture. Our another groups are working on phosphate and silica solubiling, sulfur reducing and metal chelating to make consortia of microbes to weather rocks and make fertilizer.

O-CC-2-751

## Climate Change Dry Spell Impact on Agriculture in Salyantar, Dhading, Central Nepal

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The study had attempted to understand and assess the extent of climate change impacts on agriculture. The study area is located in Salyantar village in Dhading district of central Nepal. Salyantar village which is positioned in the flat "tar" was already stuck in the grip of water stress and was exacerbated by the effect of climate change. Impact assessment was performed through analysis of meteorological data, landsat images, and study of people's perception on changes relative to agriculture sector. The results of the study portrayed rise in temperature in the study area in the recent years in comparison to the past years. The maximum temperature increase was 0.03°C per year. As for precipitation, it showed decreasing trend for both average annual precipitation by 1.85 mm per year. The temperature vegetation dryness index obtained from landsat image, showed decreasing trend of soil moisture in different years with the conclusion of increasing longer dry spell which has unswerving effect on agriculture. The entire Salyantar village was dependent upon rain-fed agriculture and rely on neighboring villages for the source of drinking water. The perceived impacts on agriculture were decreased crop yield, reduced soil moisture, increased incidence of new pests and plant species and the impacts were fairly heterogeneous in distribution.

O-CC-2-767

## Climate Change Impacts and Adaptative Measures Practiced in Agriculture at Latikoili VDC of Surkhet District, Nepal

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A study was carried out in Latikoili VDC of Surkhet district aiming to identify impacts of climate change in agriculture, examine people's perception on climate change and assess existing adaptation practiced on agriculture. Primary data was collected through semi-structured and open- ended questionnaire from household survey along with key informant interview and focus group discussion. Climatic data were collected from DHM to observe rainfall pattern and temperature trend. The statistical analysis of climatic data revealed that the trend of temperature has increased and rainfall has been characterized by large inter annual variability with substantial decrease over past 29 years. Most of the respondents perceived change in climate and farming system in their locality such as delay of monsoon, erratic rainfall pattern,

increased temperature resulting drought associated with decrease in water sources, shifting cultivation, planting as well as flowering time. The analysis revealed that people's perception is in accordance with climatic records. Farmers have been practicing adaptation measures such as adapting improved seed varieties, IPM practices; cultivate varieties of crops with the change in planting time, plastic pond to store waste water to combat climate change. However, poor and marginalized group were unaware regarding climate change impacts and adaptative measures. Sharing information and raising awareness among the locals can be done to cope with climate change impact and enhance livelihood.

### Climate Change Adaption and Mitigation 3 (O-CC-3)

O-CC-3-410

## Climate Change Impacts and Adaptation Practices on Water Resources in Salyantar, Central Nepal

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The impacts of climate change are being felt everywhere in a number of ways, but the most critical are likely to be those affecting water resources. This study has attempted to assess the extent of climate change impacts on water resources and explore the adaptation strategies of local communities in Salyantar village, Dhading district of Central Nepal. The people's perception was studied through participatory rural appraisal tools which were supplemented by scientific means where appropriate. The meteorological data was analysed followed by the Mann-Kendall Test to assign the statistical significance to the trend. Present scenario of water resources was found by discharge and water level measurement along with the analysis of landsat images for last three decades. Similarly, temperature vegetation dryness index and laboratory analysis of soil samples was used to identify soil moisture. The study showed the maximum temperature was increasing at the rate of 0.039°C per year and annual precipitation was decreasing at the rate of 22.99 mm per year with statistically significant trend. The perception was fully justified by the analysis of landsat images, discharge of Haping River, soil moisture calculation, and other scientific and field assessments. Water coverage is decreasing from 28.93% to 6.47% and TVDI range lying between 0.01-0.7 in last three decades, was identified as the most sensitive sector. The community had identified new sources and other adaptation measures to cope with it which were insufficient.

O-CC-3-474

## Effect of Disturbance on Carbon Dynamics in Moist Tropical Forest of Eastern Nepal

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In the tropical moist forest biome stores huge amount of carbon(C). An accurate estimation of forest biomass and C cycling in context of disturbance is required for implementing Reducing Emissions from Deforestation and Forest Degradation(REDD) policy. The C stock in vegetation was calculated by multiplying C concentration to dry weight while C sequestration rate by multiplying C concentration to net primary production (NPP). Biomass and NPP of trees and shrubs was estimated by using allometric equations while herbaceous biomass was

estimated by harvest method. Total stand carbon stocks (Mg C ha<sup>-1</sup>) in the vegetation of undisturbed forest stand (UF) was 452.06 while in disturbed forest stand (DF) it was 211.33. The C stock (Mg C ha<sup>-1</sup>) of trees, shrubs and herbs in UF was 446.47, 2.06 and 0.61 respectively while in DF they were 206.47, 2.83 and 0.53, respectively. The rate of C sequestration (Mg C ha<sup>-1</sup> yr<sup>-1</sup>) was 12.26 in UF and 6.88 in DF. Total C input into soil through litter plus root turnover was 6.78 and 3.35 Mg C ha<sup>-1</sup> yr<sup>-1</sup> in UF and DF respectively. Several disturbance activities resulted in the significant loss in carbon stock (53%) and C sequestration capacity of forest (44%). However, both stands of present forest act as carbon accumulating systems.

O-CC-3-662

## Potential Plant Species for Bio Energy Production in Dhading District, Central Nepal

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Exploration of potential bio energy sources, mainly fuel wood and oil yielding species, in six VDCs of Dhading district, Aaginchowk, Baseri, Budhathum, Mulpaani, Phulkharka and Salyantaar, revealed 220 species of potential bio-energy plants. The list is based on formal and informal meetings, reconnaissance survey, focus group discussion, key informant interviews, audio visual records, field survey, herbarium analyses and photographs. Generally, 54 species of fuel wood and 37 oil yielding plants species are widely used plants, which are recorded from 120 (40 in each VDCs namely Budhathum, Mulpaani and Phulkharka) house hold (HH) survey. Generally, the oil yielding plant resources are cultivated in every HH. Fuel wood species (99.16 % HH) is the most widely used source of energy followed by electricity, kerosene, solar, LPG and bio gas. Out of 220 species, 140 species are trees, 44 shrubs, 11 climbers and 25 herbs. For the laboratory analysis, 10 species each from 54 and 37 fuel wood and oil yielding plants respectively, are selected on the basis of various potentiality measuring characteristics of plants. The governing characteristics are abundance, burning, smoking, durability, use value, preference ranking, chorotype, stress tolerance, propagation, agronomical integration, regeneration, seed bearing, higher growth rate, non invasiveness, higher productivity, wildlife habitat, carbon sequestration value etc.

*O-CC-3-689* 

## Treatment of Dairy Waste and Bioelectricity Production Using Microbial Fuel Cell

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Microbial fuel cell (MFC) can be used as bioelectricity producing device using dairy waste. MFC can act as biosensor, eco-friendly and low cost management of energy production. In this study, microbial fuel cell is used to derive possible fuel source from the dairy waste biomass. The MFC was designed as two chambered that included an anaerobic anode and aerobic cathode compartment and was separated from each other by proton exchange membrane. The anode and cathode electrodes were made from graphite plates. MFC showed a maximum open circuit voltage of 250mv on the fourth day for 15% substrate and remained constant. The dairy waste contained 1.2mg/ltr of reducing sugar, 17.19mg/ltr of phosphorous and 1520mg/ltr of COD before treatment. After the treatment in microbial fuel cell the reducing sugar was 0.35 mg/ltr, phosphorous was 3.181 mg/ltr and COD was 640mg/ltr. This result in reduction sugar by 70.89%, reduction of phosphorous by 81.49% and

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reduction of COD by 57.89% showed that generating bioelectricity and dairy waste water treatment by microbial fuel cell is a good alternative for producing energy and treating wastewater at the same time.

O-CC-3-696

### Urban Debris Management as the Carrier of Biological Fertilizer

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Seismically sensitive Hindu Kush Mountain Range and Tibetan Plateau is habitat for around a guarter of global population. This area is also at great threat from global warming. Hence, it is prudent that the building construction has to be seismically competent but at the same time carbon friendly. In developed countries it is mandatory to recycle building debris, however, in Nepal that recently observed two devastating earthquakes does not have code for debris management. Tectonically build Nepal by uplifting of seabed could have hazardous heavy metal in its rocks used in building material and if accumulated together as debris could find way to water system or food chain. Hence, an alternative for management of debris and lighter but stronger building materials are sought. The urban debris consists of cement, sand, stone aggregates, bricks, metamorphic rocks and can be categorized as containing minerals such as calcium, silica, nitrogenous compounds, phosphate, potassium and other trace elements which if treated properly could be developed as fertilizer. Taking around 20% stone crusher dust as replica to debris we were able to tissue culture Paulownia tomentosa. Incorporating Paulownia tomentosa biochar as building material would act as carbon sink. And upon demolition the biochar having high porosity can be used as soil amendment in trapping nutrients and housing biofertilizers. We have been able to seed germinate and tissue culture Paulownia tomentosa and have used biochar as carrier for nitrogen fixing, phosphate solubilizing and sulfur reducing bacteria as fertilizer and field trial has been initiated.

> 0-CC-3-736 e Imagery and Field

# Aboveground Woody Carbon Stock Mapping Using Geo-eye Imagery and Field Inventory in Bagmara Community Forest, Chitwan Nepal

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This study has endeavoured to map aboveground carbon stock using Geo-eye satellite imagery coupled with field based inputs in Baghmara Community Forest, Chitwan. Both multispectral and panchromatic image was pan-sharpened to get spectrally and spatially good quality image. Modified IHS method with neighbourhood was found to be the best adopted fusion technique. Multi-spectral segmentation was carried out to split the cluster of trees. Appropriate shape of the tree was extracted by morphology operation. The segmented image was classified into forest, non-forest and shadow area. Total volume and aboveground biomass was estimated using species allometric equation. The biomass was converted into carbon stock using conversion factor. The relationship between Crown Projection Area (CPA) and Carbon was established using 304 trees identified in the field and CPA derived from image. A non-linear regression model was developed between calculated carbon stock and CPA derived carbon stock from the image. Multi-spectral segmentation gave 67% accuracy that was obtained from the goodness of fit (D Value) while the overall classification accuracy was 94.5%. The occurrence of *Albizia julibirisin* is 45% followed by 28% of *Dalbergia sisoo*. *Trewia nudiflora* was in third position with 27% occurrence of total growing stock. *Albizia* 

*julibirisin* has the highest average Carbon stock i.e. 536.87Kg/per tree. *Dalbergia sissoo* has 396.5 Kg/tree. Similarly, other miscellaneous species contain 209.6 kg/tree carbon. The developed model showed there was significant relationship between CPA and Carbon. Hence, forest carbon stock mapping can be done using Geo-eye images with acceptable accuracy.

0-CC-3-764

## Plant Species Diversity and Tree Carbon stock in a *Shorea Robusta* Gaertn. Community Forest, Nawalparasi, Nepal

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Carbon trading and biodiversity conservation are hot issues at present global climate change. Shorea robusta Gaertn.is one of the major forest components species in the tropical ecosystem of Nepal. Documentation of associated species in the tropical Shorea robusta community forest, their species richness and the carbon stock patterns are major objectives of this study. Thus, this present study has been initiated in the low land (200 m asl), Bishnu Nagar Community Forest, Nawalparasi, Nepal. This forest has an area of 196.72 ha studied systematically after sampling it into 30 quadrates of 20x20m<sup>2</sup> each encompassing all management blocks demarcated by Community Forest Users Groups (CFUGs). Species encountered inside each quadrat have been recorded and individual trees were tagged permanently for a year. Carbon stock for each tree calculated after using allometric equation. In addition, soil nitrogen, phosphorus, potash and pH were also measured. Detrended correspondence analysis (DCA), non metric multidimensional scaling (NMDS), correlations and regression methods were applied through R statistical packages. This study documented a total of 68 vascular plant species under 41 families and 61 genera. Fabaceae was the most dominant family (9 species) followed by Araceae (3 species). Most species showed the significant linear relation to the major gradient (DCA lst axis length = 1.4 unit). Abundance of Indigofera decora was highly correlated towards plots with the highest value of NMDS1. The average carbon stock value found to be 115 tons per hectare and tree stem volume was measured as 225.2 m3 per hectare.

O-CC-3-77

## Climate Change Effects in Rice-Lentil System Under Simulated Increased Temperature at Khajura, Banke Conditions

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Global warming is expected to cause both positive and negative effects in the agriculture sector. For future food security, varieties adaptable at the increased temperature are required to be developed and tested. To understand the effect of increased temperature, experiment was conducted with two main factors open top chamber (OTC) and ambient condition. Five different varieties of rice (*Oryzasativa*) and lentil (Lens esculentus) were used as sub-factor in split plot research design experiment with four replications. Results showed that higher temperature inside the open top chamber (OTC) caused significant increase in paddy plant height and straw yield compared to the ambient condition. Among rice varieties, Sabitri produced comparatively higher grain yield (9.2 t/ha) than the field condition (7.6 t/ha). Lentil results showed that there was significant negative plant growth and development in open top chamber (OTC) due to higher temperature starting the month of February compared to field condition. Among five lentil varieties, ILL7715 produced highest yield inside open top
chamber (OTC) (1,268 kg/ha) and in the field condition (2,150 kg/ha). Sabitri rice variety can be recommended for the future higher temperature climate similar to the Khajura condition with adequate water supply. More varietal development efforts are needed in the case of lentil to make them adaptable for increased temperature condition.

O-CC-3-790

### **Development of Climate Wizard Nepal: Making Climate Change Visible**

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Due to recent years climate change, every year there is a huge amount of devastating disasters destroying lots of human lives and economy. Even the temperature rise and fall has affected lives. Change in climatic pattern is not an unknown matter to today's world but how and in which pattern is mysterious. Had there been any system that dramatically displays and forecast the patterns of weather, the impact due to climate change could be minimized. It is a real problem in Nepal because we lack proper weather forecasting technology that everyone understands and could reasonably predict future events. The main purpose of this project is the easy visualization of climatic parameters in order to know how the climate has changed over years in Nepal. It aims to develop a system named "Climate Wizard Nepal" using available open source technologies and database tools capable of displaying weather data along with spatial data associated with it, over World Wide Web so that it become accessible for everyone. The output of this project is a webpage application disseminating different products of automatically produced interpolated maps, interactive layers through the use of GeoServer, animations, graphs showing the changes in climatic parameters in recent years. Along with the visualization, this application also lets us compare different climatic parameter in different years. It also contains data in several formats in order to provide serviceable data about the climate to planners to plan their work smartly and effectively.

## **Environmental Pollution and Resource Recovery (O-EP-1)**

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### Technological Innovations for the Environmental Management in Nepal

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Nepal's constitution, environmental policies and programs have generally aimed at making a good match between economic development and conservation. For this, Government of Nepal has enacted several environmental laws and technical regulations of which Environment Protection Act, 1997 and Environment Protection Regulation, 1997 are the umbrella laws. Similarly, Nepal is a signatory to more than 20 environment related multinational international conventions and agreements (MEAs). Since 1992, various conventions and MEAs have guided the national development efforts and it has incorporated in the plans and program regularly since the Eight Plan (1992-1997). As per policy framework, Nepal has formed various institutions - National Council for the Conservation of Natural and Cultural Resources (1989), the Environment Protection Council (1992), Climate Change Council (2009), etc. to coordinate the implementation of various international commitments. Department of Environment is an authorized agency for the regulation and implementation of environmental standards. Nepal's economic development and urbanization is causing severe environmental problems such as air pollution, water pollution, solid waste management, deforestation, land degradation, etc. Assuming continued economic liberalization and increased urbanization, the damage to environment and health could be enormous. The

challenge, therefore, is to maintain the quality of air, water and land and protect the environment by reconciling environmental imperatives. Similarly, strict implementation of environmental regulations and enforcement by the regulating authority is of major concern. Adoption and promotion of the latest and environmentally friendly technology may help for the protection of pristine environment, which is also essential tool for the graduation to the developed country.

O-EP-1-276

## An Assessment of Noise Level and Associated Health Effects in Stone Cutting Industries in Kaski, Nepal

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A study was carried out at Sardikhola VDC in Kaski district to assess the noise levels produced from stone cutting industries during their activity cycle and to predict the risk of environmental noise induced health effects to the workers. Noise levels were measured using a digital sound level meter in twelve industries (5 single machines and 7 double machines) during their activity cycle for three times a day for three days. Altogether, 35 guestionnaires were subjected to the exposed group and 15 to the non-exposed group. The observed noise levels in all industries exceeded the allowed limit value of 85 dB(A) as recommended by WHO. The observed maximum and minimum noise levels for selected single machine industries for average equivalent sound pressure level (LAeg), nominal 8-hour noise exposure level (LAeq.8hr) and weekly average of the daily noise values (LEP,W) were 110 dB(A), 108 dB(A) and 105 dB(A); and 104 dB(A), 104 dB(A) and 101 dB(A) respectively. Similarly, for the double machine industries it was 108 dB(A), 106 dB(A) and 103 dB(A); and 103 dB(A), 102 dB(A) and 99 dB(A) respectively. The major health effects induced by environmental noise were found to be tinnitus followed by speech interference, hypertension, irritation, loss of sexual potency, difficulty to concentrate and blood pressure rise. The crude OR and 95% CI for the exposed subject was 6.42 (0.75, 55, 12).

O-EP-1-311

## Resource Recovery from Waste: A Review of the Research Works performed at CDC, TU under my Supervision

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Due to the centrally controlled administration system of the country and the lack of proper rule-regulations of urbanization and proper waste management so far, the unplanned urbanization is in peak within Kathmandu valley and is generating huge amount of waste products. These waste products are becoming severe burden.Various types of wastes and mineral resources such as charcoal, sugarcane waste, eggshell powder, silica powder, crab shell powder, banana peels, waste tire, coal fly ash, brick-dust, demolished-cement-sand-mixture waste and several other construction wastes were utilized for the synthesis of functional materials.There were mainly two purposes for the synthesis of functional materials from wastes: first one was to prepare adsorbent materials to adsorb various hazardous metal ions contaminations from wastewater and the second one was to prepare alternate cementitious materials at ambient or low temperature.Metal ions contaminations such as iron, ammonium, arsenic (III), arsenic (V), chromium, manganese and methylene blue dye were successfully removed from wastewater using the adsorbent obtained from various types of wastes. The adsorption capacities of metal ions such as iron, ammonium, arsenic, chromium,

manganese and methylene blue dye were 1.80, 250, 14.28, 23.80, 14.45, 3.04, 58.82 mg/g respectively. Similarly, various types of construction and demolition wastes were utilized for the synthesis of geopoymer products. The compressive strength up to having 60 MPa was achieved for the geopolymer synthesized from brick-dust waste at 40 °C. This can be the milestone for the construction as well as environmental fields if it can be commercialized.

0-EP-1-616

### Initial Assessment of Routine Servicing and Maintenance as a Low-cost Policy Measure to Reduce Motorbike Emissions in Kathmandu valley

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Vehicles are a major source of air pollution. Current regulations in Nepal require 4-wheelers to undergo a routine emissions inspection test for a "green sticker". However, 2-wheelers are the dominant class of vehicles accounting for 80% of the vehicle fleet. During the ICIMOD-NSF campaign in April 2015, measurements from 5 idling motorbikes suggested that routine servicing could substantially reduce their PM 2.5 emissions. To check the robustness of that result, ICIMOD started a new measurement campaign focused on emissions of motorbikes. Field measurements of particulate matter, carbon monoxide, volatile organic compounds and carbon- dioxide before and after servicing were collected using low-cost air quality monitoring instruments. The campaign was conducted for 9 days between 30 December 2015 and 12 February 2016. During this period, emissions from 38 motorbikes were measured before and after servicing; along with the interviews carried out with key informants and concerned personnel to find out technical details and secondary information about the vehicles used in the study. Our preliminary results suggest that a small fraction of motorbikes emit extremelylarge amounts of PM2.5 before servicing, whereas the remaining vehicles emit undetectable amounts of PM 2.5. After servicing, PM 2.5 from the high emitters is reduced substantially. In addition, the VOCs and CO emissions are reduced after servicing. The routine servicing involves changing of engine oil, cleaning the air filter, and checking the carburetor (total cost ≈ NPR 1000). Our preliminary results suggest that motorbike emissions can be reduced very effectively through routine servicing and maintenance at local autoworkshops.

#### O-EP-1-627

## Situation Analysis of Ambient PM 2.5 Pollution and its Health Effects in Kathmandu

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Ambient air pollution is thought to be a major threat to human health. Excessive exposure and inhalation of PM 2.5 cause various illnesses such as respiratory, cardiovascular, low birth weight, etc. The aim of this study was to assess the situation of PM2.5 and its health effect in Kathmandu valley. This longitudinal time series study assessed particulate matter (PM 2.5) and its health effects from Mid-February 2014 to Mid-February 2015 in Kathmandu valley. PM2.5 levels were continuously monitored from three fixed monitoring stations of Kathmandu valley using E-SAMPLER Aerosol Monitors, and health indicators were used from major hospitals. Weather variables like daily rainfall, temperature and relative humidity data were

collected from the Department of Hydrology and Meteorology, Kathmandu. Study findings show high levels of ambient PM2.5 in winter and spring seasons with values above 70µg/m3,and relatively low levels, below 25 µg/m<sup>3</sup> in monsoon and autumn seasons. Daily averages showed altogether 207 days (56.7 %) with 24-hour average PM2.5 exceeding the national ambient air quality standard of Nepal (40 µg/m<sup>3</sup>). Pollution levels were highest (around 74 µg/m<sup>3</sup>) in the morning (6:00-9:00 AM) followed by 56 µg/m<sup>3</sup> during the evening time (6:00-9:00 PM) which indicate morning and evening walk in Kathmandu valley are hazardous. There is need for urgent actions to reduce PM2.5 in Kathmandu valley to avoid morbidity and mortality related to ambient air pollution.

*O-EP-1-633* 

#### Effects of Ventilation on the Spatial Distribution of Pollutants in a Kitchen

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Indoor Air Pollution (IAP) is the presence of one or more contaminants in a sufficient quantity and duration to cause them to be injurious to human health and welfare. IAP represents the fourth most important health risk factor after malnutrition, unsafe sex and unsafe drinking water and sanitation. IAP causes an estimated 1.6 million deaths/year (2.7% of the entire global burden of disease) and thevast majority of these deaths occur from Lower Respiratory Infections in young children under five. Whereas significantattention has been given to improving cooking stoves in Nepal, relatively little effort has been devoted to optimizing the kitchen ventilation conditions in a manner that can minimize personal exposure to IAP. In this study, the concentrations of 4 pollutants (CO, VOC, PM, BC), carbon dioxide, temperature, and relative humidity were measured at various coordinatessimultaneously within a village kitchen in the Chitwan district. The measurements were collected for 21/2 days continuously, while the occupants carried out their routine activities including cooking with solid biomass two timesper day. Ventilation and air flow patterns within the kitchen were varied systematically during the study period by opening and closing a vent above the stove and by opening and shutting different windows. This paper describes the salient features of the IAP spatial and temporal distributions that were observed during our study. In a follow-up study, we will attempt to simulate these features using mathematical models with varying degrees of complexity.

O-EP-1-769

## Evaluation of the Ecological Water Quality Status of an Impaired Bagmati Watershed by using a Multi-index Approach

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Freshwater ecosystems particularly the running waters in human dominated landscape are highly vulnerable to multiple stressors including biological, chemical, hydrological and geophysical components. Several monitoring methods have been employed for assessing water quality status of rivers. However, the integrated assessment including biological communities are rare in South Asia because of a lack of awareness, trained manpower and taxonomic keys as a result the assessment of waterbodies are confined to only physico-chemical parameters. The objective of this study is to use an integrative approach to assess the ecological water quality status of a Bagmati river from Baghdwar in Kathmandu to Nepal-India boarder. Integrated approach accounts river hydro-morphological alteration, land use,

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physico-chemical parameters and benthic macroinvertebrates. The samples were collected at every 5 km of river stretch in mountain and at every 10 km in Tarai region. Analysis revealed that ecological water quality status ranged from river quality class (RQC) 1 to RQC 5. The effect of river pollution in Kathmandu was observed until 70 km downstream of the river. Sensitive benthic macroinvertebrates disappeared at Gokarna in Kathmandu valley and reappeared only at 60km downstream of Chovar. This holistic approach reveals more realistic status of the river ecosystems. We envisage that the outcomes of the integrated approach could be considered as baseline for better management of the river ecosystems and the methodologies applied here could be used in monitoring of other river systems.

O-EP-1-859

## Conversion of Waste Plastics into Useful Products Through Pyrolysis for Waste Management and Fuel Complements

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While walking through 21<sup>st</sup> Century, the way world views the 'waste' has radically changed. Nowadays, waste stream is considered as a valuable source: and thus appropriate technologies are being adopted that allow more materials to be recovered and add values to them. Therefore, in the context of Nepal, solid waste management could be better regarded as resources management. In this regard, plastic to fuel (PTF) technology offers a greater potential to manage the waste plastics, specifically, by using the pyrolysis process, by converting them into petroleum oils and other useful materials. The present study focuses on the pyrolysis of four different types of scrap plastics which include low density polyethylene (LDPE), high density polyethylene (HDPE), polypropylene (PP), and polystyrene (PS). Typically, waste plastics were collected from the different localities of Kathmandu Valley and subjected to pyrolysis process in which the plastics are thermally treated in absence of oxygen. The thus obtained oil and leftover were then characterized by different chemical analysis techniques such as Fourier transform infrared (FT-IR) spectroscopy and gas chromatography-mass spectroscopy (GC-MS). Moreover, the yield of oil obtained from different types of plastics were calculated and a subsequent economic analysis of the entire technology was also done.

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## Forensive Science and Management (O-FO-1)

O-FO-1-294

### **Methanol Poisoning: Forensic Case Study**

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Methanol ingestion is an uncommon form of poisoning that can cause severe metabolic disturbances, blindness, permanent neurologic dysfunction and death. While methanol itself may be harmless, it is converted in vivo to formaldehyde and subsequently to the highly toxic formic acid by enzymes alcohol dehydrogenase (ALD) and aldehyde dehydrogenase (ALDH) respectively. Methanol is analyzed by using Head Space–Gas Chromatography/Mass Spectrometry (HS-GC/MS) in blood samples and suspected forensic case samples.

0-F0-1-340

## **Counterfeiting of Fingerprints**

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Fingerprints are widely used tool of identification. They have very high discrimination power vet very easy and simple to analyze. In context of our country they are frequently used as a signatory body on different important documents like citizenship certificate, land and home ownership documents, loan documents etc. Fingerprints should be applied by person on the documents in order to be legal. With the development there is rising issue of counterfeiting of fingerprints. Most common counterfeiting processes are preparing the stamp of the fingerprints and printing the fingerprints. This study analyzed the differences between the finger applied fingerprints and stamp pad applied or printed fingerprints. The counterfeit fingerprints were developed from flash stamp printing technology generally termed as digital stamp printing. The preliminary study showed few differences. Generally the finger applied fingerprints had variable ink intensity due to uneven pressurization during applying prints whereas while applying fingerprint from the stamp pad would generally result in uniform intensity of hence applied prints. The exact repetitiveness of prints from stamp applied prints was another difference which was not observed in finger applied prints. The finger applied fingerprints generally have residue of human sweat, which would be absent in both the stamp applied and printed fingerprints. The presence of boundary edges also showed that the fingerprint is not applied by actual finger. The In case of printed prints, the prints had printing residues such as printing droplets.

0-F0-1-568

### Multiplex STR Analysis in Determining Paternity Disputes in Court Cases

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DNA profiles of highly polymorphic STR markers are analyzed to determine disputed paternity cases. National Forensic Science Laboratory (NAFOL) has been conducting parentage tests in parental disputes in both paternity trio cases and motherless paternity or duo cases since 2005/06 AD. Short tandem repeats (STRs) are DNA regions with repeat units that are 2-6 bp in length and are also called microsatellites. Multiplex PCR amplification of 15 polymorphic STR loci was performed using Identifiler PCR Amplification Kit. These 15 STR loci (D8S1179, D21S11, D7S820, ČSF1PO, D3S1358, TH01, D13S317, D16S539, D2S1338, D19S433, vWA, TPOX, D18S51, D5S818 and FGA) and an amelogenin was studied, by using capillary electrophoresis on ABI 310 Genetic Analyzer and GeneMapper ID v3.2 software. In the last five years among 209 cases of disputed paternity 150 cases were received from various courts. Of the 150 disputed cases, 73(48,66%) alleged fathers were excluded from paternity. In 2014/15 alone, 19 alleged fathers of the 40 court cases were excluded from paternity. Among excluded cases paternity was excluded in 2 cases in more than 10 loci, 9 cases in 8-10 loci of 15 markers. In trio cases more than 80% alleged fathers were excluded in more than 8 loci whereas in duo cases 70% were excluded only in 2-7 loci. The avialibility of mother in paternity testing eliminates the risk of false inclusion in close relatives and deficient paternity tests. The D21S11 locus showed the highest rate of mismatch, whereas the CSF1PO locus showed the lowest rate of mismatch.

0-F0-1-588

#### **Cuscuta Reflexa Poisoning: A Case Discussion**

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Nepal, with its versatile geography, is home to diverse flora including species that have known ethno-botanical importance. Though there has been survey discussing the therapeutic uses of these plants, toxic potential has not been discussed much. *Cuscuta reflexa* is one of the endogenous parasitic plant found in Nepal and has been used by various ethnic communities of hilly districts of Nepal for various ailments. However, there are cases of toxicity in animals as well as humans which needs attention. Here we discuss a case of *C. reflexa* accidental self-poisoning while being used for liver ailments from Makwanpur district presented to us with multiple complaints like gastrointestinal upset, restlessness, difficulty in breathing. He was managed conservatively and discharged 72 hours post-ingestion with no complaints at the time of discharge.

0-F0-1-658

## Trend of Suicidal Attempts by Deliberate Self-poisoning with Toxic Agents in Kathmandu Valley

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This study aims to examine the trend of self-poisoning in the perspective of toxic agents, gender and patient of different age groups. This is a retrospective study over the period of 14

years (FY 2000/2001 – 2013/2014). National Forensic Science Laboratory (NAFOL) received 1384 clinical toxicological cases over this period of time from emergency department of different hospitals from Kathmandu valley requested to evaluate probable toxic agent ingested by patient attempted to suicide. All the received cases were analyzed in the laboratory. Toxic agents were evaluated in 57% cases and remaining 43% cases were unknown of toxic substances. Among toxic agents pesticides were evaluated in 75% cases. Other toxic agents including drugs were evaluated in 25% cases. Significantly more females (56%) than males (44%) were attempted to self-poisoning. Trend of self poisoning is significantly more in young adults. 78% patients attempted in self-poisoning were of 15-35 years age group, 19% were between 36-60years and 3% were above 60 years age. Above findings clearly indicates the deliberate self-poisoning has become an increasingly common response to emotional distress in young adults and pesticides are the more frequent toxic agents used in self poisoning.

0-F0-1-755

#### Comparative Study of Documents With Respect To Handwriting Patterns

Mukul Pradhan, Madhumati Bajracharya National Forensic Science Laboratory ,Khumaltar, Lalitpur E-mail:mukul@forensic.gov.np

Nepali is an Indo-Aryans Language with around 17 million speakers in Nepal, Bhutan, Burma and India. Nepali first started to be used in writing during the 12<sup>th</sup> century A.D. It is written with Devanagari alphabets, which developed from the Bramhi script in the 11<sup>th</sup> century even though identification of the actual date of such old aged documents is still questionable. The composition of fiber, color of paper, inks used in paper, shape of letter and the pattern of written language etc. are the major keys for analysis. In this research, the shape of letter formation and pattern of language were studied comparatively as major parameters. The study is carried out on documents that were written within time interval 1996 B.S. to till date. The size and shape of fonts were bigger on those days as well as slants towards right. Especially numerals like 3,5,7,9 were written in typical style on those days. The language pattern used in old aged documents is different than that used in the recent documents. In addition, the relative size, formation of some alphabets and numerals as well as language pattern in old documents are different than those in recent ones which help to classify the time period of document preparation(age) to some extent.

0-F0-1-864

### Spatio-Temporal Crime Prediction Model in Kathmandu Valley using GIS

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Crime is an illegal act deviating from normal violation of the norms, causing losses and harms for people. Social, psychological, economic including environmental factors should be considered while studying crime. All these concepts affect the occurrence of crimes in different ways. People who have important roles in crime prediction are police, local governments, law enforcement agencies and those people exposed to crimes. The spatial and temporal model is generated by using crime data for the year 2070 compiled by Kathmandu Police Headquarters. Methodology starts with obtaining clusters with K-mean, Nearest and Neighborhood (Nnh) and Spatial and Temporal Analysis Clustering (STAC) algorithms. Earlier mentioned clustering methods are compared in terms of number of crimes and land-use to select the most appropriate clustering algorithm. Crime data is divided into

daily epoch, to observe spatial and temporal distribution of crime over entire Kathmandu valley. A time series model called Autoregressive and Integrated Moving Average (ARIMA) was fitted for each week day to predict crime in the temporal dimension. The spatial and temporal model of this thesis work can give crime prediction in both space and time.

0-F0-1-882-I

### **Technology Gift for Crime Detection**

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Crime is an adaptation to life stress and criminal behavior is, thus, a vastly complex, poorly understood phenomenon. Interestingly and alarmingly, Crime is at its summit in the present era throughout the world. Forensic Science is the science in the service of Crime Detection, investigation and prosecution. The modern Science and Technology gifted the Forensic Scientists many unquestionable Devices to detect crime in proper scientific and satisfactory manner. Combined efforts of investigation officer, Forensic Expert, Autopsy Surgeon, and Laboratory Scientists under ideal condition can very well detect crimes, gifted by the modern Technology & Science and prove them in the Court of Law. Brain Mapping, Narco Analysis, and Lie Detection are mostly advocated as the latest scientific procedures for exploring the truth of the crime. A detail discussion of all the aforesaid procedures advocates presentation with their scientific accuracy and legal status.

## Hydrometeorology Processes and Dynamics 1 (O-HM-1)

*O-HM-1-13* the Context

## Evaluating the Water Supply and Demand in Kathmandu Valley in the Context of Climate Change Impact on Melamchi Water Supply Project in Nepal

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Water demand is increasing continuously throughout the world with the growth of population and economy. In many cases, water stress arises due to changes in both water supplies due to climate change and water demand. Very limited studies have been conducted examining both the impact of climate change and water demand. This study focus on the impact of climate change on water availability and the change in demand using a case study of Melamchi Water Supply Project (MWSP) of Nepal. MWSP is an interbasin water transfer project constructed to divert water from Melamchi River of Indrawati River Basin (IRB) to water scared Kathmandu valley of Nepal. Future precipitation and temperature of IRB was forecasted using four climate models under two RCP scenarios which was used as an input for hydrological model SWAT to predict the water availability in the future. The analysis shows an increase in precipitation and temperature resulting an increase in annual water availability in the rivers. However, monthly analysis indicates a problem of water diversion during the month of March and April as the discharge in the rivers decreases. The water demand of the Kathmandu valley was predicted using logistic curve method and finally four cases a) pessimistic future b) moderate I future c) moderate II future and d) optimistic future were developed to analyze the water supply and demand. The study suggest that water supply management alone is not capable to support the increasing population. Even with the purposed MWSP, the number of people without access to pipe water will be 2.58 million by

2055s. Hence a combination of both water supply and demand side management strategies is necessary to adopt to the changing climate and water demand.

O-HM-1-423

### Effect of Flood on Cropland of Koshi Tappu Region, Eastern Nepal

#### Kalyan Shrestha, Tej Narayan Mandal

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The study was conducted in the Koshi Tappu region in the eastern Nepal, where a destructive flood incident occurred in 2008 which has damaged large area of cropland in Kushaha west and Haripure VDC. The study area lies within 26º 31' to 26º 37' N and 87º 00' to 87º 55' E. To study the effect of flood, three severely disturbed sites, one partially disturbed site and one control site treated as reference site were selected. The main objective of the study was to assess the effect of flood on cropland in Koshi flooded area. The analysis showed, the soil at the disturbed sites is rich in sand having high bulk density, low porosity and low moisture content. Due to the effect of flood, organic carbon total soil N reduced in the range of 68.4-90.9% and 42.7-80.9% respectively at the disturbed sites. The available N (NH<sub>4</sub>-N and NO<sub>3</sub>-N) also reduced by 33.4-67.2% and 38.4-73.5% at the disturbed sites in comparison to control site. The soil microbial biomass, an active fraction of soil organic matter also showed distinct reduction in the content due to effect of flood.NH<sub>4</sub>-N was dominant over the NO<sub>3</sub>-N and the NH<sub>4</sub>:NO<sub>3</sub> ratio varied from 1.37 to 1.81 among all sites. This ratio become wide as the system approached establishment. In the present case, partially disturbed site still did not achieve the level of nutrient contents as that of reference site. It showed the sites are still unsaturated and at the state of recovery of soil nutrients. It means soil needs further way of reclamation to reach the level of undisturbed cropland.

O-HM-1-428

#### Poverty and Flood Vulnerability: A Case Study of Syauli Bazar, Budigandaki

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Poverty is the state of one who lacks a certain amount of material possessions or money. Disaster is a phenomenon that can cause damage to life and property and destroy the economic, social and cultural life of people. A case study was conducted in Sayuli bazaar of Salyantar VDC of Aarughat, Dhading. The study area lies near the Budigandaki watershed. It aims to determine the relationship between poverty and flood vulnerability through the socioeconomic survey and secondary data of discharge. The well being status of 45% of people are poor and 20% of extremely poor and remaining are medium. Flood is main disaster for them which occur annually damaging their properties, livestock and crops. 80% are compelled to live in same place as they don't have enough money to purchase land in next place, 15 % have some family dispute in their original home and rest 5% are satisfied in the same place. 100% of casualties are not getting any compensation after the occurrence of flood. Flood frequency analysis from the secondary data of discharge of Budigandaki watershed shows that the flood having discharge 130 m<sup>3</sup>/s will occur within the return period of 25 years. Alternative source of income should be provided to poor people and flood vulnerability should be mitigated. So poor people are always vulnerable to flood unless their poverty is not reduced.

### *O-HM-1-510* Study of Hard Rock Aquifers in Hill and Mountainous Area of Badigad Catchment, Western Nepal

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The Badigad basin lies in the middle and high mountain regions of Nepal and covers 66% of Baglung, 33% of Gulmi and 1% of Arghakhanchi districts with total population of 437.858. The catchment is densely populated with predominantly rural settlements depending extensively on agriculture. As the availability of water in the catchment is very uneven, even though, the cultivated areas represent 10% of the catchment, irrigated cultivation occupies only about 19% of the total cultivated area. Groundwater of good quality is available at shallow depth and maintains the base flow of most rivers and is used intensively in the absence of surface water in the catchment. The study was conducted with the aim of identifying groundwater potential zones in the mountainous terrain using Remote Sensing and Geographic Information System. Also, the analysis of 23 springs was done for discharge, lithology, land use, slope, orientation of exposure and uses of spring water. Maximum discharge was found to be 20 L/sec and minimum discharge was found to be 0.2 L/sec in dry season. Rocks such as phyllite, quartzite, dolomite, and slate are found around the spring and the spring water is used for domestic purposes, small scale irrigation and application of water mills. Likewise, after the analysis of lineament density, slope, lithology, land use, land cover, precipitation, drainage density and soil characteristics of the catchment and mapping of physical factors, demarcation of groundwater potential zones in the study area was done. >50% of the studied springs accounted for moderate to high potential for groundwater availability and >90% area of the catchment shows moderate potential for groundwater availability. Thus, for the improvement of agricultural productivity and wise use of water resources, further studies about the hydrogeology of the catchment is recommended.

O-HM-1-737

## Characterization of the Erosional State of the Malekhu River Watershed Using Rainfall Analysis, Hypsometric Analysis and Floodplain Mapping Along the Main Stem

Niraj Bal Tamang, Naresh Kazi Tamrakar Tribhuvan University E-mail: nirajbaltamang89@gmail.com

Erosional state within a watershed or along the river banks is mainly dependent upon the topography, rainfall condition, terrain materials, stream characteristics and landuse. The Malekhu River is a 24.83 km long sixth order river with the watershed area of 101.28 sq. km. and the average gradient 0.041 m/m. The river reaches have been classified as A4-, B4- and C4-type streams under the Rosgen's Level II criteria. The bankfull flow velocity and discharge were calculated using stream cross-section survey and empirical equations. Detailed mapping of floodplain and bank erosional features was done along the main stem river. Wolman pebble counting method was adopted to characterize sediment size distribution at transects along the main stem river. Stream order and subwatershed map was prepared in Arc GIS 10. Isohyetal maps were prepared for 1.6, 25, 50, 100 and 200 years return period using the rainfall data of the 5 different gauging stations around the Malekhu River Watershed (MRW) in Arc GIS 10 and MS-Excel. Majority of the land within the MRW consists of the forest area. The northern portion of the MRW is accessed with the Prithvi Highway, so the settlement is

dense around that portion. Stream characteristics such as bankfull parameters, bank erosional structures, aggrading/degrading potential, stream power were determined and the results showed aggrading character in most portion along with enough competency to move larger particles. Hypsometric analysis performed in Arc GIS 10 and MS-Excel showed the mature erosional stage for the MRW.

O-HM-1-858

## Precipitation in Three Agro-ecozones of Nepal: Time Series Analysis 1982-2012

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Understanding precipitation patterns according to agro-ecozones of Nepal is essential to cope with the anticipated changes in future precipitation due to climate change and its impacts on crop production. This study investigates the spatial and temporal changes of precipitation in three agro-ecological zones (Terai from Indo-Gangetic Plains up to 800 m altitudes), mid-hills (800 – 1800m) and high hills (above 1800 m) of Nepal. Time series analysis of mean annual rainfall of 62 meteorological stations covering far-western, mid-western, western, central and eastern development regions of Nepal from 1982-2012 has been carried out. We revealed increasing, decreasing as well as static properties of precipitation. In most parts of the Terai region we observe decreasing trend in precipitation while in high hills increasing trend was dominant. Just opposite characteristics of precipitation according to ecological regions were visible in some studied stations. If the observed trends in precipitation continue in future, especially in Terai region, the impact on crop production is likely to be mostly negative.

### *O-HM-1-858* Precipitation in Three Agro-ecozones of Nepal: Time Series Analysis 1982-2012

#### Hemu Kafle

Nepal Academy of Science and Technology Khumaltar, Kathmandu, Nepal

Understanding precipitation patterns according to agro-ecozones of Nepal is essential to cope with the anticipated changes in future precipitation due to climate change and its impacts on crop production. This study investigates the spatial and temporal changes of precipitation in three agro-ecological zones (Terai from Indo-Gangetic Plains up to 800 m altitudes), mid-hills (800 – 1800m) and high hills (above 1800 m) of Nepal. Time series analysis of mean annual rainfall of 62 meteorological stations covering far-western, mid-western, western, central and eastern development regions of Nepal from 1982-2012 has been carried out. We revealed increasing, decreasing as well as static properties of precipitation. In most parts of the Terai region we observe decreasing trend in precipitation while in high hills increasing trend was dominant. Just opposite characteristics of precipitation according to ecological regions were visible in some studied stations. If the observed trends in precipitation continue in future, especially in Terai region, the impact on crop production is likely to be mostly negative.

## Hydrometeorology Processes and Dynamics 2 (O-HM-2)

O-HM-2-152

## Towards Scientifically Sound Management: Experience from Climate-Smart Tamor River Sub-Basin Planning

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A management plan provides a framework for actions. A comprehensive scientific approach is adopted in preparation of climate-smart River Basin management plan for Tamor River subbasin with the aim of managing e-flow to ensure ecosystem integrity and services, and resource sustainability in the basin through an evidence-based planning. Tamor River basin a sub-basin of the Koshi River basin (area:  $\sim 60,400 \text{ km}^2$ ) covering an area of 6,073 km<sup>2</sup> and extending from 135 to 8,586 m in the eastern part of Nepal - drains about 11.3 billion m<sup>3</sup> water per year that is nearly 5% of total water yield (~225 billion m<sup>3</sup>) from Nepal (at the southern border of the country). The plan incorporates the results of analysis of existing hydro-climate, remote sensing, hydrological modelling and other published data. The planning process further involves a participatory method - fully consulting with local stakeholders. Tools for situation analysis, vulnerability assessment (Flowing Forward, and Climate Vulnerability and Capacity Analysis), and scenario analysis are expected to fully capture the issues, priorities, opportunities, and challenges on the water resource in the basin, and vulnerability of local communities and ecosystems to natural hazards and stress of climate change, filling the existing knowledge gaps and supporting decision-making. In this presentation, underlining the science for management, we share the purposed methodology, experience, and learnings in the planning process of Tamor River sub-basin plan.

### O-HM-2-432 An Assessment of Interannual Variation of Phenological Characteristics Using MODIS Data

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Remote sensing data can be the useful material for the observation of phenological shift of the vegetation. In correlation of these parameters with the climatic data may give the significant result of the changing climate. This study retrieved the seasonality parameters within the time frame of 2009 to 2015 by analyzing the MODIS NDVI data layer with the spatial resolution of 250m of 16 day composite. Within the past 7 years, this study extracted the phenological parameters by using TIMESAT program, fitted using Savitzy-Golay fitting method and mapped out change in NDVI in the given period using ArcGIS. The study was conducted in Southern aspect Phulchoki hill which consists of needle leaved close forest and other associates. This study indicates advancement of 28 days in Start of Season (SOS) and 32 days in End of Season (EOS) between first and last growing season within the interval of last 7 years. This study also indicates the variation of 32 days in length of season between longest and shortest period and peak NDVI value is increased by 0.1421 between 1<sup>st</sup> and 2<sup>nd</sup> season. This study also indicates the average length of growing season as 8.48 months.

### O-HM-2-440 Comparison of Satellite Rainfall Estimation over South Asian Monsoon Region

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To meet the needs of weather forecasters, climate scientists and hydrologists, an increasing number of satellite-based rainfall products are now available. This study compares two widely used satellite-based high resolution products over the South Asian Monsoon Region; Tropical Rainfall Measuring Mission (TRMM) Multisatellite Precipitation Analysis (TMPA) 3B42, Version 7 (3B42-V7) and Global Satellite Mapping of Precipitation, passive microwave radiometer (GSMaP MVK+) along with gauge-based interpolated gridded data Asian Precipitation Highly Resolved Observational Data Integration Towards Evaluation of Water Resources, Monsoon Asia (APHRODITE V1101R2). The preliminary results shows precipitation maxima exist over southern foothills of the Himalayas, and west coast regions of India and Myanmar. All products show high precipitation rates along the mountain chain, but with different magnitude and patterns. GSMaP MVK+ detected weaker precipitation over the Indian west coast region and over the Himalayan foothills than the other products. When compared to TRMM/PR 2A25, APHRODITE significantly overestimates precipitation over most of the regions except the western Himalayas and east coast of southern India. Further it is noted that TRMM 3B42 tends to overestimate the precipitation over the low-altitude areas of the central Himalayas (Nepal region).

*O-HM-2-503* 

### **Reservoir Inflow Forecasting Using GP and GEP Models**

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There are many inflow forecasting models using in practice to forecast the reservoir inflow. However none of the models are unique and it is necessary to develop the new models that give better results. In this study, monthly, fortnightly and weekly inflows are forecasted by using Gene Expression Programming (GEP) and Genetic Programming (GP) methods for a case study of Tanahun Hydropower Reservoir in Nepal. The best model is selected based on performance criteria of coefficient of determination (R2) and Roor mean square Error (RMSE). The best method is purpose for infow forecasting for reservoir for Tanahun Hydropower Project.

O-HM-2-667

### Spatial Trends of Precipitation and Extreme Weather Events in Centralwestern Hills of Nepal

Sanjaya Devkota<sup>1</sup>, Narendra Man Shakya, Karen Sudmeier-Rieux<sup>2</sup>, Anu Adhikari<sup>3</sup>, Michel Jaboyedoff<sup>2</sup>

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The Panchase region of Central-Western Nepal is known to have the highest rainfall events in the country, with an average of about 4,500 mm annual rainfall, most of which occurs in monsoon season (June-Sept). According to the literature precipitation trend have become more intense and one cause of more frequent triggering of debris flows and shallow

landslides in the region. The changing trends of precipitation over the last 35 years in Panchase region were examined using the observed time series (1980 - 2015) data from eight fairly reliable weather station (Pokhara-Airport, Bhadaure-Deurali, Lumle, Karki-Neta, Kusma, Syangia, Chapakot and Lamachaur) of the Department of Hydrology and Meteorology (DHM) Nepal. The data were examined and homogeneity test was implemented which was followed by non-parametric Mann-Kendall (MK) statistical test and Generalized Extreme Value (GEV) evaluation was applied in R (https://cran.r-project.org - free statistical software) using the package called "Kendall" and "Spatial Extreme" respectively to detect precipitation trends and extreme weather events in the region. The result indicated mostly negative (decrease) precipitation trends in all the weather station except in Karki-Neta. Bhadaure-Deurali weather stations showed the maximum number of negative trends (Kendall Tau = -0.11, Sens' slope = -0.46) followed by stations in Lumle (Kendall Tau = -0.05, Sen's slope = -0.27). Pokhara Airport (Kendall Tau= - 0.06. Sen's slope = -0.26) where as Karki-Neta showed positive Kendall's Tau (0.01) with no Sen's slope parameter. In most cases, annual trends were monotonic and statistically non-significant (higher p-value at 95% confident level) and the trend was found to be negative. However analysis showed that the annual sum of the precipitation over time (1980-2015) was more or less same with decreased number of wet days that have indication of increased intensity leading to more frequent extreme events.

O-HM-2-830

## Connection of Winter Time Precipitation System In and Around Nepal with Pacific and Indian Ocean Indices

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In wintertime (December-March), Nepal receives less amount of precipitation compared to summer. The winter precipitation system in Nepal is linked to the atmospheric variables associated with western disturbances. Additionally, this study covers larger-scale atmospheric circulation over the Indian and Pacific Oceans. The winter precipitation variability was found to be inflated by the westerly circulation passing through western Asia and moist air from the Arabian Sea. The winter precipitation (dryness) was related with positive (negative) Dipole Mode Index (DMI) and negative (positive) Southern Oscillation Index (SOI) with comparable correlations of about 0.4. Both DMI and Sea Surface Temperature (SST) of Indian Ocean revealed that they are in agreement with excess and deficit wintertime precipitation over Nepal.

O-HM-2-94

## Seasonally Separated Logistic Models to Assess the Impact of Atmospheric Variables on Occurrence of Rainfall in the Bagmati River Basin, Nepal

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This paper aims to develop some seasonal logistic models for prediction of rainfall (as wet day or dry day) and extreme rainfall (yes or no) on basis of daily rainfall data obtained from 25 stations installed in Bagmati river basin of Nepal and seven atmospheric predictors taken from NCEP/NCAR reanalysis data. Principal component analysis was used to construct 13 components for seven predictors. A day is referred as a wet day if area weighted daily rainfall (AWDR) is 1 mm or more. Extreme rainfall is determined by the 98thpercentile of AWDR. The time periods: 1981-2000 and 2001-2008 are considered as calibration and validation periods

for statistical modeling. Results show that geopotential height\_1 (first principal component) has the greatest influence (OR=16.498) in predicting a wet day during pre-monsoon. It is followed by air surface temperature\_2 (second principal component) with OR=4.757 in post-monsoon, relative humidity\_1 (OR=4.112) in winter and relative humidity\_2 (OR=3.601) in monsoon. The least influence is detected for sea level pressure\_1 (OR=0.012) in predicting a wet day across four models. Similarly, relative humidity\_2 has the highest contribution (OR=7.395) in predicting extreme rainfall in post-monsoon across all five models. It is followed by air surface temperature\_1 (OR=7.194) in monsoon, relative humidity\_1 in winter (OR=6.820) and pre-monsoon (OR=5.076), and relative humidity\_2 (OR=3.186) in year. These are the most influencing predictors in predicting an extreme rainfall day in respective season or year. Hosmer-Lemeshow test and deviance test are considered as model-fitting tools. Standardized deviance residuals and linear predictors are used for diagnostic tests.

## Hydrometeorology Processes and Dynamics 3 (O-HM-3)

O-HM-3-140

## Snow and Ice Melt Contribution to Discharge from Glacierized Hunza River Basin, Karakoram, Pakistan

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This paper presents the results of semi-distributed modified positive degree-day model (MPDDM) for estimating snow and ice melt contribution to discharge from glacierized Hunza River basin, Pakistan. Model uses daily temperature, precipitation data and positive degree day factors for snow, ice and debris as input parameters. Model is calibrated for the period 1995-2001 and is validated for 2002-2013, which demonstrate a close agreement between observed and simulated discharges with Nash-Sutcliffe Efficiency 0.90 and 0.88, respectively. Furthermore, the Weather Research and Forecasting model projected temperature and precipitation data from 2016-2050 are used for representative concentration pathway (RCP4.5) & (RCP8.5) and bias corrected using statistical approach. No drastic changes in future discharge is predicted for both emission scenarios. The aggregate snow-ice melt contribution is 39% to total discharge in the period 1993-2013. Snow-ice melt contribution ranges from 35% to 63% during high flow period (May to October) which constitutes 89% of annual discharge, and in low flow period (November to April) it ranges from 0.02% to 17% which constitutes 11 % of the annual discharge. Snow and ice melt contribution in total discharge will increase in future gradually and reaches up to 45.40% in 2041-2050. From sensitivity analysis it is found that combination of temperature 2°C and precipitation 20% increment shows 16% increase in discharge.

#### *O-HM-3-228*

### Frequency Analysis of Flood Flow at Chisapni Station Karnali River, Nepal

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This paper presents a frequency distribution analysis of maximum yearly flood in Karnali River at Chisapani station from 1962 to 2010. The Karnali River originates in the Himalayas in the Tibetan Plateau and flows through mountainous terrain of West Nepal. The flow carries snow-melt water and has significant discharge during dry seasons. The Gumbell extreme value type I is tested for maximum yearly flood analysis. The Gumbel's estimated discharges as 8914m<sup>3</sup>/s, 11719m<sup>3</sup>/s, 13576m<sup>3</sup>/s, 15358m3/s, 17664m<sup>3</sup>/s, 19391m<sup>3</sup>/s, 21113m<sup>3</sup>/s and 23384m<sup>3</sup>/s for return periods (T) of 2yrs, 5yrs,10yrs, 20yrs, 50yrs, 100yrs, 200yrs and 500yrs respectively. The analysis help to derive frequency curve for Chisapani station by using Gumbel extreme value type I. The results however, can vary between the flow gauge stations influenced by their geographical, topographical and climatic factors. The study can be used for planning and designing hydraulic structures such as bridges, dams, canals etc. The analysis can be extended into preparation of flood forecasting techniques and flood inundation maps for Karnali River to minimize downstream flooding.

O-HM-3-326

## Satellite Observations of Glacier Area Change using Landsat Images from 1976 to 2015 in the Gilgit River Basin of Pakistan

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The fate of the glaciers of Gilgit river basin is an issue of concern due to their rapid melting and retreat. However, there is an acute shortage of systematic large-scale observations of the extent and status of glaciers in the region due to the high altitude, inaccessibility of the terrain. and extreme climatic conditions. Here we present a remote sensing based comprehensive assessment of the current status and observed changes in the glacier extent of the Gilgit River basin. For each of the target years (1976, 1999, 2008 and 2015) land cover data was obtained through supervised classification (maximum likelihood algorithm) in ERDAS imagine, using Landsat images, topographic sheets, field observations and secondary data. The images were pre-processed and labeled according to the following legend: Rock/vegetation, clean glacier and debris glacier. Over the 39 years, most glaciers showed a slight reduction in area, which was most prominent at the glacier tongues with losses of around 5% of area. The total glacier area has decreased alarmingly, from 1541 km<sup>2</sup> (17.37%) to 982 km<sup>2</sup> (7.5%). Debris cover also significantly changed from 231 km<sup>2</sup> (1.75 to 137 km<sup>2</sup> (0.78%). Climate change appears to be mainly responsible for the significant amount of changes in glacier area in the Gilgit river basin. An inclusive understanding of the extent and nature of changes in glaciers will support downstream hydrological planning and water resource management.

## 0-HM-3-441

## Influence of Debris Cover on Surface Mass Balance Assessed from an Ice Flux Method, Changri Nup Glacier (Nepal)

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Debris-covered glaciers occupy more than 1/3 of the total glacierized area in the Everest region, yet the surface mass balance of these glaciers has not been measured directly. In this study, ground-based measurements of surface elevation and ice depth are combined with terrestrial photogrammetry and unmanned aerial vehicle (UAV) elevation models to derive the surface mass balance of the debris-covered Changri Nup Glacier, located in the Everest region of Nepal. Over the debris-covered terminus, the mean thickness change between 2011 and 2015 is -0.93 m ice/year or -0.84 m w.e.  $a^{-1}$ . The emergence velocity in this region, estimated from the total ice flux through a cross-section immediately above the debris-covered zone, is +0.45 m w.e.  $a^{-1}$ . The debris-covered portion of the glacier thus has a mean mass balance of -1.29 ±0.20 m w.e.  $a^{-1}$  between 5240 and 5525 m a.s.l. In comparison with nearby debris-free locations, the rate of mass loss is reduced by 1.7 m w.e.  $a^{-1}$ . It results that the surface mass balance is strongly influenced by the debris cover. The insulation due to the debris cover largely dominates the enhanced ice ablation due to the supra-glacial ponds and exposed ice cliffs.

O-HM-3-543

### **Climatic Trends and Glacier Variation in Two Mountain Basins of Nepal**

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Mountain environments are considered sensitive to climate change. Himalayan glaciers and icehave received an increased attention because of their sensitivity towards changing climate. Glaciers, ice caps, and snow cover plays important roles in reserving and supplyingmeltwater to river that is particularly very important during dry seasons. The melting of glaciers, changes in seasonality, snowfall, and water supply can affect the agriculture production, hydropower generation, ecosystem goods and services, and potential increases in the climate related hazards. Temperature and precipitation are two key indicator variables of climate. The glacierized West Seti and Tamor River basins are selected for case study representing two different climatic conditions of Nepal. Ground stations data, global and regional climate data products were used for the analysis of spatio-temporal patterns of temperature and precipitation. Parametric and non-parametric statistical tests used for climatic trend and variability analysis. Temperature and precipitation trends show a heterogeneous behavior in the basins. Most of the station data in both

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basins indicate an increasing trend of temperature.In general, we observed an increase of 0.042 °C yr<sup>-1</sup> in the Tamor basin and 0.036 °C yr<sup>-1</sup> in the West-Seti basin in 1975 to 2014. The station data indicates that the precipitation has no trend or slightly positive trend in the Tamor basin (1960s to 2014), but significantly negative trend with a rate of -14.3 mm yr<sup>-1</sup> after early 1990s, while in the West-Seti basin, a continuous negative trend (decreasing) with a rate of -4.2 mm yr<sup>-1</sup> is observed since 1960s.Glacier surface area and snow cover extend has decreased in both the basins. Since 1975 to 2014, the glacier surface area in the Tamor basin has decreased by 0.24 ± 0.29 % a<sup>-1</sup> (453 to 410 km<sup>2</sup>), while in the West-Seti basin by 0.32 ± 0.30 % a<sup>-1</sup> (336 to 295 km<sup>2</sup>), higher than in the Tamor basin.

O-HM-3-763

## Estimation of Discharge from Gilgit River Basin, Karakoram Pakistan Using a Glacio-Hydrological Model

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This paper provides the results of a semi-distributed modified positive degree-day model (MPDDM) for a sub- catchment of Upper Indus River basin in Pakistan. The main aim of the present study is to estimate the present and future daily discharge from Gilgit River basin using MPDDM. The MPDDM is calibrated for the period 1999-2005 and is validated for the period 2006-2010 with Nash-Sutcliffe values of 0.85 and 0.80 and volume difference of ~4.26 % and ~3.72 % respectively. Similarly, the relative contribution of snow and ice melt in the total discharge in the calibration and validation years are 27.71 % and 26.21 %, respectively. Furthermore, the projected precipitation and temperature data from 2016 to 2050 are obtained from the Weather Research Forecasting regional climate model, for the representative concentration pathways; RCP4.5 and RCP8.5. After bias correction, temperature and precipitation data are used as an input to the MPDDM for river flow projections. Between 2016 and 2050, the average discharge in the basin is 325.78 m<sup>3</sup>/s and 333.59 m3/s for RCP 4.5 and RCP8.5 scenario respectively. Projected discharge of the basin (2016-2050) shows increase in river discharge by 0.54 m<sup>3</sup>/s per year in RCP 4.5 and a decreasing trend by -0.28 m3/s per year in RCP 8.5 with the increase in snow-ice melt contribution of 31.01% in RCP 4.5 and 32.51 % in RCP 8.5. This model is good enough to estimate daily discharge from glacierized river basins and it can be used in climate sensitivity studies.

O-HM-3-88

### The Observed Headwater Flows of the Nepalese Face of Mount Everest

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Three new hydrological stations controlling the headwater flows of the southern side of the Mount Everest have been monitored since 2010, sponsored by the French AgenceNationale de la Recherche. They are completed by the hydro-meteorological observations of the Department of Hydrology and Meteorology of Nepal and by the joint project between the Everest-K2-CNR Association (Italy) and the Nepal Academy of Science and Technology. This original hydrological network is unique at these high elevations in CentralHimalaya. The analysis of the water budget shows excess water flows regarding the otherterms of the balance, which cannot be explained solely by glacier shrinking or groundwaterflows.

Analyzing the observed data a sub-daily time step, several stages that drive the flowregime have been detected: winter basic flows, snow melt and ice melt cumulated withmonsoon precipitation. The authors highlight that the uncertainties in the water balanceare due to two main factors: insufficient density in climate observations at the middleelevations (below 4000m), where heterogeneity is high, and an undeniable weakness of the devices installed for measuring solid precipitations at high elevations.

## Water Quality and Sanitation 1 (O-WQ-1)

O-WQ-1-236

Physico-chemical and Microbiological Quality of Traditional Water Resources in Kirtipur

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This study presents water quality of traditional water resources of Kathmandu. The water samples were collected from 14 different locations and analyzed for physico-chemical characteristics such as pH, electrical conductivity, total alkalinity, total hardness, calcium, chloride, ammonia, arsenic, total coliform and iron. The results were compared with World Health Organization (WHO) and National Drinking Water Quality Standard (NDWQS) limits. The result revealed that pH value ranges from 6.6 to 7.9. The water contained moderate amount of inorganic salts. Alkalinity values were within the range of WHO and NDWQS. Total hardness was 230 mg/l. The sample collected from pond, lake and dug well crossed the limit of WHO and NDWQS. Coliform was found in all the samples.

0-WQ-1-241

## Climate Resilience and Water, Sanitation, and Hygiene (WASH) Interventions in Nepal

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Realizing the fact that climate change could have direct and indirect impacts on Water, Sanitation and Hygiene (WASH) sector and ultimately public health, this study aims to comprehend if WASH interventions made in Nepal are climate resilient. Any interventions implemented by either government or non-government sector to enhance Water (quality, quantity, access); Sanitation (access, status, coverage); and Hygiene (personal and community hygiene promotion); was considered as WASH interventions. A trend analysis of meteorological parameters over a period of thirty years (1984-2013 AD) shows that, the temperature is increasing in faster rate in all Eco regions, especially in the Mountains. Mean annual precipitation shows no clear trend except for Terai, where it is in increasing trend. Effects of climate change vary differently in Nepal due to its ecological diversity. WASH interventions till date concentrated on the supply side. Systematic approach to address the issues of climate resilience is entirely missing. Meteorological trend possess double trouble for water quality and quantity. Coping capacity of current Water and Sanitation infrastructures with probable climatic effects is vulnerable. The emerging climate scenario demands climate resilient infrastructures and interventions. Designing Eco region based Water and Sanitation infrastructures with interventions in micro- catchment level can be climate resilient and sustainable. Twelve climate and disease vulnerable districts identified in this review document would be worth considering for building climate resilient WASH.

*O-WQ-1-483* 

### Assessment of Performance of Improved Tiger Toilets: A Pilot Study

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It is estimated that 2.5 billion people globally do not have access to "improved" sanitation facilities. Existing on-site sanitation technology has limited choices as they rely mostly on pit latrines, cesspits and septic tanks which are often difficult and expensive. The Tiger Toilet is a worm-based on-site sanitation system, which aims to speed-up the fecal decomposition using a bed of Tiger worms (Eisenia fetida) which degrade the feces and turns it into a nutrient rich fertilizer. Despite encouraging performance, it's improvement for efficient treatment fecal sludge is a subject of research. This study aims to find the best alternative of bedding materials and drainage layers suitable for the treatment of effluent and fecal sludge reduction. The lab scale Tiger Toilets were developed for four different bedding materials and drainage materials. The feeding of feces was done daily. The microbiological and chemical analysis was carried out twice a week. From the analysis, the combination of woodchip and coir was better bedding material whereas charcoal and sand was better drainage material. In pilot scale with combination of the optimized bedding and drainage material, the reduction of fecal sludge was 50%, TSS reduced by 99%, phosphorus removal was 71%, and E-coli was reduced from range 46000-110000 MPN/ml to 300-910 MPN/100ml. The study shows that proper design of vermifiltration system helps to treat fecal sludge with the potential disposal to environment without harm to human health. The improved performance of the optimized Tiger Toilet makes it a suitable on-site sanitation system for developing countries

*O-WQ-1-532* 

#### Investigating Arsenic Speciation in NawalparasiSediments

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There is scarcity of solid-phase arsenic speciation data in arsenic contaminated Nawalparasi region which impedes in understanding controls on arsenic mobility. We examined solid-phase arsenic speciation of alluvial aquifer sediments along a topographic gradient to understand controls on spatial patterns of solid-phase arsenic speciation in the upper gangetic floodplain. We used x-ray absorption spectroscopy, selective extracts, scanning electron microscopy and x-ray flourescence techniques for sediment analysis. Nawalparasi sediments have a complex stratigraphy with contrasting sediment origin. The aquifer sediments contain discrete layers enriched in arsenic. Redued arsenic species (arsenite and arsenic sulfide) increase with depth as well as down the topographic gradient from the foothill to the floodplain. The solid-phase arsenic speciation in Nawalparasi sediments seems primarily controlled by physiographic characteristics such as elevation; depth; seasonal water table.

O-WQ-1-538

## Geochemical Control on Arsenic Release Mechanism in the Upper Gangetic Plain

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Geogenic arsenic contamination in the groundwater is a major threat to the people living in Nawalparasi, Nepal. The upper gangetic plain has not been investigated extensively for

geochemical controls on arsenic release in compared to the middle and lower gangetic plain. We examined the hydrogeochemical characteristics of a shallow (less than 50 metres) alluvial aguifer in the Nawalparasi district of the Terai region to identify possible mechanisms and controls on geogenic arsenic mobilization in groundwater. Groundwater and river water samples from a topo-gradient flow-path and floodplain of a minor river draining the Siwalik forehills were analysed for physico-chemical parameters. The aquifer is characterized by ca-HCO3 type water and is multi-contaminated, with the WHO guideline values exceeded for arsenic, manganese and flourine. The middle portion of the floodplain was the most heavily contaminated with arsenic, predominantly as As (III). The river water had elevaed flouride. The sub-oxic conditions, dominance of As (III) and Fe2+ species and positive association between arsenic and both ammonia and UV-absorbance at 254 nm (Abs254) suggests that oxidation of roganic matter coupled with microbial mediated reductive processes are important for mobilizing arsenic in the aquifer. Other geochemical mechanisms such as silicate weathering and precipitation/dissolution of carbonate minerals, also control the maior ion composition of groundwater and the distribution of solutes in groundwater of the Nawalparasi district.

O-WQ-1-624

#### Water Quality of Different Sources of Kathmandu Valley, Nepal

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Nepal Academy of Science and Technology (NAST) has been providing drinking water quality analysis service since 2002. Water contaminated with physical, chemical and microbial contaminants are the modes of transmission of the number of infectious disease like diarrhea, dysentery, jaundice etc. So, work aims to analyze the physio-chemical and microbial analysis of different sources of ground and other sources of water quality of Kathmandu valley as pure. safe and clean drinking water is essential for well being of all human health. Realizing the health of the public and to fulfill the public demand of water quality analysis, study was conducted to evaluate the quality of drinking water from different sources and places of the valley for the year 2014. In total 928 water samples were tested and were compared with Nepal Drinking Water Quality Standard (NDWQS), 2062. Sources wise 38.15%, 13.36%, 21.66%, 2.37% and 24.46% water sample tested were of well, boring, treated, tap and from others respectively. Samples collected from places like Lalitpur, Kathmandu, Bhaktapur and others were of 39.44%, 27.16%, 5.6% and 27.8%. The samples were analyzed for physical, chemical and microbiological parameters and the results revealed that 75.86% of water samples analysed for microbiological parameter exceeds National Standard value likewise Iron Content 35.88%, Ammonia Content 31.25%, Turbidity 29.20% and Arsenic 0.32% exceeds National Standard value. To know the perception of people about the drinking water guality a guestionnaire survey was also carried out. Study revealed that tap water is taken as best source of water by most of people (31.76%) and most of people store water in tank (67.06%) and apply simple filtration technique (54.12%) to make their water drinkable. Few people comment that water pollution is mainly of sewage contamination and leachate of solid waste. Easy, simple and cost effective ways of water purification methods are needed to introduce to make alternative source of water drinkable.

0-WQ-1-861

## Water Security and Ecosystem Services in Mustang: Relevantcy of Environmental Virtual Observatory

Jagat K. Bhusal<sup>1</sup>, Wouter Buytaert<sup>2</sup>, Prem Sagar Chapagain<sup>1</sup>, Suman K. Regmi<sup>1</sup>, Santosh Regmi<sup>1</sup>, Praju Gurung<sup>1</sup>

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Mustang, located in the trans Himalayan region, is blessed with an appreciable amount of fresh surface water potential. Being in the rain shadow region, the monsoon brings about 60 to 70 percent of the annual rainfall in four months. Like other rivers in Nepal, Kaligandaki river in Mustang shows an uneven flow pattern, but relatively higher flows in dry months in compared to rivers in no rain shadow region of Nepal. Flash type floods occurred in streams and rivulets due heavy snow fall and avalanches. Annually, the available surface waters in quantity, exceeds more than the total amount of waters required for consumptive uses, but uneven distribution makes the region as water scares. Ecosystem services of Mustang, which are the base of livelihoods in the region since history, are subject to climate related pressures and vulnerabilities. The integrity of the mountain ecosystem is under pressure by the melting of snow and glaciers, changes in water availability, rainfall patterns, and soil degradation. Such processes are impacting to the ecosystems of the region. Environmental Virtual Observatory, a pilot study in Mustang promotes the citizen science for better management of ecosystems and support poverty alleviation.

O-WQ-1-861

### Water Security and Ecosystem Services in Mustang: Relevantcy of Environmental Virtual Observatory

Jagat K. Bhusal<sup>1</sup>, Wouter Buytaert<sup>2</sup>, Prem Sagar Chapagain<sup>1</sup>, Suman K. Regmi<sup>1</sup>, Santosh Regmi<sup>1</sup>, Praju Gurung<sup>1</sup>

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Mustang, located in the trans Himalayan region, is blessed with an appreciable amount of fresh surface water potential. Being in the rain shadow region, the monsoon brings about 60 to 70 percent of the annual rainfall in four months. Like other rivers in Nepal, Kaligandaki river in Mustang shows an uneven flow pattern, but relatively higher flows in dry months in compared to rivers in no rain shadow region of Nepal. Flash type floods occurred in streams and rivulets due heavy snow fall and avalanches. Annually, the available surface waters in quantity, exceeds more than the total amount of waters required for consumptive uses, but uneven distribution makes the region as water scares. Ecosystem services of Mustang, which are the base of livelihoods in the region since history, are subject to climate related pressures and vulnerabilities. The integrity of the mountain ecosystem is under pressure by the melting of snow and glaciers, changes in water availability, rainfall patterns, and soil degradation. Such processes are impacting to the ecosystems of the region. Environmental Virtual Observatory, a pilot study in Mustang promotes the citizen science for better management of ecosystems and support poverty alleviation.

## Water Quality and Sanitation 2 (O-WQ-2)

0-WQ-2-418

## Geochemical Controls on Arsenic Release Mechanism in the Upper Gangetic Plain

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Geogenic arsenic contamination in the groundwater is a major threat to the people living in Nawalparasi, Nepal. The Upper Gangetic plain has not been investigated extensively for geochemical controls on arsenic release in compared to the Middle and Lower Gangetic plain. We examine the hydrogeochemical characteristics of a shallow (<50 m) alluvial aguifer in the Nawalparasi district of the Terai region to identify possible mechanisms and controls on geogenic As mobilization in groundwater. Groundwater and river water samples from a topogradient flow-path and floodplain of a minor river draining the Siwalik forehills were analyzed for physico-chemical parameters. The aquifer is characterized by Ca-HCO<sub>3</sub> type water and is multi-contaminated, with the WHO guideline values exceeded for As, Mn and F. The middle portion of the floodplain was the most heavily contaminated with As, predominantly as As (III). The river water had elevated fluoride. The sub-oxic conditions, dominance of As(III) and Fe<sup>2</sup> species and positive association between As and both NH<sub>3</sub> andUV-absorbance at 254 nm (Abs<sub>254</sub>) suggests that oxidation of organic matter coupled with microbial mediated reductive processes are important for mobilizing As in the aquifer. Other geochemical mechanisms such as silicate weathering and precipitation/dissolution of carbonate minerals also control the major ion composition of groundwater and the distribution of solutes in groundwater of the Nawalparasi district.

O-WQ-2-500

### A Case Study on Assessment of Ground Water in Balkhu Area

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Water quality of drinking water is crucial from view of health prospect. It is directly concern with health matter. In this study, assessment of ground water of Balkhu area was carried out. Water samples were collected from local wells and tube wells. The chemical parameters such as iron, ammonia, ortho-phosphate and nitrate were investigated by spectrophotometric method where as total hardness, chlorine, total alkalinity, free carbondioxide and dissolved oxygen were tested by titrimetric method. The pH was measured by pH metre and conductivity was measured by conductivity meter. It was found that the ground water of Balkhu area was polluted. This is indicated by amount of ammonia was found to be 0.29 mg/L and amount of iron was 0.90 mg/L and 0.31 mg/L , which is obviously crossed the limit of WHO standards of drinking water. The amount of dissolved oxygen was found to be 4.02 mg/L which is less than WHO standards.

0-WQ-2-645

## Poly-Aluminum Ferric-Silicate Chloride, an Efficient Coagulant for Water Treatment

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The polyaluminum ferric silicate chloride (PAFeSiC) coagulant has been successfully prepared by co-polymerization techniqueat different (OH/AI) and (Al/Si) molar ratio. The

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coagulation efficiencywas evaluated and compared with conventional alum. After proper coagulant dosing in the sample water, the flocculation time was set for 8 minutes followed by sedimentation for 15 minutes. The best performance was obtained at 2.0 molar ratio of OH/AI and 7.5 molar ratio of AI/Si. The optimum pH range was found to be 7-8.5. The effective coagulant dose for efficient coagulation was demonstrated at 1.5 mg/L. Moreover, PAFeSiC resulted in very low residual aluminum concentration of about 0.021 mg/L. As compared to conventional alum, PAFeSiC showed much better turbidity removal and minimum residual aluminum content. Hence, PAFeSiC has proven to be a highly efficient coagulant for water treatment in comparison to conventional alum.

0-WQ-2-746

## Highly Porous Activated Carbon from Rice Husk for Removal of Residual Chlorine

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Chlorination is the simple, convenient and cost effective technique which has been widely used for the treatment of water. The residual chlorine in the drink water is fixed by WHO guide line. A free chlorine residual of 1.5 to 2.0 ppm (USA, EPA 1999) is acceptable in drinking water. However, excess of residual chlorine in drinking water may lead to serious problem and must be removed, because too high concentration imparts both odour and is harmful to human metabolism. Highly porous activated carbons were prepared by carbonization of rice husk in presence of different activating agents in an inert atmosphere of ultrapure nitrogen at 400oC for removal of residual chlorine. The adsorption capacity of these activated carbons wae evaluated by determining iodine and methylene blue numbers. Scanning electron microscope (SEM) revealed that all the activated carbons are highly porous (micropores and mesopores). Surface functional groups were determined by FT-IR spectra which show the presence of oxygenated surface functional groups. The specific surface areas of the activated carbons were determined by BET adsorption isotherm. The performance of the rice husk carbon in removing residual chlorine from chlorinated water was studied. Rice husk activated carbon is found to be highly efficient in removing residual chlorine.

O-WQ-2-765

### Water Security in Times of Rapid Urbanization and Environmental Change: Investigating Water Management Systems in Kavre Valley, Nepal

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Like many small towns in the mid hills of Nepal, Dhulikhel settlements are clustered around the ridge of a mountain, but unlike many others, the city lacks a higher elevation mountain landscape which could supply spring water. The challenge faced by this 'satellite town' has become more severe in the recent years, with escalating demand for water. For the last two decades Dhulikhel has tapped water from the mountain– called Bhumidanda, located 14kilometers away. But with the recent expansion of tourist services and other development infrastructure, Dhulikhel is once again struggling to achieve water security. The challenge will escalate with climate change and population growth. Based on a two year long field study involving socio-economic and hydrological analysis, we identify a number of challenges related to planning, governance of water management systems, though communities have

played important role in the absence of elected local government. But this is not going to be sufficient given the scale and severity of the challenges Kavre valley is facing on water insecurity. In particular, under an already variable climate with growing threat of climate change, such towns need more robust planning, management and national policy support to achieve water security. We found that water stakeholders both downstream and upstream make decisions with limited information and poor institutional capacity to undertake adaptive governance. Given this, we offer a scenario based assessment and planning that can help Kavre Valley water stakeholders to minimize water insecurity related risks in the changing socio-economic and environmental contexts.

O-WQ-2-856

## Study of Morphology, Mechanical, Thermal and Water Absorption Behaviour of Natural Fiber Based Polymer Composites

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Natural fibers (such as bamboo, sisal, wood fibers etc.) from various sources were subjected to different kinds of chemical modifications (such as mercerization, bleaching, silvlation, acetylation etc.) and their textures were investigated using Fourier transform infrared (FTIR) spectroscopy and scanning electron microscopy (SEM). This work deals with the comparative study on compatibility of neat and delignified natural fibers reinforced polymer composites based on isotactic polypropylene (iPP; Moplen PP562N, commercial product of Basell) and aliphatic-aromatic copolyester (Ecoflex<sup>®</sup>, commercial product of BASF, SE). The delignified fibers were prepared by using caustic soda followed by bleaching and was confirmed by the removal of characteristic peaks at 820 cm<sup>-1</sup>, 1250 cm<sup>-1</sup> and increase in peak intensity at 3400 cm<sup>-1</sup> and 1050 cm<sup>-1</sup> in FTIR spectra. The acetylation and silvlation on natural fibers in ionic liquids were also confirmed by appearing strong C=O stretching peak at 1740 cm<sup>-1</sup> and stretching and bending peaks of Si-OCH<sub>3</sub> at 1250 cm<sup>-1</sup> and 840 cm<sup>-1</sup> respectively. The different composition composites were prepared by melt mixing followed by compression molding. Results obtained by Fourier transform infrared spectroscopy, scanning electron microscopy, tensile testing, thermogravimetric analysis and water absorption tests were compared. In neat fiber loaded composites, the weak fiber/matrix interface adhesion acts as defects for deformation and are responsible for increased water absorption. Chemically treated fibers were found to be more compatible with matrix compared with neat fibers. In case of polypropylene composites the addition of maleic anhydride grafted polypropylene was found to be positive to enhance the filler matrix interfacial compatibility.

O-WQ-2-857

## Removal of Arsenic From Aqueous Solution Using Chemically Modified Sugarcane Bagasse

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Present study was carried out to remove arsenic from aqueous solution using chemically modified sugarcane bagasse. Modification was carried out using iron hydroxide as chemical additive. Arsenic removing experiment was based on batch method and performed at different pHs (pH 2, 3, 5, 7, 9, and 11) of aqueous arsenic solution by exposing 0.1-0.5 g of adsorbent at 30 min of exposure time. It was found that more than 90 percent arsenic was removed

when exposed adsorbing material to arsenic solution at pH 2-11. Maximum arsenic was removed when exposed 0.3 g of the material to 1 mg/L of arsenic solution at 30 m of exposure time. The result shows that chemically modified sugarcane bagasse may be an effective method of arsenic removal from aqueous solution.

## Mathematics, Statistics, Modeling and Analysis 1 (O-MS-1)

O-MS-1-170

# Selecting of Variables While Fitting a Multiple Regression Model for Forecasting

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Purpose of this study is to demonstrate, a procedure for selecting variables while fitting multiple regression model for forecasting when there are too many possible predictors. This study aimed to investigate an optimized parsimonious multiple regression model for rice production forecasting in Nepal. Firstly, a raw list of some twenty one predictors which were thought to have impact on rice production was collected. This list of the predictors scanned carefully through researcher's feelings about the subject matter, the insight, available literature, and experts' hunches and as per the availability of data for a particular predictor. vielded a list of eleven possible predictors. This list of the possible predictors was then subjected to the family of automated stepwise methods: forward selection, backward elimination and stepwise methods (forward selection with a backward review). At the end of these procedures a list of five potential predictors such as harvested area, rural population, farm harvest price, male agricultural labor force and, female agricultural labor force were put forward. The best subset regression option listed out the final appropriate predictors as the followings: harvested area, rural population and farm harvest price. Most often, not necessarily a model that consist all potential predictors would be the best model but a model of any subset of potential predictors does this.

O-MS-1-218

### A New Variant of Newton's Method with Fourth-Order Convergence

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In this paper, we present new variant of Newton's method for solving nonlinear equation with fourth-order convergence. This method is free from second order derivatives and is obtained by the linear combination of third order inverse harmonic mean Newton's method and inverse Wang method.

O-MS-1-242

## Mathematical Study of One Dimensional Temperature Distribution Model in Breast Tumor

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In this work, the temperature distribution in breast tumor is estimated using Pennes bio-heat equation from finite element method. The model deals the study of temperature distribution

on different layers – epidermis, dermis, subcutaneous, gland, muscle, and thoracis wall of female breast. We consider the tumor in gland layer. The method is applied to obtain the numerical solution of governing differential equation for one dimensional unsteady state bioheat transfer using suitable values of parameters.

O-MS-1-254

## Cross-sectional Analysis of Poverty Profiles and Socioeconomic Factors of Welfare among Nepalese Households

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This study focuses on the assessment of poverty and expenditure among 5,988 households of Nepal. It is based on the Nepal Living Standards Survey-III 2010/11 cross-sectional data. The data were used to analyze both descriptive and inferential statistics including poverty profiles and multiple regression analysis. The FGT poverty index (index proposed by Foster, Greer and Thorbecke) is employed to examine the head count rate or poverty incidence, poverty gap and severity poverty of Nepal. It reveals that 25.2% of the sample households live below the poverty line (Rs.19261 per individual per year) with an average poverty gap and squared poverty gap of 5.43% and 1.81 % respectively. The stepwise multiple regression analysis (with criteria "entry probability 0.05 and removal probability of 0.051") showed that household size, literacy, remittance receiving status, access to facility, PakkiGhar are the major factors associated with the real per capita expenditure in log scale.

O-MS-1-261

### Mathematical Model: Temperature Distribution in Laser in Situ Keratomileusis

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Lasers have been widely used in ophthalmology. Refractive errors are some of the most common ophthalmic abnormalities worldwide. Laser refractive surgeries were developed to correct different types of refractive errors. People with refractive errors have irregularities in corneal curvature. Laser in Situ Keratomileusis (LASIK) reshapes the corneal curvature making it flatter or steeper to counterbalance the refractive errors. Two types of laser surgical techniques: lamellar and thermal are available to reshape the corneal curvature. LASIK is a lamellar procedure where ultraviolet (UV) emitting argon fluoride (ArF) excimer laser is used to sculpt the cornea. In this paper, a finite element model is developed to investigate the temperature distribution of cornea in LASIK. Influence of different parameters of laser radiation in human eye tissues is investigated. The results are discussed, compared and validated with experimental results.

O-MS-1-279

## Theory and Numerical Solution of Microscopic and Macroscopic Pedestrian Movement

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Nowadays, pedestrian flow modeling has become more popular and has attracted the interest of an increasing number of scientist planners, and designers. The modeling for the pedestrian

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motion especially the modeling of evacuation scenarios has become very important in the last recent years. Due to the unpredictable nature of human decision making, the modeling of pedestrian behavior in a real world environment is a complex problem. We present here the deterministic and stochastic microscopic pedestrian models. Deterministic model is based on Newton's laws of motion whose corresponding Fokker-Planck equation is well known macroscopic Lighthill-Whitham-Richards (LWR) pedestrian flow model and the Stochastic pedestrian model is based on Itô stochastic process whose corresponding Fokker Planck is LWR pedestrian flow model with diffusion. We use Greenshield's model to control the velocity of the pedestrian depending on the density of the pedestrian. Here, we simulate pedestrian flow in 1-D geometry using microscopic deterministic pedestrian as well as stochastic pedestrian model. We compute the density of pedestrian in the domain in each time step and calculate the evacuation time of the pedestrian. A comparative study is also presented from the results obtained from both the models.

O-MS-1-288

### Mathematical Study of HIV transmission in Heterosexual Population

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The paper discusses a mathematical formulation of AIDS epidemic SIASe model in heterosexual population or HIV positive who are non-infectious. The existence of stability of disease free and endemic equilibrium point are also discussed. The model is further carried out for the study of ARV drugs on AIDS patients in the form of life expectancy.

O-MS-1-333

### Some Fixed Point Theorems in Dislocated Metric Space

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In 1984, S. G. Matthews introduced the concept of dislocated metric space in the context of domain theory. In 2000, P. Hitzler and A. K. Seda introduced the concept of dislocated topology and provided some variants along with dislocated metric space and established fixed point theorems. Since then, a number of fixed point theorems have been established by several authors in this space. In this paper we establish some fixed point theorems in dislocated metric space which generalize and improve some similar results in the literature.

O-MS-1-354

## Dynamical Study of Lotka-Volterra Prey-predator System Through DDE and SDE

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One of the most ecological applications of differential equation system is Lotka-Volterra prey predator problem. Delay differential equation (DDE) and stochastic differential equation (SDE) are very useful in many areas of applied sciences. In this paper, qualitative analysis of the prey predator system through DDE and SDE is analyzed.

## Mathematics, Statistics, Modeling and Analysis 2 (O-MS-2)

O-MS-2-908-I

## Mathematical Sciences : A Prerequisite for Nepal's Graduation to Developing Country Status

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Nepal's Graduation to Developing Country Status depends heavily on the scientific knowledge, technological skill and innovative capability of her people. No Science, Technology and Innovation isperfectin the absence of Mathematical principles, Statistical methods and Computational skill. Bringing them together under the title "Mathematical Sciences as an Umbrella Discipline" has become one of the most popular and promising area of study, research and application in the 21<sup>st</sup> century. Nepal, in order to attain GDCS, has to learn a lot from the knowledge and experience of the outside world, how to reform, transform and introduce radical changes in teaching, learning and use of Mathematics/Statistics/CST through a new programme that will, at least, make a certain minimal amount of mathematical know-how easily available, comfortably affordable and widely accessible for the welfare of all people irrespective of age, race, gender, colour, religion, language, ability, etc. (a) improve the quality and level of mathematics education so as to make the recipients able to face the problems and challenges of the science and technology dominated 21<sup>st</sup> century globalised world of work threatened by the lack of peace and disrespect of human-values; and, derive benefits from the opportunities generated by the new programme, (b) help advocate the idea contained in the slogan "Mathematics in All and All in Mathematics". Today, on behalf of NAMASTE- NAtionalMAthematical Sciences Team, would like to brief how, we have planned to launchan AiMS for AIMS through MAMS that will advocate Mathematical Sciences as an umbrella discipline.

#### O-MS-2-365

## A Comparative study of some compatible mappings in matric and fuzzy metric space.

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The study of common fixed point of mappings satisfying contractive type conditions has been a very active field of research during the last three decades. In 1986, G. Jungck introduced the notion of compatible mappings, which is more general than commuting and weakly commuting mappings. Since then, many authors have introduced different types of compatible conditions like weakly compatible, compatible mappings of type (A), compatible mappings of type (B), compatible mappings of type (C) and compatible mappings of type (P) to establish the fixed point. In 2014, we have introduced the new notion of compatible mappings of type (K) in metric space and further extended it to fuzzy metric space and established some common fixed point theorems with examples. The purpose of this paper is to discuss the interrelationship between the various types of compatible mapping with newly introduced compatible mappings of type (K).

O-MS-2-388

#### On Some Generalized Forms of Metric Space and Fixed Point

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The term *Distance Function* is customarily attributed to the metric associated with a metric space as introduced by M. Frechet in 1906. The metric space is an indispensable intermediate in course of evolution of the general topological spaces. Based on the impact and utility of this notion, several interesting generalizations have been attempted such as semi-metric space, fuzzy metric space, statistical metric space, partial metric space and complex metric space. The main purpose of this presentation is to discuss briefly some generalized forms of metric space with applications relative to fixed point.

O-MS-2-419

## Study of Deterministic and Stochastic Single-Species Population Models and Parameter Estimations

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The growth of the population modeled by deterministic equations may not capture the natural phenomenon of the growth. The population dynamic could be affected by the some random environmental noises. Here, we study the very well known single-species Malthusian population growth model and Pearl-Verhulst logistic growth model by introducing in them white-noises. The resulting models are the stochastic differential equations or also known as Itô processes. We also present the procedures to estimate the parameters involved in the deterministic as well as stochastic population growth models. In the deterministic model, we use least square techniques and in the stochastic model, we use non-parametric estimation procedures to estimate the parameters.

O-MS-2-439

## A Common Fixed Point Theorem in Semi-metric Space Using E.A Property

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In 1922, Polish mathematician Stephan Banach established Banach's Contraction Principle. Since then it has become milestone to the researchers in analysis to establish new theorems by generalizing this theorem. K. Menger in 1928 introduced the notion of semi-metric space as generalization of metric space. The purpose of this paper is to establish a common fixed point theorem in semi-metric space using E.A property which generalizes the existing similar results in literature.

O-MS-2-629

## Effect of Temperature and Rainfall variation in Wheat Productivity of Nawalparasi District. A log linear Analysis

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A study was made in Nawalparasi District of Nepal to measure the effect of temperature and Rainfall variation in the Wheat Productivity. Tempeature and Rainfall Data of the last 30 years

were obtained from the Department of Hydrology and Meterology. Similarly Production data of Wheat of the last 30 yrs was obtained from the District Agriculture Development Office, Nawalparasi. Impact of cumulative rainfall from CRI to heading Period and temperature of post anthesis period on wheat was studied. With the availability of the data regression analysis was done and it was found that data were best fitted in OLS. It was found that the model has R-square of 0.71. The coefficient of the elasticity of the total Area under wheat is found to be 1.38 indicating that 1% change in Area will change the productivity of wheat by1.38%. The effect of Temperature on wheat productivity was statistically significant with coefficient of the elasticity of Temperature to be 1.74 indicating that 1% change in Temperature will bring 1.74 % change in wheat productivity. It was found that the effect of rainfall was statistically non-significant positive (P > 0.384) for wheat crop. This is because there is very good facilities of irrigation in Nawalparasi district. Also the residual moisture left by Rice is quite enough for wheat cultivation. 1% change in the Rainfall was found to change the productivity by 0.29%. The productivity of wheat was found to be change by 0.26% per year.

O-MS-2-788

### Reliability Evaluation of Time Dependent Semi – Repairable System

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This paper deals with the reliability evaluation of semi-repairable three state system. The system has subsystems and in each subsystem there are components. Each component has different performance rates - failure, semi - failure and repair. Under the study machines fail in Poisson fashion with the rates lamda and are repaired exponentially with time dependent rates mu. Reliability of each component, each sub system and the whole system are evaluated. Also the state probability distributions are also obtained. Some numerical results have also been illustrated so as to show that the model under study has its ubiquitous present and potential applications.

O-MS-2-826

## Transient Analysis of Tandem Queueing Model with Poisson Bulk Arrivals and State Dependent Service Rates

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In this paper we analyze a three-node queueing model with the provision that the arrivals follow non-homogeneous compound Poisson process. The service rate at each node depends up on number of customers in the queue. Customers in variable batch sizes arrive in non-homogeneous Poisson fashion in the series of three queues,, and which are served in Poisson process with the rates , and respectively. The main objective is to obtain various measures of performance in explicit form by using difference-differential equations and probability generating function.

## Medical Sciences: Basic Medicine 1 (O-BM-1)

*O-BM-1-911* 

### **Re-innovating Neurological Tools and Techniques**

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Neurosurgeons regularly come across many difficulties while trying to deliver technologies they have leaned either abroad or in their home country. Many such frustrations lead to inadequate utilization of the skill and knowledge they have acquired over time. Financial issue is another major problem we face constantly since majority of the patients are paying out of their pocket. To overcome this issue, we feel that the surgeons should be properly oriented to technology and should develop the capability to re-innovate tools and technology to meet the demand so that our surgical goals are achieved without compromising on the quality. We would like to share our experience of initiating and gradually developing a neurosurgical department so that we could give the best to our patients without giving much financial burden to them. We give different examples how we innovated new ideas to deliver the service and this technique can be utilized in other centers as well.

O-BM-1-20

### Hunting Novel Protein Involved in Cancer Pathogenesis

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High content protein interaction screens have revolutionized our understanding of protein complex assembly. However, one of the major challenges for translation of high content protein interaction data is identification of those interactions that are functionally relevant for a particular biological question. To address this challenge, we developed a Relevance Ranking Platform (RRP), that combines both functional and bioinformatic filters to provide a relevance rank among the interactome proteins. We demonstrate the versatility of RRP to enable a systematic prioritization of the most relevant interaction partners from high content data; highlighted by the analysis of cancer relevant protein interactions for oncoproteins Pin1 and PME-1. We validate importance of selected interactions by demonstration of PTOV1 and CSKN2B as novel regulators of Pin1 target c-Jun phosphorylation, and reveal previously unknown interacting proteins that may mediate PME-1 effects via PP2A-inhibition. In summary, the data presented here introduces a novel approach to address one of the major challenges in functional translation of high content protein interaction data. The RRP framework presented in this work can supposedly be modified to answer versatile research questions depending on the nature of the biological question under study. Importantly, the data indicate that RRP has clearly added value especially for analysis of protein interactions for which there is no sufficient prior knowledge available for using existing filtering tools.

O-BM-1-49

## Nephro-Protective Action of Aspirin in Gentamicin Induced Nephrotoxicity in Wistar Albino Rats

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Gentamicin is commonly used for treatment of gram-negative infections. However, their efficacy is counter balanced by nephrotoxicity mediated by oxidative stress. Administration of antioxidant compounds can prevent nephrotoxicity. In this study; possible nephron-protective action of aspirin was observed through the evaluation of their histopathological effects on rat's kidney.Thirty-two rats were randomly divided into four groups, each consisting of eight animals. Group I (control) was injected (i.p.) 1ml of saline per day. Group II and group III were injected aspirin and gentamicin respectively in single dose of 100 mg/kg i.p. daily. Group IV was given 100 mg/kg aspirin with same dose of gentamicin daily. All groups were treated over a period of eight consecutive days and on 9<sup>th</sup> day; rats were sacrificed. Kidney slides were prepared microscopic examination. ANOVA and Mann-Whitney test were used for data analysis. Results showed significant decrease in body weight by 3.76±2.19 % and increase in kidney weight (Control: 0.64±0.07 gm) after gentamicin treatment (0.92±0.02 gm), however, it improved with aspirin treatment (0.83±0.01 gm). The dilated renal tubules (PCT: 43.74±5.29µm; DCT: 40.38±4.73µm), reduced renal space (3.23±1.48µm), the hypertrophied renal corpuscle (106.22±7.64µm) and glomerulus (99.40±6.98µm), epithelial damage of tubules, cytoplasmic vacuolation caused by the gentamicin treatment were found to be normalized in kidney of gentamicin with aspirin treated rats suggesting its nephron-protective effects. However, small areas of interstitial hemorrhage and vascular congestion were observed. The rest of the changes produced by gentamicin were completely prevented by aspirin treatment. Thus, aspirin prevents toxic effects of gentamicin due to its possible antioxidant mechanism.

O-BM-1-54

## Re-use of Rapid Diagnostic Kit as a Source of DNA for Molecular Method of Kala-azar Diagnosis in Nepal

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Kala-azar is caused by protozoan parasite *Leishmaniadonovani* and transmitted by the bite of tiny female sandfly. It is endemic in the Terai region of Nepal, however, sporadic cases were reported from hilly regions including capital city. There are global concerns to control, eliminate, this disease mainly through the improvement in early diagnosis, and prompt treatment. Microscopy is still considered as a gold standard for diagnosis of kala-azar. However, a great disadvantage of microscopy is the requirements of infrastructures, supplies and to be performed by well-trained personnel. Rapid diagnostic tests (RDTs) are used to improve diagnosis. We evaluated Leishmania RDTs as a DNA source for quality control method and for further molecular surveillance. One hundred and forty seven samples were obtained from suspected kala-azar patients from different districts in Nepal for proper

diagnosis and treatment. Blood accumulated RDTs were used for DNA extraction. As a proofof-principle, we used a nested PCR method with primers targeting the parasite's minicircle kinetoplast DNA. We were able to detect up to one parasite per microliter even from samples stored at room temperature for 3 months. The diagnostic capacity of the RDTs assessed by PCR positivity, showed a sensitivity of 61% and specificity of 71%. We showed that it was possible to detect very low *Leishmania* parasites in RDTs using a PCR-based method. DNA can be extracted from used RDTs. Reuse of RDT is safe, cost-effective, and field adapted, it does not require highly invasive procedures, and easy to use for molecular surveillance methods.

O-BM-1-57

## Comparative Study of Dose Distribution in 3d Conformal and Simulated 2d Plan of Lung Carcinoma

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In this modern era, Radiation therapy is adopting newer and newer technology. In our center, we have started 3DCRT in 2007. Undoubtably 3DCRT would be better choice of treatment than 2D system. We have calculated the dose variation in 2D and 3DCRT plans and evaluate them with conformity index and heterogeneity index. Twenty five patients with lungs carcinoma were taken for this study. Both plans were prepared on the same patient body in EclipseTPS. The acceptable plans were optimized and compared for dose distribution. The conformity index and homogeneity index were calculated using the following relations from ICRU guidelines. Conformity index (CI) = Vdp/Vptv, Where Vdp = volume at 95% dose, Vptv = Volume of PTV, Heterogeneity index (HI) = D2% - D98% / D50%, Where D2% = Dose at 2%volume of PTV, D98% = Dose at 98%volume of PTV, D50% = Dose at 50%volume of PTV. The Conformity Index (CI) for 3D plan varies from 0.90 to 0.99 which indicates the smaller variation and hence better coverage of PTV while for 2D plan it varies from 0.56 to 0.99 indicates the poor coverage in many cases. The Heterogeneity Index (HI) value for 3D plans varies from 0.095 to 0.26 indicating smaller heterogeneity and hence less hot and cold spot, while in 2D plans it varies from 0.080 to 0.46, with indication of poor coverage and more hot and cold spots.

O-BM-1-70

## Incidence of Acinetobacter baumannii in Post-Tracheostomised Patients in Tertiary Care Hospital in Nepal

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This study was performed to determine the incidence of *Acinetobacter baumannii* in posttracheostomised patients. Three hundred fifty clinical specimens from tracheostomised patients were collected and *Acinetobacter* spp. was identified by standard microbiological techniques and antibiotic susceptibility testing was done by Kirby Bauer disc diffusion method following Clinical and Laboratory Standard Institute (CLSI) guidelines. Further, *A. baumannii* was identified by gelatin hydrolysis, growth at 37°C and 44°C and ability to produce acid from various carbohydrates. *Acinetobacter* spp. was observed in 31.8% of all processed samples with *A. baumannii* occurring in 63.3% among total Acinetobacter isolates. More than half of *A. baumannii* were MDR (66%). High resistance was shown for Ampicillin (100%), Amikacin (88%), Amoxycillin-Clavulanic acid (94%), Cephotaxime (96%), Ciprofloxacin (92%), Cotrimoxazole (98%), Gentamicin (86%), Piperacillin- Tazobactam (94%) and Ofloxacin

(80%) and low for Chloramphenicol (38%), Imipenem (38%) and Meropenem (32%). No and least resistance was observed for Polymyxin B (0%) and Colistin (2%) respectively. Multidrug resistant (MDR) *A. baumannii* has emerged as an important cause of infection in critically ill patients in the hospital under study. Strict infection control measures may prevent infections and high mortality.

Contamination of Patients' Medical Chart: a Potential Source of Nosocomial Infection

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Medical charts are common inanimate objects potentially contaminated by pathogenic bacteria due to their direct contact with health-care professionals (HCPs) whose hands may be contaminated thus acting as vehicle in spreading nosocomial infections (NIs). This study aimed to assess the prevalence and antimicrobial susceptibility profile of microorganisms isolated from patients' medical charts. A total of 250 medical charts randomly selected from special units (n=100) and general wards (n=150) were sampled using sterile swabs moistened with sterile normal saline. The swabs were immediately transferred to trypticase sov broth and incubated aerobically for 48h followed by subculture on macconkey, blood and eosin-methylene blue agars. Microorganisms were identified by the standard microbiological methods and antibiotic susceptibility testing was done by Kirby Bauer disc diffusion method. Eighty nine percent of charts in special units (n=89) and 84.6% charts in the general wards (n=127) were contaminated with pathogenic or potentially pathogenic (opportunistic) bacteria. Coagulase negative staphylococci were the most common contaminant in general wards (n=60, 38%) and Staphylococcus aureus in special units (n=32, 28.3%). Other bacteria isolated include multidrug-resistant Acinetobacter spp., Pseudomonas aeruginosa, Citrobacter freundii and Klebsiella pneumoniae. The current study showed that patients' medical charts were usually contaminated with pathogenic and potentially pathogenic bacteria thus may act as source of pathogenic bacteria and cross-infection in hospital. Strict hand washing by HCPs before and after handling patients' medical chart is recommended to reduce the NIs.

## Medical Sciences: Basic Medicine 2 (O-BM-2)

O-BM-2-111

O-BM-1-71

### **TRAP1: A Novel Target for Cancer Therapeutics**

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Cancer, defined as a group of diseases caused due to abnormal genetic and epigenetic alteration in normal cells resulting in uncontrolled growth and metastasis. It has become one of the major killer diseases in the 21st century with deaths reaching more than 8 million in 2012. TRAP1, a homolog of the recently labeled cancer chaperone, Hsp90 has come into the limelight because of its extra-ordinary role present in various cancerous cells and cell lines. TRAP1 is primarily located in the mitochondria; however, lately several extra mitochondrial functions have also been described. TRAP1, being chaperone has been found to function in the stability of proteins and also for the interaction between various related proteins

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responsible for mitochondrial fission. Although direct relationships are yet to be discovered, research for active participation of TRAP1 during mitochondrial function has become an active area of interest in the field of cancer biology. Recent studies have suggested the novel role of TRAP1 in survival and proliferation of cancer cells. The relative lower abundance of TRAP1 in normal cells with significant increased amount in the corresponding tumor cell lines suggest the additional function of TRAP1 in the mitochondria and extra mitochondrial sites of cancer cells. With the present state of cancer patients suffering from the risk of emerging drug resistance, TRAP1 inhibition with drugs such as Gamitrinib-triphenylphosphonium (G-TPP) that can subsequently lead to mitochondrial dysfunction, can be a novel target for cancer therapeutics. Their comparative discrimination for differential expression in normal and cancerous cell lines means the inhibition of TRAP1 can be used among wide range of cancer patients with relatively lesser consequences when compared to the existing cancer therapeutics.

O-BM-2-314

## Association between Serum Uric Acid, Urinary Albumin Excretion and Glycated Haemoglobin in Type 2 Diabetic Patient

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To examine a linear association between serum uric acid concentration, microalbuminuria as well as age, age at onset, duration of DM, blood pressure (BP), body mass index (BMI), and HbA1c in T2DM patients. This cross sectional study included 50 Type 2 diabetes mellitus patients. Type 2 diabetes mellitus was diagnosed according to the WHO criteria. Nephropathy was graded as follows: normoalbuminuria, urinary albumin excretion less than 30 mg/L; microalbuminuria, 30 to 300 mg/L; or macroalbuminuria, more than 300 mg/L. Serum uric acid concentrations were measured by enzymatic method (uricase-peroxidase). The HbA1c was measured using the principle of dry chemistry. Similarly urinary albumin excretion was measured with an immunoturbidometric assay. Mean serum uric acid concentration was 6.75 ± 1.36mg/dl. Serum uric acid concentration was higher in patients with microalbuminuria (7.54  $\pm$  1.39 mg/dl) than in patients with normoalbuminuria (6.44  $\pm$  1.23 mg/dl, p = 0.009). In addition Serum uric acid concentration was higher (p=0.002) in patients with hypertension  $(7.26 \pm 1.48 \text{ mg/dl})$ , than in patients without  $(6.10 \pm 0.82 \text{ mg/dl})$ . Serum uric acid concentration correlated positively with urinary albumin excretion (r=0.323, p<0.05), age (r=0.337, p<0.05), age at onset (r=0.341, p<0.05), and duration of DM (r=0.312, p<0.05). Multiple regression analysis demonstrated that Serum uric acid concentration ( $\beta$  = 0.293, p < 0.0001), duration of DM ( $\beta$  = 0.261, p < 0.0001), HbA1c ( $\beta$  = 0.173, p < 0.005), and systolic blood pressure ( $\beta$  = 0.268, p < 0.005) were independent determinants of urinary albumin excretion. The findings extend the knowledge on the relationship between uric acid concentrations, microalbumin, HbA1c and associated confounding variables among the researchers which highlight the importance of screening for microalbuminuria to prevent renal impairment and measuring HbA1c level on a regular basis for good glycemic control are important in diabetic patients.

O-BM-2-332

## A Study on the Cytotoxicity of Test Molecules as the Potential Antisense Carrier in Cytosolic Drug Delivery Strategy

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The development of an ideal drug delivery strategy has always been the prime need in medicine for effective disease treatments. In this study, the cytotoxicity of the test molecules

was evaluated along with the controls: polyethylenimine (PEI) and Dextran. The work was initiated by treating HeLa cells with PEI, Dextran and six different formulations of two test substances named as 'Shuttle' and 'Pore protein'. The incubation period after the treatment was for 3 days. These two test molecules had to be evaluated for their effectiveness and toxicity to be potential antisense oligonucleotide (ASO) carrier molecules in drug delivery strategy. MTT assay was carried out for cell viability observation. T-test was performed for statistical analysis. Most of the test molecule formulations showed quite good results, for example, the shuttle protein had no toxicity when conjugated with ASO. Pore protein alone was also found to produce encouraging results with increase in cell viability all along except during the 72nd hours after treatment. Pore protein conjugated with shuttle protein and ASO produced impressive result with the cell viability above 100%. Overall, the cytotoxicity of the test substances examined was found not to be high except at different time intervals after the treatment. Their conjugation with ASO was the most promising result seen in the test where HeLa cell growth was flourishing even at high concentrations. These results suggest that the novel test substances examined could be potential carrier molecule in drug delivery strategy.

*O-BM-2-400* 

#### Mathematical Modeling of Urea Concentration Distribution in Haemodialysis

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A haemodialysis device is used to purify impure blood and usually a dialysis process is carried out to separate urea up to some extent from blood. The present study is carried out for the urea concentration distribution in the blood during haemodialysis using reaction diffusion equation with appropriate boundary conditions. The Galerkin approximation method is used to solve the model equation.

*O-BM-2-461* 

#### **Evaluation of DeRitis ratio in Liver Associated Diseases**

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Liver diseases are one of the common disorders encountered in clinical practice. Investigations in liver associated diseases are used to detect type of hepatic abnormality, to measure its severity, to define its structural effect on the liver, to find out aetiology of disorder, to assess prognosis and to evaluate therapy. One should aim at a diagnosis with simple and possibly non-invasive means, avoiding extensive examinations. De Ritis ratio (the ratio of serum aspartate aminotransferase to serum alanine aminotransferase) has been proposed a valuable diagnostic marker to screen liver disorder. To assess the Significance of De Ritis ratio as a diagnostic marker in population of hepatic disorder. This is a retrospective study performed on records of 102 patients with liver diseases who were treated at the out-patient clinic or admitted to Nobel Medical College, Biratnagar, Nepal between 15/June/2015 -15/July/2015. De Ritis ratio of all the patients were calculated from documented biochemical tests of AST and ALT. De Ritis ratio and Demographic profile of all the patients were analyzed by independent t-test and one way ANOVA using software SPSS 20 version. De Ritis ratio was significantly decreased (p<0.05) in viral hepatitis (.8006±.14811) than the control group (1.0934±.13508) and markedly increased (p=0.000) in alcoholic liver disorder. Similarly, It is significantly increased (p<0.05) in NAFLD (1.2204±.17954) whereas insignificantly increased (p= 0.408) in cholestasis (1.1378±.18045). De Ritis ratio can be used as a prognostic marker of liver disorder and can be considered as non-invasive, cost-effective means of screening liver diseases.

O-BM-2-535

## Detection of Inducible Clindamycin Resistance Among *Staphylococcusaureus* Isolates from Clinical Specimens

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Now-a-days resistance to antibiotics by Staphylococcus aureus is an increasing problem. This has lead to the renewed interest in the usage of macrolide-lincosamide-streptogramin B (MLSB) antibiotic to treat S. aureus infection. Resistance against MLSB antibiotic may be inducible (iMLSB) or constitustive (cMLSB). By standard susceptibility test method the iMLSB phenotypes are not differentiated, but can be distinguished by erythromycin-clindamycin disk approximation test (D-test) and demonstration of resistance genes by molecular methods. The main objective of this study was to detect the presence of inducible clindamycin resistance among clinical isolates of Staphylococcus aureus by D-test. Eight hundred and thirty various specimens were processed during the study period, March 2015 to September 2015 in B and B hospital. All the Staphylococcal aureus isolates were identified by standard microbiological methods. Antibiotic susceptibility testing was performed by Kirby Bauer disc diffusion method and inducible clindamycin resistance (iMLS B) was detected by using D-test. Among the 76 isolates of S. aureus 17 (22.4%) were found to be inducible clindamycin resistance of which 15 (88.2%) were MRSA and remaning 2 (11.8%) were MSSA. iMLSB resistance was found to be associated with MRSA. On the contrary, susceptibility to both erythromycin and clindamycin was found to be associated with MSSA. However, cMLSB and MSB (macrolide-streptogramin B) resistance was not associated either with MRSA or MSSA. D- Test should be performed routinely to identify inducible clindamycin resistance, for the effective treatment.

*O-BM-2-663* 

## Antibiogram of *Salmonella* Serotype Typhi and Paratyphi Isolated from Patients Suspected of Enteric Fever

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Enteric fever is an ancient disease but still it is an important public health problem in developing countries including Nepal. A changing antibiotic susceptibility pattern of *Salmonellatyphi* and *Salmonella paratyphi* A and emergence of multi drug resistance has increased to a great concern globally. The present study was conducted to determine the antibiogram of *Salmonella* serotype *typhi* and *paratyphi* isolated from patients suspected of enteric fever. A prospective study was carried out from July 2012 to August 2012. The positive samples of *Salmonella* were collected from Alka hospital by streaking in Nutrient agar slant and transported aseptically to the Nepal Academy of Science and Technology (NAST) laboratory for the further identification of strains and antibiotic susceptibility testing. Antibiotic susceptibility test was performed by modified Kirby-Bauer disc diffusion method and results were interpreted by Clinical Laboratory Standards Institute (CLSI), 2012 guideline. A total of 47 *Salmonella* serotype isolated from 896 blood culture samples revealed almost equal infection in male and female. Age wise infection rate indicated higher among the age group less than 10 years. *S. typhi* was isolated in 46.81% of cases while *S. paratyphi* A in 53.19% of cases. Both *S.typhi* and *S.paratyphi* A were found to be 100% susceptible to drugs

amoxicillin, chloramphenicol and ceftriaxone. Susceptibility to ofloxacin was 100% in *S.typhi* and only 64% in *S. paratyphi* A. Similarly susceptibility of gentamicin, co-trimoxazole, ampicillin and nalidixic acid was 95.45%, 86.36%, 90.90% and 13.64% and 76%, 88%, 64% and 4% for S.Typhi and S. Paratyphi A respectively. *Salmonella paratyphi* A was observed as a rapidly emerging pathogen of enteric fever. There is increasing resistance of *S. typhi* and *S. paratyphi* A to many antibiotics and also there is re-emergence of chloramphenicol sensitivity in both strains of *Salmonella*.

## Medical Sciences: Basic Medicine 3 (O-BM-3)

O-BM-3-537

## Spectacled Cobra Naja Naja (Linnaeus, 1758) Envenoming to A Snake Conservationist and Essential of Snakebite Training for Health Staff: Report

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The Spectacled cobra (Naja naja) is one of the venomous snakes of the Elapidae family which inflicts fatal bites. World Health Organization defined this snake as highest medical importance in Nepal. It is distributed throughout the lowland to Midland region of Nepal. The present study shows a case report of snake conservationist who was bitten accidentally in the right forearm by the Spectacled cobra during the snakebite awareness and snake conservation field visit in Sindhuli, Nepal. Symptoms of local envenoming were pain, bleeding, inflammation and abscess formation. Systemic symptoms included nausea, vomiting, blurred vision, double vision and ptosis. Indian polyvalent antivenom was administered immediately to neutralize the maximum circulating venom. The findings highlight the effectiveness of antivenom. Realization of training for health staff during the field visit was accomplished by organizing the training in Sunsari, Nepal.

O-BM-3-715

## Comparative Study of Gene Xpert MTB/RIF Assay and Multiplex PCR for Direct Detection of Mycobacterium Tuberculosis

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Tuberculosis (TB) is one of major infectious diseases in developing countries. The control and management of TB is very difficult in developing country like Nepal due to lack of rapid and efficient diagnostic tools. Early detection of TB cases is the key to successful treatment and reduction of disease transmission. Hence, in this study Gene Xpert MTB/RIF assay (Gene Xpert assay) and Multiplex-Polymerase Chain Reaction (MPCR) targeting IS6110 segment and MPB64 gene for direct detection of *Mycobacterium tuberculosis* complex (MTBC) in suspected pulmonary tuberculosis (PTB) patients were evaluated. A total of 105 specimens from the clinically suspected PTB patients were included in the study. While testing for MTBC, out of 105 specimens, Gene Xpert and MPCR assay were positive in 37 and 40 specimens respectively. Positivity was shown in 7 specimens by smear, culture and MPCR, while

negative by Gene Xpert assay. Out of 40 MPCR positive specimens, targeting MPB64 gene and IS6110 segment were positive in 32 and 40 specimens respectively. While comparing the Gene Xpert assay results with culture, the sensitivity, specificity, positive predictive values and negative predictive values in 95% confidence interval (CI) were 82.1%, 92.4%, 86.5% and 89.7% respectively. However, these values for MPCR assay with reference to culture in 95% CI were 100%, 98.5%, 97.5% and 100% respectively. Gene Xpert assay and MPCR showed good sensitivity and specificity for diagnostic tools for the confirmation of the PTB but MPCR could be useful for rapid, accurate and cost effective diagnosis of PTB in resource-limit country that is endemic for tuberculosis.

O-BM-3-723

## Cystatin-C as a Marker for Renal Impairment in Preeclampsia

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Preeclampsia is a multisystem disorder of unknown etiology characterized by development of hypertension with proteinuria after 20 weeks of pregnancy in previously normotensive and non-proteinuric patients. The kidneys play an essential role in the adaptive physiology of the pregnant woman, presenting some changes at term similar to the changes found in preeclampsia -a state of increased risk of fetal and maternal morbidity and mortality. This study was aimed to compare serum Cystatin-C, Creatinine and Uric Acid (UA) levels in Preeclampsia and normal pregnant women and to evaluate the diagnostic efficiency of serum Cystatin-C level as an alternative marker of renal function in Preeclampsia. A hospital based comparative cross-sectional study was conducted with a total of 104 pregnant women (52 diagnosed cases of Preeclampsia and 52 healthy pregnant women). Serum concentrations of Cystatin-C, Creatinine, Urea and UA were measured in both the study groups. The data were analyzed after the biochemical analysis was completed. Mean Serum Cystatin-C and UA levels were elevated in Preeclampsia cases compared to Controls (1.15 ± 0.37 v/s 0.55 ± 0.12; 5.40 ± 1.44 v/s 3.97±0.68) respectively. ROC curve depicted that Cystatin-C had the highest diagnostic efficiency (Sensitivity-88.24%; Specificity-98.04%) compared to Creatinine and UA in Preeclampsia. Serum Cystatin-C consequently seemed to closely reflect the renal functional changes, which are believed to lead to increased blood pressure levels and urinary excretion of albumin, and may function as a marker for the detection of early renal impairment in Preeclampsia.

O-BM-3-729

## Utility of Ischemia Modified Albumin as an Early Marker for Diagnosis of Acute Coronary Syndrome

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Acute coronary syndrome (ACS) refers to constellation of clinical symptoms caused by acute myocardial ischemia, encompassing STEMI, NSTEMI and unstable angina. Its diagnostic approach and management are challenging. Troponin and CK-MB are reliable markers for acute MI but not for myocardial ischemia. Ischemia Modified Albumin (IMA), a biomarker positive within 6-10 minutes following ischemic onset, where oxygen free radicals leads reduction in binding capacity of Human Serum Albumin (HSA) to transitional metal-cobalt (Co(II)). This study aimed to evaluate diagnostic performance of IMA compared to cTnI, CK-MB and ECG in patients with ACS. Fifty ACS diagnosed patients and 50 healthy controls,

were enrolled. IMA was measured following addition of known amount of Co (II) to HSA, and the unbound Co (II) fraction was determined spectrophotometrically (470nm). Independent Student t-test and Post-Hoc was used to compare differences of mean between and within groups. Diagnostic sensitivity and specificity of IMA was determined by ROC curve. Serum IMA was significantly higher in ACS compared to control (0.823±0.191 vs 0.410±0.081) (p<0.001). ROC curve derived optimal cut-off of 0.475. Absorbance Unit (ABSU) had diagnostic sensitivity and specificity of 92% and 82% respectively, with AUC 0.96. No significant difference in mean IMA values between three categories of ACS was seen (AUC 0.506). At the time of presentation, sensitivity of IMA (92%) was significantly higher compared to ECG (72%), cTnl (18%) and CK-MB (42%). IMA measurement was superior compared to ECG, cTnl and CK-MB for diagnosing ACS, however, with limited ability to discriminate between STE-ACS and NSTE-ACS.

O-BM-3-739

### System Biology Approach on Deciphering Etiology of Rheumatoid Arthritis

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Rheumatoid Arthritis (RA) (OMIM ID: 180300) is an inflammatory autoimmune disease caused by reaction against the proliferating synovial fibroblasts. Nonsuppurative proliferation of synoviocytes frequently progresses to destroy the articular cartilages and underlying bone resulting in permanent disability. Using system biology approach candidate genes obtained from OMIM (Online Mendelian Inherritance in Man) and its interacting proteins were prioritized on the basis of three Gene Ontology terms (Molecular Function, Cellular component, and Biological Process) employing Funsimmat (Functional Similarity Matrix). Amongst the prioritized genes NFkBIL-1 (Nuclear Factor-k of B-cell Inhibitor Like protein-1) (UniProtKB ID: Q9UBC1) that negatively regulates CD45 gene expression by competing against SR (Ser-Arg) protein, ASF/SF2, that transcribes splicing variant of CD45 mRNA that prevents overproduction of cytokines such as TNF-α, IL-6, IL-1 in preventing immunological attack as has been observed where knockdown of endogenous NFkBIL-1 in CD4+ and CD8+T-cells. Overproduction of cytokines such as TNF-α, IL-6, IL-15 induces inflammation in the synovial membrane. This induced stress in the synoviocytes result in expression of stress induced MICA/B (UniProtKB ID: Q29983/Q29980) through downstream signaling. Expression of MICA/B enables interaction with its ligand NKG2D associated with DAP10 (UniProt KB ID: Q9UBK5) that are expressed on CD8+  $\alpha\beta$  T-cells, CD4+ $\gamma\delta$  T-cells and NK cells which carry out cytolysis of MICA/B expressing synoviocyte along with further production of cytokines TNF-α and IL-15. Hence, alteration in NFκBIL-1 induces MICA/B that leads in production of cytokines could be the most probable cause of chronic RA. Gene expression profile of NFkBIL-1, MICA/B and DAP10 could validate the hypothesis.

#### O-BM-3-792

## Association of Thyroid Profile and Prolactin Level in Patient with Secondary Amenorrhea

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Association of thyroid hormones with hyperprolactinemia in patient with amenorrhea was determined by investigating fifty women with diagnosed cases of secondary amenorrhoea and fifty two healthy women as controls. Prolactin level was graded as follows: Hyperprolactenemia, prolactin level more than 23.2 ng/ml and normoprolactenemia 1.0 to 23.2 ng/ml. Serum Prolactin and TSH along with fT3 and fT4 were measured by ELISA technique using Perfermed, Human and Diametra kits respectively. Mean serum prolactin

level was found to be significantly higher in the cases as compared to the controls. Mean serum fT3 and fT4 level in the hyperprolactinemic cases ( $2.67\pm1.04$  pg/ml and  $1.38\pm0.51$  ng/dl respectively) were slightly lower as compared to normoprolactinemic cases ( $3.21\pm1.86$  pg/ml and  $1.73\pm1.37$  ng/dl respectively). Mean TSH of normoprolactinemic and hyperprolactinemic cases were comparable (p=0.049). There was positive correlation between prolactin, BMI and TSH whereas negative correlation of prolactin was seen with fT3, fT4 and age. In hyperprolactainemic cases, prolactin was found to be negatively correlated with TSH (r = -0.155, p = 0.491) whereas prolactin was positively correlated with TSH (r = 0.296, p = 0.126) in normoprolactainemic cases. Hyperprolactinemia with thyroid dysfunction may be contributory hormonal factor in patient with amenorrhea and thus recommend the assessment of thyroid hormones whose abnormality may interplay the amenorrhea and correction of thyroid function may be crucial for positive outcome of amenorrheic patients.

*O-BM-3-855* 

## How Vaccines Containing Aluminum Adjuvants Work?

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Due to the immunomodulatory effects and safety records, the aluminum compounds (alum) have been used as additives in many human and animal vaccines since 1920s. However, the mechanisms of action of these adjuvants are still unknown. It has been hypothesized that these adjuvants work by generating depot, inducing the antigen target by antigen presenting cells at the injection sites, and inducing inflammation. This talk will discuss how these hypotheses are important in the vaccine immunology and in designing vaccines in future.

## Medical Sciences: Community Health 1 (O-CH-1)

O-CH-1-124

## Opportunistic Parasitic Infections Among People Living with HIV/AIDS (PLHA) in Eastern Nepal

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In most of the developing countries like Nepal, gastro intestinal problem caused by intestinal parasites is a major cause of morbidity and mortality. It has also become one of the major factors for the deaths of HIV infected patients. A cross sectional study was conducted among PLHA for six months in a tertiary referral level hospital. Stool specimens were analyzed for the detection of protozoans and helminths. Microscopic examination was done by both saline and iodine wet mount method and Kinyoun modified staining method. The stool specimen was concentrated by formal-ether sedimentation and Sheather's solution. Statistics were analyzed to compare within various sub-groups of the study. 151 specimens among 182 people visiting the antiretroviral center were analyzed. The overall prevalence of intestinal parasites was found to be 38.4% (38.2% among HAART-enrolled-patients and 39.02% among non-HAART-enrolled-patients). Parasitoses were most prevalent among patients with CD4 count 200-299 (13.25%). But opportunistic parasitoses was significantly higher among patients with CD4 count <200 (11.9%) (p<0.05). Males had more parasitoses (29.1%) compared to females (8.3%) and third gender (0%). Cryptosporidium and Cyclospora (12.5% and 1.9% respectively) were found to be higher with the CD4 count below 200ul. The most commonly found non-opportunistic parasite was Ascaris lumbricoides (34.4%). Both protozoal and helminthic intestinal infections are common among PLHA in the study

population. Low CD4 count may account for high risk for opportunistic parasitic infection. In clinical practice, screening for intestinal parasitoses is recommended for all PLHA regardless of CD4 count status.

O-CH-1-38

## Bacteriophage Therapy: A Promising Alternative in Fight Against Multi-Drug Resistant Bacteria

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Amid global antimicrobial resistance crisis & 'superbugs' already threatening advances of modern medicine pushing us closer to post antibiotic era, alternatives to antibiotics are being highly sought. Of all alternatives, phage therapy - using bacterial virus to kill bacteria - though used longest in clinics, is largely ignored. Bacteriophages/phages are viruses that only infect bacteria and can be used therapeutically. As multi-drug resistance (MDR) spreads threateningly, interest in phage therapy is revitalized & now even US-NIAID lists 'phage' as research priority to address antibiotic crisis. Here, we isolate phages against MDR bacteria from rivers of Kathmandu, assess lytic property and identify them morphologically. Forty MDR bacteria representing 12 genera were collected from hospital. Five water samples were screened for presence of phages, purified & tested for presence of multiple host range. Most potent phages were amplified & identified using electron microscopy. Thirty four lytic phages were isolated. Except 2 Klebsiella phages, all 32 phages lysed multiple bacteria. Salmonella phages even showed interspecific (S. typhi&S. paratyphi) lytic ability. Bacteriophage induced mutants were only observed in Klebsiella phages. All except Klebsiella phage were effective in log & stationary phase of growth cycle & were Caudovirales (tailed virus) implying multiple host range is a function of tail/tail fibers. Our findings show 'phages against MDR bacteria' that could be used therapeutically exists & they aren't extremely host specific as professed in scientific world & even possess interspecific lytic capability. Conclusively, Phage Therapy is not a 'myth' but an alternative when antibiotics fail.

> *O-CH-1-42* wa Landfill Site

## Nutritional Status of Landfill Affected Community of Okharpauwa Landfill Site, Nuwakot, Nepal

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A cross sectional study was conducted among the 161 residents of affected community of Okharpauwa Landfill site. Waste disposal is blamed for deterioration of environmental and public health standards. A multistage sampling technique was used. Anthropometric measurement (BMI), twenty four hour recall methods were used to collect data. Food frequency questionnaire, important sources of media for hygiene behaviors were collected through structured questionnaire. The result showed that underweight was 100 (62.1%) person, normal weight 48 (29.8%) where as overweight 13 (8.1%). Underweight 61 (37.9%) was found in maximum affected areas, 6 (3.7%) in moderately affected zone and 33 (20.5%) was found in least affected zone. Normal weight was found 21 (13%) in moderately affected zone. No of the participants from least affected zone and maximum affected zones were of overweight. The cross tabulation between nutritional status and study zone showed significant with Pearson X2 83.189 (P-value< 0.05). The most favorite food among participants was tea

35.30%, tea was taken by 25.6% at morning, at night rice 21.1% and curry 24.5% consumption was reported. Television 40%, Newspaper 44.4%, College 51% and friends 54.40% were reported as important sources of information for hygiene behaviors. The study concluded that the affected areas of landfill site have low nutritional status. Role of communication media can be important source for hygiene behavior. Recommendation on study with large sample size, less bias, more scientific techniques with multidisplinary team is here by recommended.

O-CH-1-56

## Iodine Status among the School Children of Hilly and Plain Region of Eastern Nepal

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lodine deficiency is a leading cause of preventable mental retardation in the world today affecting 19.4% population of Nepal. It is particularly affect the developing brain of fetus and neonates. The geographical situation and poor accessibility of adequately iodized salt are the main cause of iodine deficiency in our country. Urinary iodine concentration (UIC) reflects current iodine intake and salt iodine content explore the level of iodine in household level. This study aimed to assess the iodine status of the school children in Eastern Nepal. A community based study was conducted on twelve districts of the Eastern Nepal representing hilly and plain region. A total of 4525 primary school children (6-12 years) were enrolled in the study and equal numbers of salt and urine samples were collected for the assessment of iodine status. UIC was measured by ammonium-persulphate digestion microplate (APDM) method and salt iodine content by semi quantitative rapid test kit. Our study showed that 583 (12.9%) of school consumed open salt whereas 3942 (87.1%) consumed packet salt. Majority (86.7%) of school children consumed adequately iodized salt but 10.2% consumed inadequately iodized salt and 1.1 % children consumed salt with no iodine. The median UIE of the all school children is 241.08µg/L indicate the adequate iodine nutrition but still 13.1% children were suffering from some degree of jodine deficiency. We conclude that jodine status of the school children in Eastern Nepal is improving but continuous monitoring is necessary for the sustainable elimination of iodine deficiency disorders (IDD) from the country and prevention of iodine induced diseases.

0-CH-1-8

## Effect of an Educational Intervention on Knowledge, Attitude and Practice Regarding Pharmacovigilance and Consumer Pharmacovigilance Among Community Pharmacists in Lalitpur District, Nepal

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Pharmacovigilance activities are in a developing stage in Nepal. Community pharmacists could plan important role in pharmacovigilance. This study was conducted among community pharmacists in Lalitpur district to examine their knowledge, attitude and practice (KAP) about pharmacovigilance before and after an educational intervention. KAP was studied before, immediately after and six weeks following the intervention among 75 community pharmacists. Responses were analysed using SPSS version 20 for Windows. Both descriptive and

inferential statistics were used asappropriate. A pretested questionnaire having twelve statements for assessing knowledge (maximum possible score 60), nine statements for attitude (maximum possible score 45) and five statements for practice (maximum possible score 25) was used. Wilcoxon Signedranks test, paired sample t test and chi-square test were used to compare scores among different subgroups. Knowledge scores improved significantly immediately post-intervention among both males and females but the retention scores (after six weeks) were higher among males. Attitude scores improved significantly among females and respondents between 21-30 years of age showed improvement in both post-intervention and retention. Practice scores improved among both males and females and for all age groups. The scores improved among community pharmacists with a work experience of 5-10 years and who handled 50-100 patients daily. Practice scores improved significantly only among pharmacists dealing with less than 50 patients daily. KAP scores improved after the educational intervention. The national pharmacovigilance center should promote awareness about ADR reporting among community pharmacists.

O-CH-1-829

## Iron, Iodine and Thyroid Hormone Profile among Primary School Children of Udayapur District

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lodine is an essential trace element but its optimum level is required for normal functioning of the thyroid gland. Similar to iodine, several minerals and trace elements such as Iron, Zinc, Selenium are essential for normal thyroid hormone metabolism. The present study was aimed to assess the lodine, Iron and thyroid hormone profile and evaluate the relation between iodine and iron status with thyroid hormone profile. This community-based cross-sectional study was conducted in three VDC of Udayapur district after recruitment of 200 primary school children aged 6-12 years by random sampling. Urine and serum samples were collected and assayed for urinary iodine concentration (UIC), free thyroid hormones (fT3 and fT4), thyroid stimulating hormone (TSH), serum iron, total iron binding capacity (TIBC) concentrations and percentage transferrin saturation was calculated. Overall, 15.5% of the children were iodine deficient (UIC<100µg/L) and 36% had excessive iodine nutrition status (UIC>300µg/L). The prevalence of thyroid dysfunction was 8.5% (n=17). Subclinical hypothyroidism (7%) was more prevalent than overt hypothyroidism (1.5%). Most cases (n=8) of subclinical hypothyroidism had excess iodine nutrition status while all cases (n=3) of overt hypothyroidism had iodine deficiency. The overall prevalence of iron deficiency (Transferrin saturation < 16%) was 34% (n=68). Among iron deficient children 5.9% had subclinical hypothyroidism (n=4). Subclinical hypothyroidism is the most common thyroid dysfunction among study population with iodine excess which warrants for further confirmation. The prevalence of iron deficiency is high and iron deficiency does not significantly alter the thyroid hormone profile in the study region.

O-CH-1-865

# "Optimization and Implementation of Allele Specific PCR for the Detection of JAK2V617F Mutation in Nepalese Patients with Chronic Myeloproliferative Neoplasm"

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Myeloproliferative neoplasms (MPNs) represent a group of chronic conditions including polycythemia vera (PV), essential thrombocythemia (ET), and primary myelo- fibrosis (PMF). Complications associated with MPNs include thrombosis, hemorrhage, myeloid metaplasia,

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and acute leukemia. The major molecular lesion in these diseases is JAK2V617F gain of function mutation, which occurs in approximately 96% of PV, 65% of PMF, and 55% of ET cases. JAK2 V617F mutation is characterized by a G to T transverse at nucleotide 1849 in exon 14 of the JAK2 gene, located on the chromosome 9 p, leading to a substitution of valine to phenylalanine at amino acid position 617 in the JAK2 protein. JAK2V617F has thus become a valuable marker for diagnosis of MPNs and an excellent target for therapeutic drug development and it will become a useful adjunct to acess MPN profile when performing genetic studies in Nepalese population. The main aim of the study is to analyse the frequency of mutation in patients with different types of myeloproliferative disorders by optimizing and implementing allele-specific PCR (AS-PCR). Among 32 MPN patients under study, totally 40.6% of the MPN patients had JAK2 V617F mutation; 53.1% suffered from PV among whom 47.1% had JAK2 V617F mutation; 31.3% suffered from ET among whom 20.0% had JAK2 V617F mutation. JAK2 V617F mutation should be included in initial disease detection process for MPN suspected patients.

0-CH-1-90

## Proportional Odds Model: An Application to Maternal Health Care Service Utilization Data

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Antenatal Care (ANC) is named as one of the four pillars of the Safe Motherhood Initiatives. In this study, ANC status is typically characterized by frequency of ANC visits. Number of ANC be highlight on the factors associated with 'no', 'some (1-3)' and 'adequate (4 or more)' antenatal care visits. The data for this study is chosen from the Demographic Health Survey (DHS), 2006 and 2011 of Nepal. The unit of analysis for the study is Ever Married Women (EMW) who had at least one live birth in the five year preceding the survey. Proportional odds model has been used to model the socio-economic (education level, wealth index, occupation, currently working) and demographic (age, birth in last five years, residence and religion) variables that affected the ANC visits. For 2011 NDHS, the assumption of the parallel line is violated. Therefore partial proportional odds model (PPO) has been used. This model free all the variables from the parallel line constraints even though, the parallel line assumption be violated only few of them. Therefore the study used restricted PPO model. Once the particular model has been fitted, several standard measures of model adequacy tests have been considered in order to examine how well the model fitted. The result of this study showed that education level, wealth index increase the likelihood of favoring a higher category of ANC visits.

O-CH-1-93

## Nutritional Status and Intelligence Quotient of Preschool Children Residing in Folkland, Dharan 17, Sunsari, Nepal

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Nutritional status has vital role on brain development of children during pregnancy and the first two years of life. To find out nutritional status and intelligence quotient of preschool children of Folkland, Dharan 17, Sunsari, Nepal. A descriptive cross sectional design was used for the study. Sixty pre-school children were selected. Data was collected by using self developed semi structured questionnaire, measuring tape, weighing scale and standardized tool and nutritional status was classified as WHO standard. Indian adaptation of Vineland

Social Maturity Scale and Developmental screening Test. Data was analyzed using Pearson Chi-square. Majority (68.3%) of children had normal height according to their age followed by 13.3% of children were moderately stunted while 18.3% of the children were severely stunted. Similarly, majority of children (88.3%) had normal weight while 11.7% of children were moderately wasted. About 16% of the males had moderate wasting whereas nearly 7% females were moderately wasted. Majority (70%) of the children had average level of intelligence quotient whereas only around two percent of the children had borderline IQ. Mother's occupational status is significantly associated with IQ of the children (p-value 0.007 at 95% confidence interval). There is significant association between height for age and Intelligence Quotient of the children (p-value=0.049 at 95% confidence interval). Malnutrition among children is still a public health issue in Nepal and is affecting the intellectual function and later academic function of children.

## Medical Sciences: Community Health 2 (O-CH-2)

O-CH-2-150

### A Cross-Sectional Study of Lung Functions in Traffic Police Personnel at Work in Kathmandu Valley, Nepal

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Traffic police personnel (TPP) working in outdoor urban environments are occupationally exposed to pollutants generated by engine combustion. They are exposed to air pollution most of the time, and are most likely to have impaired pulmonary function. The present study was aimed to assess pulmonary functions in the traffic police personnel posted on traffic duty in Kathmandu valley, Nepal. The study group consisted of 17 females and 89 males, constituting 16% and 84% of the total police personnel studied, respectively. In the control group of 25 individuals, 16% (n=4) were female and 84% (n=21) were male. The work experience of more than or equal to two years was required as inclusion criterion for the TPP to be included in this study. Health examination and questionnaire survey was carried out in camps. Portable desktop spirometer was used for the PFT measurements. It is seen that in females as compared to males, PFT parameters show a significant decrease. There is significant decrease in parameters like FVC, FEV1, PEFR, FEF25%, and MVV at p value <0.01, a significant decrease in FEF25% at p value <0.05. A one-way ANOVA conducted to compare the effect of duration of air pollution exposure showed that there is a significant variation in PFT parameters among the groups. The exposure duration has significant effect on the PFT parameters. Greater the officers are engaged in traffic duty for years, greater is the decrement in their lung functions test.

O-CH-2-182

## Knowledge, Attitude and Practice on Hepatitis A and E among Secondary Level Students: An Interventional Study

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Hepatitis A and E are the major burden of the developing countries due to poor sanitation. Awareness on proper hygiene and common health hazards plays crucial role in this issue. Few studies have been done regarding Knowledge, Attitude and Practice (KAP) on Hepatitis A and E. The study aims in obtaining baseline KAP, note deficiencies, plan intervention, execute and evaluate the same. The study was conducted in one of the oldest and renowned schools of Lalitpur District. The study was cross sectional and semi structured pretested

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questionnaire for data collection was employed. Demographic information like gender, ethnicity, caste, age was noted. An educational intervention using PowerPoint presentation and interactive sessions were conducted. The KAP before and after the intervention were compared using Wilcoxon Signed Rank Test. Total participants were 192. Among them 108 (56.3%) were female. 20 (10.4%) were not aware of the term hepatitis and this was associated with the level of education of the most educated member of family (p<0.01). Above it, 88 (50%) didn't know about Hepatitis A and E. Hepatitis, as a disease of liver, was known to 163 (93.1%) respondents which had significant association with the presence of any member in family related to health service (p=0.39). The response regarding season of disease outbreak was significantly associated with mother's education (p=0.019). 147 (84%) of the respondents said that they would consult a doctor if they got infected. Among total, 164 (84.4%) replied that they wash hands after defecation. About 154 (88.5%) were using both boiled and filtered water for drinking purpose. The level of knowledge and practice was found poor while attitude was satisfactory. The educational intervention was effective in improving knowledge and attitude.

O-CH-2-256

### Mathematical Modeling on Sweating Effect in Human Males' and Females' Body Temperature Variation

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Body temperature is a complex, non-linear data point, subject to many sources of internal and external variation. Sweating is one of the effective thermoregulatory processes when the body is in hot condition of heat strain caused by hot ambient conditions or a high metabolic rate. The study deals comparative study of thermoregulation activities of human males and females under hot zone due to sweating. The solution is presented on the basis of variational finite element method for one and two dimensional steady and transient cases. Sweating is considered as a heat loss within the body by evaporation of water inside body. The sweating rate for male is calculated by the relation: E = 8.47\times  $10^{-5}$ {(0.1\times T\_{sk} + 0.9)  $times T_{b}$  - 36.6(circ)C ,  $[kg/m^{2}/sec]$  where,  $T_{sk} = T_{0}$  (Outer skin surface temperature),  $T_{b} = 37^{\text{crc}}$  (Body core temperature). The sweat rate in females is less compared to males due to the lower density of sweat gland and hormonal pattern in females. So, coefficient of  $T_{b}$  is considered as 0.7 instead of 0.9 in above relation for females. The analysis sought out that tissue temperature in males is slightly higher as compared to females when atmospheric temperature T\_{infty} is less than body core temperature. But the females tissue temperature is higher when T\_{\infty} exceeds above 37^{\circ}C. The steady state nodal temperature is achieved earlier in case of males in comparison to females. Convergence of temperature values due to sweating is also carried out by varying the mesh element sizes. The numerical results are compared with past simulated general human body (male) results.

O-CH-2-259

## Mathematical Study of Travel Rates of Humans in the Transmission of Dengue Disease

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Dengue is an infectious disease caused by dengue viruses of four serotypes DEN 1 to DEN 4. It is transmitted to humans by the bite of female aedes mosquitoes. The disease has

become a major public health concern in recent years. Dengue viruses have expanded their geographic range through the movement of infected humans. In the present work, a multipatch epidemic model is proposed to describe the transmission dynamics of dengue disease in patches with the mobility of humans. Different travel rates of humans are considered to study the dynamics of the disease. Different patches are considered to have different disease prevalence. Basic reproduction number of the model is calculated and some threshold conditions are established to study local and global stability of the equilibriums.

O-CH-2-310

## Mathematical Study of Temperature Variations on the Transmission Dynamics of Malaria Disease

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Mosquito population dynamics is a key determinant of malaria risk. The parasites that cause malaria depend on Anopheles mosquitoes for transmission, and the survival rate of Anopheles mosquitoes rely on temperature variations. The experiment carried out by Johnson et al. showed that the largest abundance of long lived mosquitoes are in the temperature range 20<sup>o</sup>C-30<sup>o</sup>C. The present study is carried out on the qualitative analysis of system of deterministic differential equations involving humans and mosquitoes and the impact of temperature variations for the transmission of malaria. Conditions for the existence of disease free and endemic equilibrium are also analysed.

*O-CH-2-435* Bioequivalence and Pharmacokinetic Study of Two Oral Controlled Release Formulations of Sodium Valproate in Healthy Volunteers

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Different formulations of sodium valproate are available in Nepalese market which may vary in dissolution characteristics and absorption rate. This study was conducted to compare pharmacokinetic parameters of two widely used controlled release tablet formulations (test & reference) of sodium valproate 200 mg and investigate their bioequivalence after single dose under fed condition. An open-label, randomized, 2-way crossover study was conducted in thirteen Nepalese healthy human volunteers. Washout period of 7 days was kept between the study periods. Serial blood samples were collected over a period of 24 hours on each study day. Plasma concentration of the drug was estimated by a pre-validated gas chromatography method. Following oral administration,  $C_{max}$  was reached within 7.300 ± 1.664 hrs with test and 6.422 ± 0.776 hrs with reference formulation.  $C_{max}$ , AUC<sub>0-24</sub>, AUC<sub>0-∞</sub>,  $t_{1/2}$ , and  $k_{el}$  were 29.763 ± 7.467 µg/ml and 23.578 ± 5.788, 375.554 ± 91.03 and 342.356 ± 87.170 µg.hr/ml, 850.449 ± 724.125 and 653.327 ± 552.725 µg.hr/ml, 19.800 ± 21.634 and 15.124 ± 10.999 hrs,  $0.035 \pm 0.029$  and  $0.044 \pm 0.033$  1/hr for test and reference formulations respectively. The 90% confidence intervals of the mean of the difference between log transformed values for AUC<sub>0-24</sub>, and AUC<sub>0-∞</sub> and C<sub>max</sub> were within the bioequivalence accepted range of 80% to 125%. The test and reference formulations of sodium valproate used in the study met regulatory criteria for bioequivalence and hence can be considered interchangeable.

#### O-CH-2-614

## Assessment of Blood Lead Level among 06-36 Months Children in Kathmandu Valley

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Childhood lead exposure is estimated to contribute to about 600.000 new cases of children developing intellectual disabilities and 143,000 deaths each year with the highest burden in developing regions The main objective of this study was to assess blood lead level (BLL) among children (06-36 months) living in Kathmandu Valley. A cross-sectional study was conducted among 312 children between 6 to 36 months of age visiting the Out Patients clinics of Paediatrics Department (OPD) of Tribhuvan University Teaching Hospital (TUTH), Patan Hospital and Siddhi Memorial Hospital between January 2015 and March 2015. Written informed consents were taken from the parents and exposure and health related data were collected using the structured questionnaire from the parents. Blood sample was collected in the OPD after parental informed consent by a heel prick or venipuncture after the initial interview. Anodic Stripping Voltammetry (ASV) portable instrument was used to determine the blood lead level in children. Data were analyzed using SPSS version 16. Of the total 312 children enrolled in the study, 64.4% had the blood lead level that exceeded the cut off limits proposed by the Centers for Diseases Control, USA as potentially harmful serum lead level (CDC;  $\geq 5 \mu q$  /dl). Our study also demonstrate that children living in homes with the enamel paints on walls, windows and doors, belonging to the lower ethnic group and playing with dirt and dust had significantly higher blood lead level.

## Energy Technology (O-ET-1)

0-ET-1-885-I

## Semiconductor Materials for Energy Technology

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Growing threat of Energy Crisis in the world has encouraged materials scientists either to synthesize new materials for their possible applications in energy technology or to investigate the possibilities of using established materials for energy technology applications. Semiconductor Materials are being extensively investigated for the generation, storage and transmission of electricity. Different facets of applications of elemental semiconductor, silicon, and metal oxide semiconductor such as titanium dioxide nano-particles for the generation of electricity in solar cells are briefly discussed in this paper. Comparison of performances, properties and fabrication sequences of Silicon Solar Cells and Dye Sensitized Solar Cells are presented along with their optimization procedures. This paper mainly aims at sensitizing the young researchers willing to pursue future career in semiconductor devices, materials science or nanotechnology, especially connecting them to research and development of energy technology for future through the practical experiences of the author. With ever increasing budgetary investment of the Government of Nepal in the promotion of alternative energy technology such as Solar photovoltaics, it is high time also to invest for setting up a

full- fledged semiconductor technology research center in the country, keeping energy technology into principal focus.

O-ET-1-23

### ADM1 Modelling for Pulse Feed Mode of UASB Reactor

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The anaerobic digestion model 1 (ADM1) is applied to upflow anaerobic sludge blanket (UASB) reactor for continuous and pulse feed mode of operation treating domestic wastewater. The size of modelled UASB reactor is 250L operating with COD load of 3.4kgCOD/ (m<sup>3</sup>.d) and 6h HRT for both modes. This study aimed at evaluating the influence of mode of operation on process efficiency for anaerobic digestion of domestic wastewater. The process is simulated for four different pulse intervals of 0.5, 1, 2 and 4h and three different pulse lengths 5, 10 and 20 minutes, each for 100 days. It shows that all tested pulse feed modes of operation produces higher amounts of biogas than continuous feed operation. However, COD removal is slightly higher in continuous operation. Among the different pulse length is highest and is about 20% higher than the continuous operation, whereas COD removal is about 8% less. This suggests that pulse feed mode of operation is suitable for efficient conversion of COD to biogas. Pulse feed also has practical advantages. The results led to recommend the use of pulse feed operation for anaerobic digestion of domestic wastewater.

O-ET-1-295

## Potential Biomass Supply and Economics for the Pellet Production from Forest Biomass and Agricultural Crop Residue in Nepal

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Depletion of fossil fuel and its impact on the environment has been among the most important global concerns and has triggered the development of improved and sustainable forms of energy. Nepal, a country rich in biomass, still does not have any commercial pellet production plant and is wasting large amounts of forest residue, industrial by-products and waste, and agricultural crop residue. These residues and waste could be important sources of raw materials for pellet production. In the current study, the potential biomass supply for the pellet production in Nepal is discussed. The potential supply of the biomass for pellet production is calculated based on secondary data. The production cost of pellets was calculated considering market surveys and available literatures. The current study showed that about 2.76 million tonnes (Mt) and 5.61 Mt of biomass in the form of pellets (with 10% moisture content) are potentially available from forest-based and agricultural residues, respectively. Considering a processing capacity of 6 tonnes (t)/hour of a pellet plant, the production cost of the pellets was calculated to be \$43.53/t. The brick and cement industries, where until now coal has been extensively used as the primary source of energy, could use these pellets. Cofiring of pellets in such industries could play an important role in reducing the import volume of coal and minimize the related environmental loadings.

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*O-ET-1-41* 

### Design, Fabrication and Thermal Analysis of a Biogas Plant

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A thermal model for a prototype biogas plant has been developed at the Prabhat Poultry and Hatchery, Dhulikhel in order to understand the heat transfer from the digester body to the surrounding and from heat exchanger to the digester. All the designs were made to attain the optimum temperature for anaerobic digestion which is  $35^{\circ}$ C. Poultry droppings were utilized for the analysis of temperature of digester with heating mechanism in the pilot biogas plant to increase the biogas production rate. The plant includes heat exchanger in the digester to maintain the temperature at mesophilic range (i.e.,  $35^{\circ}$ C) that is assisted by solar thermal collector as heating system. Aluminium pipe of 1cm diameter is used as heat exchanger through which hot water circulated from the storage tank. The heat transferred from aluminium coil maintained the digester temperature. The methodology opted for the study included data collection: primary and secondary, followed by data analysis and interpretation. Temperature sensors are used to measure temperature of digester and storage tank fluctuating only up to 7<sup>b</sup>C is due to extra loss occurred and fluctuating solar radiation.

*O-ET-1-443* 

### **Thermoelectricity for Utilizing Waste Heat**

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Thermoelectric effect was discovered about two centuries ago. After few decades of initial research, the effort to utilize thermoelectric effect for the viable production of electricity got exhausted. Revisiting of thermoelectricity for enhancement of efficiency of a thermoelectric device started around 1990, which resulted in achieving remarkable success mainly due to new findings of semiconductor materials having larger ZT values (figure of merit). Half Heusler alloys are being considered to be one of potential candidate materials. The talk will focus on the calculation of thermoelectric properties of some selected half-Heusler alloys.

0-ET-1-47

Design and Analysis of Hydropower Tunnels in Lesser Himalayan Region of Nepal: Case Study of Kulekhani-III Hydroelectric Project

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Underground construction most commonly becomes challenging due to weak rock mass quality and high overburden. Most hydropower tunnels have squeezing problem. When induced stress level exceeds the strength of rock mass, tunnel fails. Stress plays a crucial role in developing brittle fractures, rock strength reduction and rock mass instabilities. The critical stress is the indicator for the support design of tunnel. It is important to quantify the degree of deformation caused due to fragile rock and rock stresses. The convergence confinement method is a type of analytical method where the behaviour of ground and liner are studied independently to study their interaction. Time dependent deformation or the failure

of rock mass, such as extending cracks, gradual rock falls, etc. are costly works to be carried out in underground tunnels and caverns. To understand the damage evolution of rock mass in underground engineering, various causes causing them are to be studied carefully. This paper uses Convergence Confinement Method and Time-dependent Creep Analysis to study and compare the deformation of tunnel in weak rocks with high rock stresses at Kulekhani-III Hydroelectric Project, Makawanpur, Nepal.

O-ET-1-603

## Integration of Hybrid Renewable Energy Resources in a DC Microgrid: Design, Simulation and Analysis

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Despite rapid advancement in electric power technology, people in countries with LDC (Least Developed Countries) status, like Nepal, are forced to sustain their livelihood in darkness, owing either to load-shedding, or to electrification being beyond infrastructural feasibility. Amid these circumstances, one promising approach to solving the problem caused by energy crisis would be the concept of hybrid DC microgrid with distributed renewable energy generation, i.e. to reach the energy demand locally, utilizing locally available renewable energy resources like micro-hydro power, solar PV and wind energy, combined in a DC grid. This paper presents foundational research for the concept- energy consumption trend; currently existing load and DC replacement of existing load in 15 houses in Salmitar VDC, Kavrepalanchwok, Nepal; theoretical design- source selection, voltage level selection, wire sizing, converter sizing and operation scheme design for microgrid; modelling- source modelling, load modelling, buck-boost converter design and modelling; simulation and operational analysis of DC microgrid as required in the semi-remote scenario of Nepal. Power electronic circuits; control circuits; renewable energy sources and storage elements like DC-DC converters, charge controllers, load controllers; source selectors for solar photovoltaic system, micro hydropower station and deep-cycle lead-acid batteries were modelled for smooth and efficient operation of the system. Survey shows that about 69% of total electrical load in semi-remote area of Nepal is composed of lighting loads, with most of the load concentrated at 5am-7am in the morning and 6pm-8pm in the evening. About 65% of electricity could be saved just by replacing existing system with equivalent DC system. The paper presents a completed electric model with efficient operation scheme for electrification in semi-remote sites in Nepal.

0-ET-1-95

## Design, Fabrication and Development of 500W Horizontal Axis Wind Turbine (HAWT) System

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Development of wind energy in Nepal is far behind when compared to other countries. The proper design and fabrication of wind turbines has not developed due to lack of research in renewable energy technologies. This research focuses on the analysis of the wind data, the power extraction and design of small scale 500 watt HAWT. Wind velocity data is analyzed by modelling the maximum and average wind velocity along with the direction and frequency of occurrence of wind speed. Research is carried out to develop 500 watt horizontal axis wind turbine which is aimed to be designed and fabricated from the available local resources. Research is also carried out to assess the design of coil structure and the magnet poles to generate the required voltage and current. The blade rpm and TSR are analyzed to rotate the

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turbine in the rated speed to generate the optimum power. The rotor design, hub design, blade design, structure of coils and magnetic alignment in the rotor for the optimum output power are the major concerns of this research. The paper also includes wind data analysis and the details of the technical aspects to design the final wind turbine system. The main outcome of this research is to highlight the potential of wind energy as an alternative form of energy and the construction of small scale wind turbine.

## Information Technology (O-IT-1)

*O-IT-1-144* 

## **Visible Light Communication : Applications and Challenges**

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In recent days, Visible Light Communication (VLC), a novel technology that enables standard Light-Emitting-Diodes (LEDs) to transmit data, is gaining significant attention. However, to date, very little research has been performed on its deployment. The enormous and growing user demand for wireless data is placing huge pressure on existing Wi-Fi technology, which uses the radio and microwave frequency spectrum. Also, the radio and microwave frequency spectrum is heavily used and overcrowded. On the other hand, visible light spectrum has huge, unused and unregulated capacity for communications (about 10,000 times greater bandwidth compared to radio spectrum). Li-Fi, the wireless technology based on VLC, is successfully tested with 224 Gbps speed in lab and also implemented commercially with 1 Gbps speed - that is 100 times faster than current average Wi-Fi speed. In the near future, this technology could enable devices containing LEDs - such as car lights, city lights, screens and home appliances - to form their own networks for high speed, secure communication. In this paper wide overview of need of VLC, applications of VLC and design challenges for VLC are presented. The potential application areas of VLC that are identified include smart lighting of buildings, vehicular communication, defense and security, indoor positioning, road safety, hospitals and healthcare, aviation, etc. This paper also presents a through survey of recent advancements in the domain of VLC, starting from its emergence to commercialization.

O-IT-1-245

### Design of 32-bit RISC Microprocessor Using FPGA

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The recent technological development in the field of Information Technology has made processing of large amount of information necessary. For this purpose, the development of high performance processor has been a necessity. The 32-bit RISC processor has been developed for this purpose, borrowing the most popular MIPS architecture implementation. The unicycle processor versions developed were implemented to fit a low cost FPGA board. Basic simple instructions present in the MIPS architecture were added in the processor. Two types of instruction formats, namely, R-type format and I-type format, are being used for the control and processing of the data. Similarly, the ALU, register file, interfacing of UART and PS2 keyboard and other various objectives were also successfully achieved in this processor. The developed work comprehends single clock cycle per instruction processor with a pipelining concept. The implementation that we carried out allows the user to understand how the operations are performed by consulting the storage elements. A software interface was

designed to be appealing to the user, providing full access and control of the processor operation. The developed processor could carry out simple arithmetic operations like addition, subtraction, multiplication and logical operations such as AND, OR, XOR, etc. The microprocessor we developed can be used in various embedded systems and furthermore, it can be used in various fields such as mechanical control unit, router, etc.

0-IT-1-344

#### Ethics in Internet, Online Social Networks and Virtual Worlds

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Online Social networking is a platform to build social networks or relations among people in internet sharing interests, activities, backgrounds or real-life connections. A social network service consists of a representation of each user, their social links, and a variety of additional services. This paper examines ethical issues specific to internet and web 2.0 networks such as online social networks and virtual worlds and facilitates researchers to discuss ethical decision-making. This study also explores ethical considerations and problems in the conduct of implicit research by describing the extent to which behavioral studies on the internet fulfill with ethical standards. An extensive literature review was performed to conduct this study. The increase of awareness of and commitment to the established ethical principles is crucial in online social networks and virtual worlds. The ethics and ethical governance of online research have been widely studied and a number of professional organizations have promulgated guidelines for researchers conducting their research.

O-IT-1-505 Study on Utilization of Mass Media by Progressive Farmers of Chitwan District

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In the agricultural production, the use of mass media is very important to disseminate latest technology to the rural farmers. Radio, print materials, television were used for a long time to create awareness about innovative technologies of agriculture and allied subjects. However, it is generally labeled that mass media are class media and largely urban biased both in the use of language and choice of content. Now, the reach of television and radio is gradually increasing in the rural areas. In Chitwan district, more than four FM radio stations aired agriculture programmes, more than 15 dailies and weeklies were available for rural readers and 9 national television channels were being watched by the rural community. Apart from that, more than 10 online news portals were available wherever internet bandwidth is available. Chitwan is known for mustard seed production, fine aromatic rice and bumper maize crop production and today it is better known for the booming poultry and feed industry. More than a dozen large entreprises and hundreds of small ones have established Chitwan as the number one district for poultry and feeds, hatcheries, layer farms, broiler farms, and feed industries in the country. Availability of groundwater irrigation, effective use of biopesticides and off-season cultivation practices have attracted the local farmers towards cultivation using modern and commercial farming. Youth entrepreneurs are engaged in agrobased farming system in the district. The study was conducted in four VDCs of Chitwan district viz. Khaireni VDC, Devendrapur VDC, Sukranagar VDC, and Madhi VDC to assess the pattern of mass media utilization by the rural farmers of Chitwan district. A total of 156 farmers were selected as respondents for the study and data were collected through a comprehensive and duly pretested structured questionnaire. Some data were collected

through focus group discussion and key informant survey. The results showed that maximum number of respondents were the regular listeners of FM radio (79.49 percent), followed by television viewers (26.92 percent), newspaper readers (24.36 percent), online media users (17.95 percent) and magazine readers (16.67 percent) respectively. Majority of the farmers used FM radio (88.46 per cent) for news and information followed by newspaper (67.94 per cent), television (52.56 per cent), online (24.35 per cent) and magazine (14.10 per cent) respectively. Most of the respondents had given political news coverage in newspaper as first preference (WMS or weighted mean score = 8.86) followed by social information (WMS = 7.68), entertainment (WMS=11.80 and WMS= 11.05) respectively.

0-IT-1-563

### Increasing Project Utility by Implementing Knowledge Management System for Creating A Knowledge Base

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Knowledge Management Systems (KMS) can be used for increasing project utility. Creating a knowledge base, which contains project information, can be very useful for other generations of students, while they are working in similar projects. This paper highlights the project trend in Department of Computer Science and Engineering (DoCSE), KU and discusses some of the problems that hinders effective knowledge sharing between different project stakeholders. Finally, it suggests a possible solution to the problem through the use of Knowledge Management System.

0-IT-1-636

## FPGA-based Design, Implementation and Performance Analysis of Digital Signal Processor

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Simple processor faces a great problem whenever multiplication is encountered in its processes. Easy approach to reduce this complexity of processors is to use efficient algorithms. Here, MAC module uses Wallace tree algorithm that computes multiplication between two user given inputs and restores the computed result in accumulator. FFT serves as an efficient and ubiquitous tool for computation of DFT. Since less number of computation is required in FFT than other DFT algorithm, it is widely used in speech processing, signal processing, multimedia communication, etc. Designed FFT core computes radix-2 8-point FFT using floating point operations. Interfacing unit PS/2 keyboard is featured to input the desired values to the processor whereas LCD and VGA are featured to display the computed result from the processor. Hierarchical design method is used for implementation of designed module by VHDL language. After simulation, schematics generation and timing analysis is carried out in Xilinx ISE simulator 14.7. The individual modules are implemented and tested in Spartan 3E family XC3S500E FPGA board. The latency of MAC processor also includes brief analysis of the performance and FPGA resource consumption.

O-IT-1-706

#### **Tri-Angular Monitoring Approach for Real Time Cloud Container**

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Container is the modern age distributed applications packaging toolkit over the cloud environment. It features the management of applications with easy plug and play ability, migration, replication, relocation, upgrading et cetera in the real time. Such containers running different applications over the cloud infrastructure may consume different kinds of resources which require real time monitoring. Monitoring of the applications over the distributed cloud environment is a challenging task for the better service level agreement. Docker is open source platform independent tool used to create, deploy, and run applications by using containers. Containers allow a developer to package up an application with all of the parts it needs, such as libraries and other dependencies, and ship it all out as one package to the multiple cloud. This gives a significant improvement in performance and size of the applications. For efficient management of containerized applications in the distributed cloud environment, we have conceptualized to develop JAVA based tri-angular monitoring approach in the IPv6 based network environment where the monitoring probe collects different monitoring metrics and sends to remote surveillance system in the JSON format. Real time data to be monitored shall be stored on the time series database and visualized in the web. The term tri-angular is proposed in this paper with the concept that the source machine sends the metric information to the monitoring station before and after the migration of containers while destination node sends the status of migrated container to the same monitoring station after the container is received.

0-IT-1-742

#### Traffic Load Balancing over Software Defined Networking

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Nowadays, networks need to handle huge amount of traffic serving thousands of clients. A single standalone server to cater such a huge load is almost impossible. The solution is to use multiple servers using load balancer at the front end. Traditional Load balancer uses dedicated hardware which forwards the client requests to different servers depending upon load balancing strategy. This sort of hardware is expensive and inflexible. Network administrators cannot create their own algorithms since traditional load balancers are vendor locked, non programmable. However, currently available load balancers contain few algorithms that can be used. Server load balancing based on SDN as compared with the traditional load balancing method effectively improves the performance of the server load balancing and reduce the complexity of implementation. On the other hand, SDN load balancers are programmable and allow us to design and implement our own load balancing strategy. Other advantages of SDN load balancer is that we do not need dedicated hardware. In this paper weighted Round-Robin load balancing strategy is implemented with an Open Flow switch connected to a POX Controller. This algorithm better manages the server load and results show that the algorithm has good feasibility and higher traffic scheduling performance of network.

O-IT-1-878-I

## Trust Computational Models for Distributed Systems: Case Studies of eCommerce and MANET

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Distributed systems like e-commerce, peer-to-peer networks, social networks, and mobile ad hoc networks (MANETs) require cooperation among the participating entities to guarantee the formation and sustained existence of cooperation services. Recommendation based trust management has been proposed in the literature as a mechanism to filter out the misbehaving players while searching for a reliable cooperation. However, building a trust model that adopts recommendations by other players in distributed systems, such as ecommerce and MANET is a challenging problem due to the risk of dishonest recommendations. The talk will present our research investigation on the problems of attacks posed by misbehaving players (nodes in MANET) while propagating recommendations in the existing trust models. We will propose a recommendation based trust model with a defence scheme, which dynamically filters out attacks related to dishonest recommendations between the nodes and show our empirical analysis.

## Material Physics (O-MP-1)

*O-MP-1-151* 

### **Eight Layered Perovskites for Next Generation Telecommunication**

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The rapid progress in microwave telecommunication generated a huge demand for dielectric resonators. As a result, the production of dielectric resonators emerged as one of the fastest growing areas today in the electronic ceramic manufacturing. One of the solutions to the network hassle is related to the chemical aspect i.e. quality of the resonator used in the base station of the mobile phone. Ceramic pucks suitable for resonator applications are designed to sustain a standing wave within its body of a specific resonant frequency. Ceramic oxides with perovskite structure, in particular A(B'<sub>1/3</sub>B"<sub>2/3</sub>)O3, exhibit better microwave properties. For a material to be used as an dielectric resonator it should have a high dielectric constant (e), low dielectric loss, tan d, and the temperature coefficient of resonant frequency (t<sub>i</sub>) should be close to +0 ppm/<sup>0</sup>C. New dielectric ceramics are required as components of base-station filters for next-generation microwave communication networks. We synthesized various composites and solid solution involving eight layered Perovskites (1-x) [Ba(Co<sub>1/3</sub>Ta<sub>2/3</sub>)O3] – x[(Ba(Co<sub>1/8</sub>Ta<sub>3/4</sub>)O3]. No impurities were found in the powder X-ray pattern; the dielectric constant changed linearly for all the "x" values and the dielectric loss was below zero. These composites are highly promising and can be tuned to zero t<sub>f</sub> values.

### Thermo-Physical Properties of AI-Mg Liquid Alloy

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The thermodynamic properties, such as free energy of mixing, enthalpy of mixing, activities of free monomers and entropy of mixing, and the structural properties, such as concentration fluctuation in long wavelength limit and short range order parameter of Al-Mg liquid alloy at 1073 K have been studied assuming the existence of complex in the initial melt on the basis of regular associated solution model. The mole fractions of the complex and the free monomers have been computed. The compositional contributions of the heat associated with the formation of the complex and the heat of mixing to the net enthalpy change have also been computed. For transport properties, viscosity and diffusion coefficients have been analyzed using different approaches. The surface concentration of Al atoms has been computed and it has been used to determine the surface tension of Al-Mg melt.The theoretical investigations show that the Al-Mg liquid alloy at 1073 K is found to be hetero-coordinating system. All the interaction energy parameters are found to be temperature dependent and the alloy system is found to be weakly interacting.

O-MP-1-298

#### Optimizing Thickness of Perovskite Absorber for Photovoltaic Application

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Organic-inorganic hybrid perovskite, as photovoltaic absorber, draws the enormous attention of scientific community due to its suitable opto-electronic behavior and low temperature solution process ability. In this work, simulation is carried out with different set up of the perovskite-based Spiro-MeOTAD/MAPbI<sub>3</sub>/TiO<sub>2</sub> devices to optimize the thickness of the absorber. To optimize the thickness of the absorber, we have developed the devices without and with introducing the interface trap state density. Without interface trap, optimum performance of V<sub>OC</sub> = 1.13 V, J<sub>SC</sub> = 25.56 mA/cm<sup>2</sup>, FF =82.42%, PCE = 27.41% are observed at 700 nm thickness of the absorber. Beyond this thickness, the performance of the cell is found detrimental which is due to the increase in shunt resistance and platform for the recombination. After introducing interface traps, the performance of the solar cell is found as  $V_{OC} = 1.13$  V,  $J_{SC} = 25.56$  mA/cm<sup>2</sup>, FF =82.87%, PCE = 24.02% at the same thickness due to introduction of the recombination centers and change in resistance. These values are quite good to articulate optimal thickness for optimal performance.

O-MP-1-395

### Stability of Methane Hydrates at High Pressure: a First-principles Study

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The stability of methane hydrate at high pressure is relevant in multiple areas like geophysics, alternative source of energy and environmental aspects. Previous reports, based on computational and experimental studies, have revealed some controversial results regarding

the stability/decomposition of methane hydrates in elevated pressure. By using densityfunctional theory (DFT) level of calculations, we have reported that methane hydrate (MH-III) is unstable against its constituents above the pressure of two-digits in gigapascals (GPa), which is consistent with an experimental study where they claim decomposition of the compound above 3 GPa. Here, we have included van der waals (vdW) interactions, which are known to be important at relatively low and moderate pressures, in DFT calculations and have shown that decomposition is favorable above 4 GPa. Inclusion of vdW interactions are found to affect the previous results up to 60 GPa leaving the higher pressure properties intact. Within the regime of metastability, we further found that the methane hydrate III (MH III) changes to new structure known as "High Pressure" structure above 180 GPa.

O-MP-1-580

## Plasma CVD-Grown Graphene Film at Low Temperature using Camphor Precursor

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Plasma assisted growth of graphene films is essential for its compatibility with modern electronics technology. This method is appropirate to grow large area graphene films and also advantegious for significant energy savings. Previously we approached to grow large isolated graphene domains by using plasma processing at low temperature. In this work, we employed mircowave surface wave plasma CVD to grow large area continous graphene films by reducing the plasma induced damages on the sp2 bonding of growing graphene. The film shows very good transparency (93.58%) with 1.71 k-Ohm/sq sheet resistivity.

O-MP-1-631

O-MP-1-639

## Production and Characterization of Seeded-Arc Plasma for Different Materials of the Electrodes

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Plasma production and its diagnostics is one of the oldest but still an active and interesting research problem in the field of plasma physics. Arc discharge is a thermal discharge of very high temperature and can be generated using a suitable power supply. An addition of a foreign material to the arc, hence called Seeded-Arc, and its study is an interesting field of interest because of its emerging new applications. But a detailed study and characterization of the seeded-arc is lacking. So, in this present study we aim to produce seeded-arc plasma, characterize it and explore for possible application. To be specific, variation of the plasma parameters such as electron temperature, ion temperature, plasma potential, etc. is studied.

## Study on the Electronic and Magnetic Properties of RVSb3 (R = Ce, Pr) Desirable for Spintronic Applications

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Electronic and magnetic properties of lanthanide antimonide RVSb3 (where R=Ce and Pr) has been studied by using full-potential linearized augmented plane wave (FP-LAPW) method

based on the density-functional theory(DFT). For the exchange-correlation potential, generalized gradient approximation (GGA) has been used. Based on our DFT calculations, CeVSb3 has a ferromagnetic (FM) ground state while that of PrVSb3 has an antiferromagnetic ground state in agreement with the experimental measurement. Preliminary investigation on CeVSb3 shows finite density of states (DOS) at the Fermi level in one spin channel depicting possible candidate in the family of half-metallic (HM) ferromagnets suitable for spintronic applications. PrVSb3 on the other hand is found to be AFM metal with finite DOS in both spin channel contributed mostly by Pr-4f and V-3d states. DOS result shows the exchange-splitting of V-3d and rare-earth (R) 4f states electrons, which are responsible for the ground state ferromagnetic (FM) behavior on CeVSb3. The FM behavior of this compound is strongly influenced by the average number of V-3d and Ce 4f-electrons.Strong hybridization between O-2p, V-3d and R-4f states are observed from the DOS features. The effective moments of CeVSb3 and PrVSb3 were found to be 3µB,0 respectively.

O-MP-1-640

## Two-Photon Ionization Cross-Section for Hydrogen Atom using Volkov Wavefunction

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We considered photo-ionization of Hydrogen atom by electron impact in presence of intense laser field. Evaluation of ionization cross-section involves matrix element of the dipole operator between complete set of states of target (hydrogen) atom which contain the continuum states. Using Volkov states for states of the atom, we obtain ionization crosssection for hydrogen atom with the absorption of two-photon. This cross-section found to be function of initial kinetic energy of incident electron, photon energy and scattering angle.

O-MP-1-750

## First Principles Study of Structural and Electronic Properties of Boron and Boron-Nitride (with different diameter) nanodisc

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Based on the first principles calculations using Generalized Gradient Approximation, we calculate electronic properties of Boron and Boron-Nitride (with different diameter) nanodisc and related structures. Here the total cohesive energy per atom is calculated and which is used to verify the stability of the structure. Furthermore, the density of states and partial density of states is also performed. In this experiment, we demonstrate the variation of conductivity of Boron while doping with Nitrogen and relation of variation of conductivity with the diameter of the Boron-Nitride nanodisc.

## Nanoscale and Radiation Physics (O-NR-1)

O-NR-1-901-I

## Nano-size Powder Synthesis for Chemically Homogeneous Antiferroelectric Phase of $(Pb_{1-x} Ba_x)ZrO_3$ (0.05 $\le x \le 15$ ) Ceramics

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Advantages of semi-wet route to the synthesis of lead barium zirconate ceramics are presented. It is shown that (Pb<sub>1-x</sub> Ba<sub>x</sub>)ZrO<sub>3</sub> (PBZ) (for x=0.05,0.1 and 0.15) powder of nano size is synthesized at 700.35 <sup>0</sup>C using semi wet involving solid state thermo-chemical reaction in a mixture of ZrO<sub>2</sub> and carbonate precursor (Pb1-xBax)CO<sub>3</sub>. The carbonate precursor is prepared employing forced co-precipitation of PbCO<sub>3</sub> and BaCO<sub>3</sub>. The nanopowder is sintered in pellet form achieving nearly 99.5% of theoretical density at 1050°C which is more than 300°C lower than the employed for conventional dry route. The XRD pattern of sintered powder are more intense than those of as calcined powder and those derived from dry route, which is attributed to having higher grain growth and chemically homogeneous of Ba<sup>2+</sup> in PBZ matrix. The structure of the samples is antiferroelectric orthorhombic superlattice. The volume change (~1%) from orthorhombic to rhombohedral phases represents the large strain energy. The study of dielectric measurement confirms the XRD results. The antiferroelectric to ferroelectric phase transition accompanies large lattice strain, energy change and high dielectric constant. Such properties and distinct phase transition in antiferroelectric materials provide great opportunities for the realization of energy storage devices such as supercapacitor, energy conversion devices such as MEMS and actuator applications.

## O-NR-1-128 Study on the Environmental Radioactive Cesium Decontamination using Metal Hexacyanoferrate

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Separation science is a broad field that mainly covers solvent extraction, ion exchange, and adsorption. For any of these methods, selectivity, capacity, kinetics, and stability of the material in the given system are the important parameters. When the task is environmental decontamination, for example, removal of Cesium (Cs) from various solution systems, the choice of adsorbent material becomes additionally important. Regarding the radioactive Cs decontamination, two groups of materials, in particular, zeolites and metal hexacyanoferrates (MHCFs), are extensively studied and used. Though natural zeolites offer merits like wide working pH and substantial adsorption capacity, these are less selective. In contrary, MHCFs are well known for their unique selectivity for Cs. Therefore, when the primary purpose is selective removal of Cs for the purpose of volume reduction of the radioactive cesium contaminated wastes or its uptake from environmental waters, MHCFs are better. Our study on the preparation, characterization, and application of MHCF for the decontamination of radioactive Cs in the environment released from the Fukushima nuclear accident will be presented.

O-NR-1-219

#### X-ray Absorber in the Outflow of Active Galactic Nucleus Mrk 509

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It is well established fact that the active galactic nuclei (AGN) are powered by the accretion of surrounding mass onto the supermassive black hole (SMBH) at the center. During the process of accretion, high amount of energy per second is released in all possible energy bands of electromagnetic spectrum: from radio to gamma rays. While most of the material is accreted onto the SMBH via accretion disk, significant portion of it flows away from the nucleus in the form of outflows and jets. The emitted radiation is reprocessed due to the interaction with the outflowing matter before reaching to the observer. In this work, we discuss the outflow from the nucleus of active galaxy Mrk 509 and model the absorption of X-ray radiation by the ionised gas present in the line of sight. We used the numerical code TITAN to solve the full radiative transfer equations and computed the physical properties of the absorbing gas. We show that the absorber in Mrk 509 can be modelled by a single plane parallel slab of gas in total pressure (gas + radiation pressure) equilibrium. The strength of absorption, i.e., absorption measure distribution computed from our modelling is consistent with the value derived from the observational data of X-ray satellite XMM-Newton.

O-NR-1-250

#### Sol-gel Synthesis of TiO<sub>2</sub> Nanoparticles Using Lysozyme

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Titanium dioxide (TiO<sub>2</sub>) nanoparticles were synthesized by the sol-gel route using titanium isopropoxide. Their structural and optical properties were compared with and without using lysozyme. X-ray diffraction pattern showed dominance of anatase phase using lysozyme. The grain size of nanoparticles was found to decrease from 38 nm to 17 nm on using lysozyme. Fourier transform infra-red spectroscopy study revealed the existence of chemical bonding of Titanium and Oxygen. The band gap energy calculated by UV-Vis spectroscopy was found 3.53 and 3.40 eV without and with lysozyme respectively.

O-NR-1-454

### Electron Impact of Single Ionization of Kr and Xe

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Theoretical studies of electron impact single ionization cross sections of Kr and Xe atoms have been performed in binary encounter model using accurate expression (cross section for energy transfer) as given by Vriens. Hartree-Fock velocity distribution for the target electrons have been used throughout the calculations. The calculated results of single ionization cross sections for both Kr and Xe are found in fair agreement with the available experimental results of R Rejoub *at el* (2002).

O-NR-1-458

## Assessment of Indoor Radon in Different Houses of Nepal

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Radon, a naturally occurring radioactive inert gas, exists naturally as a result of the radioactive decay of Uranium, Thorium, and the Actinium series. These days, radon and its progeny constitute the most important natural radiation exposure. After smoking, radon represents the second leading cause of developing lungs cancer in general people. To assess the level of residential radon, a survey was conducted in five different districts Kathmandu, Bhaktapur, Lalitpur, Pokhara and Siraha. The measurements were carried out over a period of three months using time integrated passive radon detectors CR-39 based on type II Solid State Nuclear Track Detector (SSNTD) technique. For the observation, two types of houses were chosen, concrete with plastered walls and stone-mud build house. The minimum concentration of radon in the studied areas was found to be less than 20 Bq.m<sup>-3</sup> and the maximum concentration was 110±20Bq.m<sup>-3</sup>.The study reveals that the indoor radon concentrations are well below the reference level as recommended by International Commission on Radiation Protection (ICRP). However, the ventilation condition, the lifestyle of people, construction of the dwellings and the climates of areas were the major influencing factors in the variation of observed indoor radon concentration. The study also establishes that the people of the concerned residential areas are safe from the possible hazards of radon exposure.

O-NR-1-460

### Study of Elastic Scattering of an Electron in Dressed States

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We discussed the various importance aspects of the theory of electron – atom elastic collision in laser field. We analyzed the collision accompanied by the transfer of I- photons. We studied the free electron states i.e. volkov states and target atomic sates i.e. dressed states. We calculate the first born scattering matrix for electron–atom elastic collision. The present work accounts the calculation for H- as target atom in soft photon limits. In weak field the dressing effect becomes significant in the region of low momentum transfer. We noticed differential cross-section becomes infinite at very low momentum transfer, reaches maximum of value of 25000 a.u. at momentum transfer 0.44. The differential cross- section falls due to absorption of photons.

O-NR-1-540

## Status of Radiation Leakage and Protection after Earthquake in Various Hospitals in Kathmandu, Nepal

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We had carried out the observations of radiation leakage from diagnostic X-ray and CT (Computed Tomography) machines in some hospitals of Kathmandu valley after great devastating earthquake in April 2015. It includes relations between Voltage (kVp) and Current

(mAs), kVp and Dose, mAs and dose, intensity and leakage, structure and quality of materials for protecting radiation. As X-ray is most common diagnostic tool for every person without any restriction comparing other tools such as CT and MRI and it has better quality of the images with low dose as reasonably achievable to the patients, they are widely used in every hospital. But the accumulative nature of the radiation hazards through leakage with the long time exposition for radiographers and patients would cause non-terminating effect. We had calculated the dose of radiation leakage and compared this dose with the MPD (Maximum Permissible Dose) prescribed by ICRP (International Commission for Radiological Protection). Due to the cracks and rupture in walls and leads, the radiation leakage is found to be problematic in some hospitals. Because of the lack of management of X-ray and CT rooms and lack of personal monitoring service for radiation workers themselves, as well as the other staffs and even patients get hazardous radiation in some hospitals. There is a great need for Radiation Protection Regulation in the hospitals. We had further researched on the dose, effect and the management of radiation which will become basic tool for the analysis of radiation status, protection, its leakage and management in futuristic way.

O-NR-1-594

## Performance of Dye Sensitized Solar Cell Fabricated using Anode Prepared with Nanostructured ZnO Film Sensitized with Natural Dye Extracted from Prunusdomestica Fruit

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In this work, dye-sensitized solar cells (DSSC) were assembled by using the extracts from Prunusdomestica (Plum) as sensitizer for nanostructure ZnO photo electrodes. Fluorine doped Tin Oxide (FTO) films were deposited on glass substrate by spray pyrolysis method at substrate temperature of 450° C. Seed layers of ZnO were deposited on the FTO substrate by using spin coating method and these substrates were used for hydrothermal growth of ZnO nanostructures. The optical and electrical properties were studied for reproducibility of FTO sample. Structural properties of the film were studied by X-ray diffraction study. Dyes were extracted from different parts of plum fruit as well as aged plum fruit in distilled water and in ethanol separately and optical properties of these dyes extracts have been investigated. The fleshy part of fresh Plum dye in distilled water shows higher absorbance with a wide range of absorption than other dye extracts. DSSC were successfully fabricated using Plum dye loaded nanostructured ZnO film on FTO film as anode. The performance of DSSC was studied from I-V characteristic of the cell.

## Gorkha Earthquake (O-GE-1)

O-GE-1-890-I

#### Cause and Consequence of 2015 Gorkha Earthquake in Nepal

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Cause of 2015 Gorkha Earthquake in Nepal is due to that the Himalayan belt still grows upward at the rate of about 2 mm per year and moves northward against Tibet at the rate of

4-5 cm per year. Because of such movement (i.e. collision between Indian and Eurasian plates), several faults (intra-crustal thrusts) evolved and propagated towards the south from the north in the Himalavan region including Nepal, Among them, Main Frontal Thrust (MFT) is considered as a southern tip of the Main Himalayan Thrust (MHT), a plate boundary thrust between the colliding plates. The MHT has been found to be active to produce catastrophic earthquakes along the Himalaya and is also the source of recent 25 April 2015 Gorkha Earthquake which happened in Nepal with magnitude of 7.8 Mw and its epicentre was located about 77 km northwest of Kathmandu near Barpak Village in Gorkha District of west-central Nepal. The focus of the earthquake was about at depth of 15 km (considered shallow and therefore more damaging quake) and main shock was followed by two major aftershocks with magnitude of 6.7 Mw (26 April 2015) and 7.3 Mw (12 May 2015) and the 2015 continuous seismic sequence in the central Himalaya was the biggest series of events after the 1934 Nepal-Bihar great earthquake. The consequences of 2015 Gorkha Earthquake in the Nepal were extremely devastating that killed 8.964 (and 21.952 injured) and huge economic losses with draining the scare resource the country. The earthquake triggered an avalanche on Mount Everest, killing at least 19 and another huge avalanche in the Langtang Valley, where killing about 350 people. Several landslides (around total of 4312) were induced by the Gorkhaearthquake and Arniko Highway (trade link between Nepal and China) was severely damaged by slope failures. Thousands of people were made homeless especially those near the epicentre and across the many districts (14 affected districts) in Nepal. Centuries-old buildings were destroyed at UNESCO World Heritage sites in the Kathmandu Valley, including some at the Kathmandu Durbar Square, the Bhaktapur Durbar Square, the Patan Durbar Square, the SwayambhunathStupa, and the Changu Narayan Temple. Still geological hell of Nepal earthquakes may not be over; many experts are warning based on GPS monitoring and geological studies (i.e. no evidence of surface ground rupture or ground deformation in 2015 Gorkha Earthquake to release all stored energy) that Nepal Himalaya is vulnerable to earthquake, particularly because of its fragile geology, rugged topography, urbanization, and architecture. Thus, geo-scientific innovative research/investigation is indispensable to know the stress release mechanism in the seismically active Nepal Himalaya.

O-GE-1-213

### Earthquake 2015 in Nepal, An Experience at Bir Hospital, Kathmandu

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Background: On 25<sup>th</sup> April 2015 Nepal experienced earthquake of 7.8 Rector scale followed by another one of 6.8 Rector Scale next day with epicenter near Kathmandu. More than 9,000 people died, 25,000 injured, 200 missing, 500000 houses collapsed. Big after Big-shock 17 days later on 12th May, Killed 300, injured 3000 people. Country's central Hospital, Bir Hospital located in Kathmandu in hub hospital for disaster management, though damaged itself, yet it treated all victims brought here. Methods: All Victims brought in immediately and later were triaged, resuscitated, damage control surgery followed later by definite surgery were carried out as per necessity. Records were kept. Challenging logistics and supply were managed in best possible way under the circumstances with aid from abroad later in kind, man power.As the hospital was damaged too, all in-patients were evacuated to nearby open field. Triage was carried out in open spaces available.Makeshift operation theaters were put up and surgery began as existing ones were damaged too. Side by side institutional rehabilitation was begun too with help from volunteers. Several volunteers from abroad technical and nontechnical also helped us a lot. Results; Between 25 April till 17 June, total of 2574 victims attended this hospital. Of them 132 were dead, 1432 were admitted, 1135 undewent surgery ,568 of Major and 567 of Minor category,24 died in hospital while on treatment. Of surgery,

most (568) were orthopedic cases, followed by Polytrauma and General Surgery 299, Neurosurgical 39, Chest trauma 24, Burn & Plastics 9, ENT & Dental 7. Damage control surgery was performed on 40 victims. Of 190 Orthopedic surgery,101 were for Lower Limb ,69 for Upper Limb,20 for Spine & Pelvis. Mechanisms of injury included being buried in rubbles, trapped between heavy objects & collapsed building, falling objects and panic fleeing. This Natural catastrophe struck least developing country Nepal causing huge loss of life and economy. Rehabilitation and reconstruction is challenging. Since forewarning technology is still unavailable, hospital preparedness in emergency program with regular drill is essential for us to perform better in such situation.

O-GE-1-269

## Rapid Assessment of Effects of Gorkha Earthquake on Radiological Facilities

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Radiation monitoring involves the measurement of radiation dose or radionuclide contamination for reasons related to the assessment or control of exposure to radiation or radioactive substances, and the interpretation of the results. In the present work, an attempt for radiation monitoring has been made in public and private hospitals and nursing homes across Kathmandu, Bhaktapur and Lalitpur districts in the wake of April 25, 2015 destructive Gorkha earthquake to assess the damage, if any, in the radiological facilities of some hospitals. The exposure to radiation can be dangerous at any level and has cumulative effect with time. At this point, it is important to know the radiation levels to which personnel are being exposed. Radiological facilities of altogether 18 public and private hospitals were monitored for the radiation level at specified locations. The radiation monitoring was performed by Radalert 100 Nuclear Radiation Monitor. International Medcom, U.S.A. Radiation dose rates recorded from a maximum of 933 µSv/hr to a minimum of 0.30 µSv/hr. The patient waiting room and even the control console area of some of the hospitals demonstrated a significant dose rate which over a long term exposure could prove detrimental to radiation workers as well as patients and the public. Based on the conclusions, recommendations have also been made considering them to be helpful in ensuring compliance of radiation protection with regulatory standards as set up by International Commission on Radiological Protection (ICRP).

O-GE-1-278

## Field Reconnainance and Engineering geological lesson learned from Gorkha Earthquake 2015, Nepal

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The Himalaya is a product of collision between Indian and Eurasian plates. The northward movement of Indian plate under Eurasia is estimated 40 mm/year. The  $M_w$  7.9 Gorkha earthquake occurred on April 25, 2015 on and around the main Himalayan Thrust near Barpak, Gorkha with a hypocentral depth of 15 km followed by  $M_w$  7.3 aftershock in Kodari causing 8700+ deaths and leaving hundreds of thousands of homeless. The recorded ground motion data in the middle of the basin had a very low peak ground acceleration (PGA) = 151 cm/s<sup>2</sup> and very long period. The ground shaking was substantially lower in the short-period range than would be expected for and earthquake of this magnitude. However, the

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Kathmandu valley was uplifted more than 1 meter within 4-5 seconds which created lots of instability and landslides. Topographic effect, liquefaction and land subsidence are clearly visible in the affected areas. Most of the houses were damaged in the topographic ridge compared to slope and valleys which were constructed by mud mortar with stone of rounded to diagonal shape. More than 10000 landslides were triggered by this earthquake. Most of the landslides are shallow and occurred in weathered bedrock and appear to have mobilized primarily as raveling failures, rock slides and rock falls. There are numerous cracks in the ground especially in the epicenter area. Similarly, liquefaction occurred in the different parts of Kathmandu valley. However, the recording in KATNP and DMG indicate that the ground motions that resulted from the quake were not strong enough to fully weaken liquefiable materials and in most cases incipient or "marginal" liquefaction was observed.

O-GE-1-359

## Landslides Caused by the Gorkha Earthquake 2015: Findings from their Spatial Distribution

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The April 25, 2015 Gorkha earthquake triggered more than 17000 landslides widely distributed in an area of 20500 square kilometers. Interestingly, regional clustering and localization of these landslides are observed in a narrow angular band and mostly within the probable seismo-genic fault. Most landslides are shallow disrupted falls in steep slopes and nearby the ridges and valleys. Rock falls and dry debris flows are common, however the larger and deep seated are more destructive but less frequet (like the Langtang debris avalanche, Bainsari landslide in Kaligandaki valley, etc.). In these cases, these landslides are more destructive than the structural damage due to shaking, which swept away several villages and claimed many lives and property. Landslide dams and landslide roads blockades was common. Different from rainfall induced landslides, these widely distributed landslides usually cannot be prevented by current mitigation structures; instead the effective preventive measures are potential earthquake induced landslide hazard zoning, early warning system and evacuation of vulnerable communities. For this, as a primary step, it is necessary to establish correlations between the spatial occurences of these landslides with: 1) seismic (distance to epicentre, distance to seismo-genic fault, PGA values), topographic (elevation, slope, aspect, topographic position) and geological lithilogical units' parameters. A preliminary understanding is made on this. The event of an earthquake induced landslide is a consequence of the delicate interplay of these parameters. The landslide inventory is prepared in Google Earth using the updated satellite imagery in the affected area, some days after the earthquake.

O-GE-1-480

## Post Earthquake Remote Sensing Based Geomorphic Assessment of Landslide

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Nepal is situated in high energy environment which characterizes high relief, steep hill slopes and river gradient, fragile geological, active tectonic activity and high agriculture dependent population. Life in hills is at ever-increasing risk of being wiped out by disasters, as disasters

triggered by natural hazards are killing more people over time with contrast of recent Gorkha earthquake. These events have been triggered out along with the development of fissure and subduction of land in slope area. These fissure and subduction of land are considered as major triggering factor for possible landslide. Fissure, land subduction along with landslide in various area in Rasuwa district were reported but their documentation has been lacking during the period of Earthquake. Remote Sensing and GIS have been considered as effective tools to document the geomorphic assessment of geological process such as landslide. Two main approaches were undertaken for the preparation of landslide inventory map: Interpretation of Satellite images and field work. Various new landslide, fissures and land subducted area were documented and mapped. From the inventory of the fissure and landslide in Rasuwa district it had been observed that it was very much affected by recent Gorkha earthquake.

0-GF-1-770 Study on Thermal Comfort in Temporary Shelters in Nepal after massive Earthquake 2015

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As we know, April 2015, a massive earthquake has become another reminder of the fact in Nepal. Those who are rendered homeless after the earthquake have been living under makeshift tents, without basic facilities. Unlike conventional houses, these makeshift camps provide no relief from rain, scorching sun or biting cold. Homeless victims are doomed to live in thermally uncomfortable temporary shelters. It effects on their thermal comfort and health condition. After the massive earthquake almost no such research has been done about the thermal environment in temporary shelters and thermal comfort of residents. The objective of this research is to find out the level of thermal sensation, thermal preference, thermal satisfaction and overall comfort in the temporary shelter. We have also clarified the comfort temperature of the residents. Gorkha, Sindhupalchowk and Lalitpur districts have been chosen as the research areas. We have measured indoor air temperature, globe temperature, surface temperature and relative humidity by using instruments and conducted thermal comfort survey and clothing insulation by using questionnaires. The surveys were carried out for 30 days in autumn (October 22 to November 21, 2015). We have collected data from 202 residents. The mean indoor temperature is 21.1°C, which are similar to the globe temperature. The respondents felt cold and prefer much warmer, similarly they were slightly unsatisfied and slightly uncomfortable with their present thermal environment. The comfort temperature in the temporary shelter is 23.9°C and the mean clothing insulations of residents is 0.73clo. So this research will be be first record of thermal comfort survey in temporary shelters in Nepal and contribute not only in terms of academic research but also in planning at national and local level.

O-GE-1-772

### Engineering Geological Investigation for Large Dam in Himalaya - a Lesson from Budhigandaki Hydropower Project in Nepal

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An arch dam of 265 m high is designed to be built in Budhigandaki River of Central Nepal Himalaya. Geological and geotechnical investigation was carried out to explore the suitability

of the proposed location for the construction of dam. The objectives of the investigation were to characterize the rock mass in order to explore the geo-technical design parameters. The investigation reveals that the geo-structural setting of the project location is to be characterized by overturned stratigraphic sequence, with bedding strike near parallel to the river and dip towards upstream indicating higher degree of folding and faulting at local level. Geophysical test (e.g. ERT & SRS) followed by geotechnical investigations revealed that the thickness of the overburden is as high as 30m. The Rock Quality Designation (RQD) index is highly variable (20 - 75) explaining poor rock mass guality at shallow depth. However, as it goes deeper (>50m), it improves. This was also proved due to the high (10 Lu) and low (0.001 Lu) value of Lugeon test on the upper and lower sequences of rock mass respectively. Six test galleries were excavated on either side of the proposed dam axis where geotechnical insitu test (e. g. PJT, Dilatometer, Seismic and Lugon tests) were carried out. These test result indicates that the 50 meter thick fractured and weathered rock mass and overburden materials shall be removed in order to achieve the stable dam-abutment foundation. In general the investigation reflects that the project location is found to be on favorable for the project where sequences of quartzite, phyllite and siliceous-dolomite are prevailed. The investigation concluded that the exploration and test carried out for the project is sufficient. However, rock mass of the area at dam, tunnel and powerhouse area were found to be fractured and heavenly jointed require additional test of hydro-fracturing to improve our understanding towards the project site geology.

## Himalayan Vulnerability (O-HV-1)

O-HV-1-902-I

## Addressing the Growing Vulnerability in the Himalaya through Appropriate Policies, Effective Institutional Arrangement and Output Oriented Activities

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The beautiful Himalayan terrain is formed by the complex geological process, which is still continued resulting in various geological activities. These geological activities together with the hydro-meteorological activities are giving rise to various hazards which eventually increases the vulnerability to people, infrastructure and natural resources. The people living in the Himalaya has a history of exposure to multiple hazards, such as earthquakes, landslides, soil degradation, flood, deforestation, loss of biodiversity, and drought thereby being vulnerable. Recent research has revealed that the global environmental change is the primary factor for increased exposure to vulnerability in Himalayan region that is projected to be more severe in the coming decades. With the visible and pronounced impact of climate change, large population will become vulnerable to various types of hazards, which eventually has significant impact to their livelihood. Similarly, the infrastructures that are exposed to high vulnerability with high disaster risk will have significant impact to the development of the nation. In order to address the growing vulnerability in the region, proper understanding of the bio-physical, social and institutional components is required. The vulnerabilities of various components due to different factors should be identified and required mitigation and adaptation measures should be adopted timely. This can be done only through the government-academia partnership with the community involvement. This paper is intended to present a comprehensive scenario of the vulnerabilities in the Himalava, existing issues, its analysis and further recommendation for reducing the Himalayan vulnerabilities.

## *O-HV-1-733* Vulnerability Analysis of City Core: A Case Study of Traditional Settlements of Asan to Indrachowk of Kathmandu

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Nepal with an area of 147181 sq. km. represents a great physical and cultural diversity in terms of geology, altitude and location. It consists of many landscapes of different geological formation. Nepal is an Earthquake prone country mainly due to its young geology, mountainous terrain, and widespread poverty. The historical data shows that Nepal witness Middle Earthquake (Up to VIII intensity in MMI) within 40 to 50 yrs. and Large Earthquake (Above VIII intensity in MMI) within 75 to 100 Yrs. The Great Earthquake of 1934 destructed parts of Kathmandu city to the ground, almost 500 houses were collapsed, Death toll was almost 500 (Nepalko Mahabhukampa, 1934). Population density in the city had crossed over 1,000 persons per hectare in some wards particularly at the city core of Kathmandu Metropolitan city. Land Uses in present are: Residential; 53.12%, Agriculture; 17.87%, Service; 10.94%, Greenery; 6.13% and Mixed; 7.01% (KMC). The changes in land use have affected in Population growth, Demands of dwelling size, decrease in open space and agriculture land, urban transportation and economic as well as environment problems. This situation is helping to increase vulnerability in all sectors and creating Kathmandu city as a less safe city to live. Studies also have forecasted that a large earthquake near the Kathmandu Valley today would cause significantly greater human loss, physical damage, and economic crisis than caused by past earthquakes (JICA, 2002).

O-HV-1-138

## Vertical Vegetable Garden for Vulnerables: Innovative way to Contribute in Food Security Status of Earthquake Displaced Households of Rasuwa District

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After devastating earthquake of 25th April 2015, the food insecurity and undernourishment tremendously increased in Nepal. This was serious among more than 21,000 earthquake displaced people (IPDs) residing at camps. Most of rural populations depending on subsistence agriculture are currently seeking alternative livelihood options in absence of agricultural land at camps. Most of the earthquake victims were managing rice but undermined the need of vegetables in daily intake of food. With the instigation of growing maximum nutritious vegetable within a limited land available to the IDPs, the concept of vertical vegetable gardening was initiated. Three tier vertical gardens with use of local resources is an innovative technology to produced short durational vegetables. The production of vegetables was sufficient for at least 14 days for each family. Simple random sampling of 10% of IDP households and focal group discussion with IDPs of Laharepauwa and Dhaibung of Rasuwa showed significant contribution of vertical gardening on the nourishment of children, pregnant women and elderly people of IDPs. Hence this research concludes that vertical vegetable garden is an innovative way to contribute food security status of vulnerable IDPs and has been suggested to replicate in other IDPs camps and land scarce areas.
0-HV-1-235 obability of

# An Empirical Model to Determine Rainfall Threshold and Probability of Landslide Occurrence in the Koshi Basin, Nepal

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The rainfall-triggered landslide has been one of the major causes of the serious hazard throughout the world, leaving Nepal no exception. Most of the Himalayan regions of Nepal witness catastrophic landslides each year. Despite this fact, only scanty research involving an empirical model has been undertakento determine landslide triggering rainfall threshold. While previous researches calculating rainfall threshold considering only Daily Rainfall, this study aimed to determine the relation of Antecedent Daily Rainfall and Daily Rainfall with the probability of landslide occurrence in the Koshi basin, Nepal. For this study, a year 2002 was choosen as most of the catastrophy was reported in this year. An empirical model "Antecedent Daily Rainfall model" was employed along with logistic regression analysis to determine the probability of landslide occurrence along with rainfall threshold. This study concludes that the probability of landslide occurrence is really high (>90%) if Daily Rainfall exceeds 168 mm. Furthermore, if an Antecedent Daily Rainfall exceeds approximately 112 mm, landslides can occur even without additional rainfall. This study warrants further studies to obtain reliable rainfall threshold value to set up a forecasting system with unerring accuracy.

O-HV-1-297

#### Pre Earthquake Nationwide Landslide Inventory of Nepal 2015

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Landslide is a common hazard in Nepal because of its high relief mountains, relatively steep river gradient with active geology and intense monsoon rainfall. Vertical and sharp landscape further acts as a catalyst for this hazard. Google Image 2014 was used to identify all the landslide patches of Nepal in pre-earthquake scenario (2013-2014). Images were digitized and analyzed with the help of ArcGIS tool. For the study, the landslide patches of more than one square kilometer located in 72 districts were selected. Landslide classification was made on the basis of mass wasting type, pre existing land use and land cover, aspect of the slope, topographic position of landslide, human disturbance and risk. A total of 5,003 landslides were counted, which made a total area of 126,343,776 m<sup>2</sup> (12634 km<sup>2</sup>). The highest number of landslides was found in Rolpa district (258) followed by Bajhang (212), Baitadi (176) and Jumla (175), while the lowest was in Jhapa, Rautahat and Siraha, each having 8 landslides. Two districts in Tarai plain Parsa and Sarlahi did not have any such landslide. South facing slope contained highest number/area (43%) of the total landslide. In perspective of land use and land cover, the highest number of landslide was in shrub-land (782) and dense forest (779). The highest risk of landslides was in forest and shrub-land having 1844 landslides followed by agriculture land with 1125 landslides. Road construction contributed 603 patches of landslides.

O-HV-1-430

#### Landslide Vulnerability from Social Perspective in Mugu District

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There is dense settlement on opposite aspect of eastern hills of Rara Lake. The seepage of water from the lake had formed streams. These streams had been the reasons for numerous landslides in that area. The problem of landslides is of less concern for the community. Also, literatures regarding landslide studies and the vulnerability of the social settings in the area are rare. This research was carried out in order to find the extent of social vulnerability among the peoples living there. Vulnerability assessment is based on scoring of the indicators and in turn these scores are summed up to generate indices. And the results were mapped in Arc-GIS environment. Vulnerability score ranged from 16.5 to 21.75 which was standardized and divided into five classes. Here, 33.08 % of household sampled possessed moderate vulnerability. High and very high categories of vulnerability occupied 18.8 and 4.51 percentages of households respectively. Environmental and institutional indicators were found to be indicating high vulnerability. Houses made of stones and mud, use of firewood, showed their contribution towards social vulnerability. Decreasing forests and grasslands, increasing temperatures and decreasing rainfall were environmental indicators showing vulnerability. Field observation showed the households scattered away from the village clusters were highly vulnerable

O-HV-1-637

## Stabilization of Ramche Landslide through the Application of Bioengineering Technique

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Ramche landslide has been active since August, 1985 and reactivates every year in monsoon. However, there are no any mitigation approaches are being implemented till date to stabilize the landslide. It has created a maximum impact in the society and tourism sectors of our country as well. The present study includes the analysis for suitability of bioengineering techniques for stabilization of landslide and erosion control of Ramche landslide. Desk study like topographic maps, aerial photographs, published and unpublished reports and literatures, journals, field manuals and established theories related to the present study were collected from the different sources. Likewise, field investigations were carried out as reconnaissance survey and detailed field study. After the analysis, wedge failure was found at toe and scar area of landslide. Live check dams, fascines, jute netting, hedge brush layers, drainage fascines and palisades can be implemented to control the landslide. Retaining wall and gabion check dams will be more suitable at the toe and scar area. Formation of alternative roads, deforestation, overgrazing and heavy rainfall leads to reactivation of landslide so people and all the concerned stakeholders should be made aware about the causes and consequences of landslide. Bioengineering should be the priority method for the stabilization of the landslide, rather construction other alternative roads in that area. Such type of study is recommended in other landslides also before the start of any mitigation activities.

0-HV-1-862

## Spectral Element Method to Evaluate the Stability of Kuiyadaha Landslide, Gokuleshor VDC, Baitadi

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Stability analysis of the Kuiyadaha landslide is performed with higher order finite element method known as spectral element method (SEM). The soil parameters obtained from the lab tests are modified by back analysis. Numerical program 'SPECFEM3D\_GEOTECH' is used to analyze the stability of slopes and to propose the possible mitigation measures. In this research, it has been found that Kuiyadaha landslide is susceptible to failure in rainy season. For this particular problem, reduction of ground water table along with toe loading is found to be satisfactory. Validation of the work is made using commercial software 'Phase2' and comparing the result from phase2 and SPECFEM3D\_GEOTECH, 0.965 correlation value is obtained.

0-HV-1-89

## Identification of Sediment Sources using Geochemical Markers in Chitlang Watershed of Nepal

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The sediment management is a key requirement to reduce the on-site and off-site impacts of water erosion in developing countries including Nepal which is however hampered by the lack of reliable information on catchment sediment sources. To prioritize the areas for conservation at the watershed scale, source identification is must. This study attempts to estimates the proportional contribution of sediments by land use in Chitlang Watershed using geochemical markers. Tracer concentrations of 12 trace elements were determined in potential sediment sources (forests, agricultural land and road tracks). Suspended sediment collected from Chitlang river during pre-monsoon, mid-monsoon, post-monsoon and flood event were analyzed using atomic absorption spectroscopy. It uses statistically verified geochemical tracers and a multivariate mixing model to identify the main sources of the suspended sediment transported by the river. Results indicate, for pre-monsoon K and Zn, for mid-monsoon Ni and K and for event sediment P, Zn, Al, Mn were the best tracers to discriminate potential sediment sources. Post-monsoon was excluded due to its nonconservative behavior of the trace elements. Mixing model showed that about 35% of the stream suspended sediment originated from forest soil, 34% and 30% from agricultural land and road tracks respectively in pre-monsoon. Similarly, road tracks (35%) dominate the sediment contribution following agricultural land (33%) and forest (31%) in mid-monsoon and flood-event. Despite the resource constraints and methodological uncertainties the results suggest that the majority of the sediment was derived from road track and arable soil erosion.

### Science, Technology and Society 1 (O-ST-1)

#### O-ST-1-244

Vector Error Correction Model Approach between International Tourist and Their Length of Stay towards Share of Gross Domestic product of Nepalese Tourism

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This study tries to examine long run causality of international tourist arrival in Nepal and their average length of stay towards share of gross domestic product of tourism by using vector error correction model (VECM). A multivariate time series analysis has been applied from the period of 1991 to 2014. The results of Johansen test of co-integration indicates there is one co-integrated vector under 4 lags of length among the share of gross domestic product of Nepalese tourism, international tourist, and their average length of stay. The long run relationship based on vector error correction model has indicated that GDP elasticity with respect to average length of stay is more elastic as compared to GDP elasticity with respect to number of international tourist arrival in Nepal. The results of Granger causality analysis have depicted that there exists bidirectional causal relationship between international tourist and their average length of stay of tourist. Similarly, unidirectional causal relationship exists between GDP and number of international tourist arrival in Nepal.

O-ST-1-368

### Science, Technology and Innovation: Vehicles for Nepal's Prosperity!

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Science, technology and innovations (STI) are the fundamental vehicles leading the society towards multi-faceted development. In this respect, the research activities are directed ultimately towards creation of new tools and techniques leading to new discoveries useful for the society. On the other hand, research and innovations are not new things for us. The art of metal alloying, painting, and wood carving were discovered and developed by our artisans. Our sub-continent had been the centre of innovation in both natural and spiritual sciences for several thousand years. However, as Buddha said - everything in this world is impermanent. We could not keep up with the spirit of our innovations. With the new industrial revolution, new dimensions of research and innovations evolved which we have not been able to grasp firmly still today as the history of modern education in our country is only around one hundred years old. However, we have a great potential of developing our science and technology leading to discoveries and contributing towards the well being of society worldwide. At this juncture, we need to awake and move forwards. We are not poor, nor are we backward. What we miss is the confidence and inner view, which can be revitalized. We are wandering around like musk deer searching for the source of the intense fragrance which is emanating from inside itself. In this presentation, we will begin with our difficulties and opportunities for innovations and highlight the areas of research from our perspective highlighting the areas in which we could focus our attention to support our industrialization. In context of those difficulties and opportunities, the objective of this paper is twofold: 1) To briefly review the technological advancements made by our ancestors in various fields (architecture,

sustainability, materials science and medicine) and highlight the gaps between traditional technologies and advanced ones; and 2) Identify the potential areas of scientific developments in different sectors and make recommendations

O-ST-1-375

#### The Orbit of the Earth

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The distance between the Earth and the Sun is not same throughout the year, i.e. the orbit of Earth deviates a bit from the circle. The goal of our research was to see if changing the shapes or the inclination of the Earth's orbital plane makes any difference in the axial tilt of Earth and Sun, the time period taken for the Sun to move from vernal equinox to autumnal equinox, and then back to vernal equinox. For this, we constructed a 3-D numerical model of the Earth-Sun geometry. Our model defines Earth's orbit as an inclined plane of spherically symmetric system. We calculated the degree of the tilt of the Earth orbit to the ecliptic plane by converting from ecliptic frame of reference to the orbital frame of reference and then we made all the measurements. Initial inputs of our model are aphelion and perihelion parameters. It is interesting to examine that our results obtained from Earth inclined orbit is same that observed value from Earth's circular orbit. In other words, values of the axial tilt of Earth and Sun, the time taken for the Sun to move from vernal equinox to autumnal equinox and then back to the vernal equinox does not change. Moreover, we were also able to derive mathematical relations for finding the length of the apparent solar days throughout the year. Our mathematical relation provides new insight for the calculation of time for the revolution of Sun around the Galactic Center.

O-ST-1-408

# Effect of School Vegetable Gardening on Knowledge, Preference and Consumption of Vegetables in Nepal

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The present study attempts to explore the effects of school vegetable gardening as a learning tool to improve knowledge, awareness and preference for vegetable consumption among the school children in Nepal. Thirty schools from hills (Dolakha and Ramechhap districts) were randomly selected to identify the nutritional outcomes of school vegetable gardens by using a randomized control trial (RCT) design. Students in the treatment group participated in a 23-weeks garden based nutrition activities. The treatment schools were evaluated using a pre and post intervention data collected from students (n= 1275) of grade 6 and 7. Post intervention findings of the study significantly resemble the higher level of awareness & preference (p<0.01) towards the consumption of nutrient dense vegetables in treatment schools. Students who participated in garden-based intervention increased their level of knowledge (7.80) on vegetables and nutrition, more than the students in control group (5.92). The research unveils the fact that school vegetable gardening is an effective concept to increase knowledge, awareness and preference towards nutrient dense vegetables and their

importance in human health. Students could be an effective mediator to promote domestic vegetable gardening activities in the rural community. So, the practical intervention of school vegetable gardening along with home gardening activities is necessary and should be practiced through all schools of Nepal.

O-ST-1-414

#### Public Facility Locations and Rural Roads Network in Hilly Regions of Nepal

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Identification of optimum locations of public facilities is an important issue for the government in order to deliver goods and services to the community residing in hilly areas of Nepal. This paper has studied the covering scenario of the existing settlement in the hilly areas by the existing public facilities. A location allocation model, maximal covering location problem (MCLP) is utilized for the study. Connection to the optimum villages and public facilities by road links, forms a basic rural roads network in the rural hilly areas. A Minimum Spanning Tree (MST) of the network is the minimum connection level necessary for the connectivity of the public facilities and the rural settlements in the hilly areas. The model can be a more practical and realistic optimization tool for the rural public facility location and development of roads network in hilly areas of Nepal.

#### *O-ST-1-436* Present Land use Versus the Land use Zoning: A Case Study from Waling Municipality, Syangja

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Scientific land use planning is necessary for the systematic assessment of land and water potential, alternatives for land use in order to select and adopt the best land-use options; thus preparation of existing land use and land use zoning map is a must. A total of 26 soil samples along the banks of Aandhikhola river of Waling Municipality of Syangja district, Nepal were taken at 1:10000 scales in May, 2015. A rule based Multi Criteria Evaluation (MCE) methodology was developed for optimum use of land resources under the following six broad land use zones: agricultural area, residential area, commercial area, industrial area, forest area, public service area and other category. The suitability classes for land use zones are rated from the most suitable to the least. Each suitability class is therefore designated a zone with suitability ratings. Agricultural (55.12%) and forest areas (37.80%) were dominating while commercial (0.58%) and industrial areas (0.01%) were the lowest at present. In the proposed land use zoning, area under agricultural zone should be decreased by 5.02% and commercial, public and residential zone be increased by 0.19%, 3.45% and 1.66% respectively while the forest and industrial zones will remain intact. Switching of one land use to another was done just because lands, utilized for agricultural purpose, were actually not productive; moreover those were suitable for commercial, public and residential use.

### Anthropology: An Observation

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Cranial capacity of we humans since our ancestors had been increasing but the present scenario describes almost 10% decrease in the cranial capacity of ours from about 1500 c.c. - 1359 c.c. which might be a cause of dependency of machines and the theory of H.L. Shapiro regarding Homo futuris (Future man) might not be reliable. Bipedalism we have acquired might come into light when we consider regarding Center of gravity and semicircular canals of our modern human ear when compared to that of other organisms. Homo naledi can unlock pathways for the origin of human culture and its mysterious disappearance until Homo sapiens neanderthalensis.

O-ST-1-807

#### **Traditional Knowledge in Modern Science**

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Despite the existent differences of origin of traditional and modern sciences, knowledge can be learnt and used from each other. Many modern sciences have developed through nature and human history. Many of them are rooted in traditional systems of beliefs that indigenous people use to understand and able to interpret in a scientific way. At the same time, their knowledge symbolizes a wealth of wisdom and experiences natural phenomena that are transmitted directly from generation to generations without any written documentation. Still, traditional knowledge is invaluable for protection, conservation, utilization and commercialization of natural products for sustainable development. These natural substances are beneficial to human health caring many deadly communicable as well as non-communicable diseases of 21<sup>st</sup> century like malaria, cancer, HIV/AIDS, diabetes, cardiovascular diseases and others. In the biological convention, the emphasis has been given to respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities.

O-ST-1-875-I

#### Smart Villages in the 21<sup>st</sup> Century

Dr John Holmes

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In the second decade of the 21<sup>st</sup> century over 1 billion people remain without access to electricity and 3 billion people still cook on dirty and inefficient stoves. Many of them live in South and Southeast Asia, mostly in rural communities. Through the Sustainable Energy for All Initiative, and now incorporated as goal 7 of the Sustainable Development Goals, a commitment has been made to achieve universal access to clean energy by 2030. But progress has been too slow to meet this target. This is a concern, not just because access to clean energy is an essential part of development in its own right, but because energy access underpins achievement of most of the other Sustainable Development Goals. The Smart Villages Initiative aims to contribute to a ramp up in the rate of progress on energy access and to ensuring that not only is energy access achieved, but that it acts as a catalyst for other

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0-ST-1-7

essential components of development such as, improved education and healthcare, better access to healthy food and sanitation, establishment of productive enterprises to increase incomes, and better democratic engagement. By bringing together front-line players in energy access in a series of engagement events in Asia, Africa and Latin America, the Smart Villages Initiative aims to identify the barriers to village level energy for development and how those barriers can be overcome, taking arising conclusions and recommendations back to policy makers and development agencies acting nationally and internationally. John Holmes will outline the Smart Villages Initiative and summarise key findings and conclusions to date.

### Science, Technology and Society 2 (O-ST-2)

O-ST-2-265

#### Carp Seed Production in Private Hatcheries of Nepal

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Aquaculture is rapidly expanding in Nepal as a result demand for fish seed is increasing. Access to adequate high quality seed is the basis for sustainable aquaculture development. Due to guick and high profitability, and encouraging government policy, a number of private hatcheries are increasing especially in southern parts of the country. A survey of 40 private fish hatcheries was conducted from different regions (Eastern-9; Central-19, Western-6, Midwestern-3 and Farwestern-3) representing 15 districts (Morang, Sunsari, Saptari, Siraha, Dhanusha, Mahottari, Bara, Chitwan, Nawalparasi, Rupandehi, Kapilvastu, Bankey, Bardiya, Kailali and Kanchanpur) of Terai and inner Terai to assess the status of different stages of seed production within five year from 2009 to 2013. The survey revealed that total production of hatchlings, fry and advanced fry within five year were 15852.6, 879.5 and 259.5 million respectively. All these development regions showed increasing trend of their own contribution within a total of five year. The percentage of eggs fertility and hatchability was more (78.3 and 71.7) in mid western development region followed by eastern (68.9 and 61.7), central (68.3 and 61.7), far western (68.3 and 61.7) and western (68.3 and 60.0). The spawn after 4 days were fed by cow milk, buffalo milk, soymilk and goat milk along with egg. Generally 1-2 chicken eggs were used for 100000 hatchlings. Though private hatcheries played important role in seed production, improving their efficiency are imperative. Further, studies are recommended to overcome constraints on carp seed production.

O-ST-2-403

# Quality Assessment of Chhari Size Dried Naini Fish (*Cirrhinus mrigala*) at Different Market Channels of Nepal

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The demand for dry fish of chhari size (50-100 g) is emerging for the reasons of food security, income generation, value added product and its longer shelf life. From the prospective of consumers' welfare, the information on quality and hygienic condition of dried chhari fish is meager. Therefore, a study was carried out to access its quality at three commercially fish drying places in Bara, Dhading and Chitwan districts and their respective whole sale and retailer markets. Three replicate samples of dried (smoked) chhari sized naini fish, *Cirrhinus mrigala* were collected from the three each of processing sites, whole sale and retail markets. Differences in crude protein (58.0 to 72.3%), crude fat (3.5 to 14.6%) and moisture content

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(8.3 to 16.2%) among samples were wide. Most of the dried fish samples exceeded 10% of the permissible moisture content except samples from processing site in Dhading. pH value was within the acceptable range (<6.6) for dried fish samples collected from processors, wholesalers and retailers related to market chain of Dhading and retailers of Bara and Chitwan. The peroxide values of all samples were within the permissible level (10 to 20meq/kg of oil) except in sample from retailer of Chitwan (20.69±11.63meq/kg of oil). The concentration of mold (12x102 to 21x105cfu.g-1), total plate count (23x10 4 to 66 x107 cfu.g-1) counted were above the recommended norms in most of the samples. Present analysis suggests that chhari size naini fish commercially dried by smoking in all processing sites and their respective market channels are less hygienic at current state of drying.

O-ST-2-507

### Science, Technology and Innovation in Nepal: Individual Effort and Achievements

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Being naturally rich, culturally broad and traditionally well with own technologies, Nepal is not making progress in science, technology and innovation. In the past fifty six years, the formal establishment of University- Tribhubhan University in Nepal, we do not have even a single innovation that makes us proud to be an academician. However, in quantitative perspective, thousands of students are graduating with masters' degree of science per year; hundreds of professors are doing their job at Universities, other thousands of students are graduating in technical field every year from different universities under various categories of science and technology stream. The fundamental question is what we achieved so far ? Until when we will be blaming state and policy makers for not maintaining proper conditions for research? We all do agree, we lack resources, lack good policy and motivation but how self-motivated we are? The idea behind this presentation is how an individual (scientist, researcher, student, even a lay man!) can contribute to innovate technology, inspire young researcher and to connect technology with society.

O-ST-2-509

## An Assessment of Ecological Footprint of Urban Squatter and Non-squatter Settlements – A Case Study of Kathmandu Valley

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This research attempted to understand the variation in ecological footprint of squatter and non-squatter households in terms of Cumulative Environmental Behavior Index (CEBI). A hybrid footprint measurement tool was built considering the principle factors affecting Ecological Footprint and published standard questionnaires for Ecological Footprint calculations. The correlation between settlement type i.e. squatter and non-squatter and the Ecological Footprint (as measured by the mean CEBI) was tested using the Pearson product-moment correlation coefficient. Knowledge, attitude and behavior of people regarding the environment were studied through questionnaire and observation. The average CEBI of non-squatter settlement was found to be significantly more than that of squatter settlement.

Abstract Book

Squatter households in the sample had a statistically significant lower environmental impact than non-squatter households at 99 per cent confidence level. Factors like building type, size, the consumption of electricity, water, meat products and processed food, waste generated, waste recycled and the mode of transport used were studied. The highest contribution to the total CEBI was from the food sector, which was followed by wastes production. People's attitudes towards environment varied and most of the squatter households had no clear opinion. Knowledge on environmental practices was found comparatively more in non-squatter households. An interesting trend was seen in home gardening where gardening was often seen as a competition among households. This research will be useful for planners, policy makers and other professionals in the related field, to make amends in related sectors for a sustainable development.

O-ST-2-651

#### Remittances and Out-migration: Is Boon or Bane in Nepalese Agriculture?

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Out migration of labour force and remittance earning have a common phenomenon in Nepal. This research attempts to examine the impacts of remittance earning and out migration on socio-economic condition and agriculture production in Nepal. Farm and household level data were obtained from two districts of terai and hill regions of Nepal in 2013. The study employed the Probit and muti-regression income models to gauge the determinants of remittances earning and its impact on the farm income. The results from the Probit model revealed that household size and extension services played a significant and positive role on household decision to migrate member for better job opportunity to aboard. However, farm income and poor had negatively significant determinant on the household decision to migrate. Findings from income function econometric model identified that the household member migration dummy had negatively significant on farm income while controlling extension services, total land holding and poor dummy variables. Finding revealed that the farm income decreased by 358% among household those member are migrated to aboard as compared to non-migrant households. This study suggests that government and policy makers should developed better policy to utilize remittance and promote commercial agriculture farming to cope the bane situation of Nepalese agriculture.

O-ST-2-702

#### WIST (Women in Science and Technology) Policies of Korea

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The 21st century is a knowledge-based society. Utilizing the strong points and full capacity of women in science and technology(WIST) are highly required for the continuous economic development of Korea. The <Law for nurturing and supporting women in science and technology>was established in 2002. Based on that law, systematic support of 3 stages of 5-year units were launched. The 1st stage (2004~2008) was to encourage and promote the girls into the science and technology majors, thereafter increase of the job market for them. Enhancement of the social understanding of the WIST, establishment of institutes for WIST were also included. During the 2nd stage (2009~2013), strategic development and nurturing of the leading group of WIST, provision of more women-friendly working environment,

increase of career development, promotion and wide utilization of WIST were the main themes. The vision of the 3rd stage (2014~2018) is summarized as scientific creativity and technology creativity boosting economic creativity run by both genders, in equal importance and contribution. The systematic support of Korean government for WIST is continuing, expecting their contribution not only inside of Korea, but throughout the world. As conclusion, the Nepali WIST should be encouraged, supported from the government and outside world to contribute for the development of this nation. Forming networks and organizing women's forums may be the first step as were in Korea.

O-ST-2-794

# Urban Visions and Realities: Linking Sustainability, Resilient Urban Development and Higher Education Potentials

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Urbanization, economic development, changing lifestyles and natural hazards are altering cities all around Asia. In parallel, changing urban paradigms and wishes for 'modernity' are triggering supposedly fashionable urban appearance, leading to an increasing grade of uniformity. On this way urban fabric often is sacrificed without consideration of the intangible values added communities add to their heritage. It is argued that urban heritage constitutes a crucial source of identity for present urban inhabitants, which is not always reflected in urban planning or conservation realities. It will foreground the extent to which certain forms of heritage form part of people's imaginings and potentials to shape the urban future. The presentation is based on own empirical studies in Kathmandu, Nepal, with university students as the main peer group, allowing for conclusions on their perception of the urban environment as well as on the educational system and its potentials. Despite major urban changes in the recent years Kathmandu's urban heritage, habits and beliefs are still of importance to the population. The presentation gains additional significance given the devastating earthquakes that heavily affected Kathmandu in spring 2015. Decisions on urban reconstruction will – or should – decide how far community ties to local culture and heritage are considered.

O-ST-2-854

#### Peri-Urban Agriculture in Kathmandu, Nepal

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Kathmandu built-up area in the valley expanded from 3,330 ha in 1955 to 16,472 ha in 2000 and the trend continues. The study explores links between peri-urban agriculture and Kathmandu's food system by juxtaposing it with climate and other environmental changes. The food system of the Valley is vulnerable to external shocks more than the impacts of climate change. Both can however lead to exacerbate adversity and lower wellbeing. The paper suggests that Kathmandu operates within a sphere of dependence on local, surrounding as well as distant ecosystems for meeting its needs. In order to enhance resilience of the city and its resident to food systems policy making needs re-conceptualize peri-urban space as a dynamic entity whose ecosystems and the services can play a significant role. Policies need to rejuvenate peri urban agriculture that help meet city food need as well maintain the ecosystem to buffer potential climate change impacts.

O-ST-2-881-1

### NRNA SKI: Nepali Diaspora Initiative for Innovation in Science, Technology and Education

Raju Adhikari, P Dhakal, Ambika Adhikari, Drona Rasali NRN ICC Skill Knowledge and Innovation (SKI) Committee. www.nrn.org.np

With increasing migration of brightest Nepali youth and professional mass to countries around the world, a pool of Nepali diaspora scientists, technologists and educators is forming at rapid rate. However, networking with this dispersed mass had been a difficult proposition until not long ago. Today, NRN movement has made its presence felt in Nepal and among diaspora mass, although much of its vast potential has vet to be utilized for igniting the innovation in science, technology and education to this date. What has been achieved is the creation a platform to mobilize diverse interests and competencies of Nepali Diaspora. From the standpoint of the diaspora working knowledge sector, establishment of Skills, Knowledge and Innovation (SKI) Task Force during the 4th NRNA Global Conference in Kathmandu in December 2009with exclusive objective of utilizing skills, knowledge, innovations and experiences of Diaspora community for the ofNepal was a turning point. NRNA has pledged to work jointly with the Government of Nepal (GoN) and national stakeholders through the SKI Task Force in the advancement of knowledge sector. The goal of the SKI Committee has been to mobilize NRN's intellectual and physical resources in transferring of diaspor acknowledge, skills, experience through varieties of project initiatives to inspire local innovation in Nepal. Through initiatives such as Open University of Nepal. Nepal Science Foundation and SKI inventory program, SKI envisages to contribute to Education, Agriculture, Health, Energy and Climate Change, Disaster Earth Quake Mitigation and NRN 1000 Housing projects areas. In collaboration with relevant institutions in Nepal, these diaspora initiatives are envisaged to help establish strong linkages between scientific, technological and educational institutions, both public and private, of Nepal with those abroad. The ultimate goal is to inspire innovation that help the masses of Nepali people of Nepal to live, work and play as a prosperous society. The paper will review and discuss the overall progress achieved in these areas and discuss about future plans to reach towards this aspired goal.

### Science, Technology and Society 3 (O-ST-3)

O-ST-3-894-I

#### Higher Education for Promotion of Science and Technology in Nepal

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Science and technology has become so intrinsically embedded in every facet of our lives that it has become imperative for every country to formulate and implement appropriate national policies to promote science and technology to ensure long-term economic prosperity. For developing countries like Nepal, afflicted by resource constraints, mobilization of adequate resources and their proper utilization in the face of urgent and competitive demands, is a very challenging task. When countries are beset with many basic needs, higher education in general and science and technology in particular are always given less priority than they deserve. Nepal exemplifies this situation. It is in this perspective that this paper highlights the current status of higher education sector in the country and the important catalytic and enabling role it needs to play to produce qualified and competent human resources, including

Abstract Book

scientists and technologists, to ensure long-term economic prosperity of the country. The policy-makers and politicians need to understand that long-term sustainable development is only possible by impartingexcellent, quality education, which produces skilled and knowledgeable human resources, especially scientists and technologists. Therefore, the Government needs to accord due importance to promoting higher education in general and science and technology in particular by allocating adequate government funding. The current financing is very low. The funding has to be considerably increased along with affirmative policy actions for long-term sustainable development and economic prosperity of the country. This paper outlines a possible roadmap for Nepal to promote science and technology through the medium of higher education.

#### Technology Justice: A Power for Transforming Lives of Poor

O-ST-3-896

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Technology enables people to live well, with less effort and drudgery, with lower costs and fewer resources. It is the heart of human development which enables people to provide food, access water, energy, and keep improved good health.So, science and technology innovation in the current world has become a common phenomenon. In this connection, different state and non-state actors have been actively engaged in science and technology innovations and investing quite a huge amount of resources every years. Although, technology has become universal and part of life in the developed countries it is not the obvious in case of developing country. The access to technology and its benefits are not fairly shared so as richer enjoyed more than poor people, this has further contributed for hardship and poverty. Science and technology innovations also poses risks as we can't anticipate with certainty where a particular line of research will take us, how it will be used and its impact will be. In most of the cases the gains from technology innovations will be accumulated solely by an individual while the risks have to be shouldered by the public. Similarly, the environmental impact has also been further pushing our planet into problem. Our technological competency is impacting our environment in a ways we do not always understand and cannot always predicted, but which are capable of making the earth uninhabitable. As there are several treaties and policies at various level that refers for better management of risk and issues but confusion and biased interest around its application to avoid potential risks/threats to the society and the environment. Theoretically, universal access to technology for everyone to have adequate food, water, energy, shelter and ultimately livelihoods has agreed but unbound access to technology can create huge problem - and has already done so. In this regard, a responsible approach to technology is fundamental if we are to solve these global problems on social and environmental issues. Technology innovations are not focused on social and environmental issues and targeted enough on improving the conditions of those living on poverty. Availability of affordable technologies including appropriate services like financing mechanism, technical, research and education system are important aspects that needs to radically change the direction of technology and development. Furthermore, we need to give emphasis to find a new path for technology development and use. We also need to change the direction and purpose of innovation in order to deliver technologies that create social, environmental and economical outcomes. It also needs to ensure everyone on the planet today can enjoy a basic standard of living where technology is used in a sustainable manner that ensures the same for future generation - so as technology justice as a power of improving livelihoods of all.

O-ST-3-883

#### Linkages of Climate Change Policy and Sustainable Development in Nepal

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Climate Change has become serious issues with multiple implications at global to national level. All countries, developed, developing or least developed are facing adverse effect of climate change. Nepal being a mountainous and least developed country is highly vulnerable to climate change. Climate change policy does not yet prominently linked within the all development agenda of Nepal lead to country more vulnerable to climate change. Although, Nepal has committed to address the negative effects of climate change hazard that will eventually leads towards the path of sustainable development. In this line, it has formulated climate change policy to enhance climate resilience development. Similarly with aim to integrated climate change adaptation activities into local and national development planning process to ensure climate resilience development, Nepal has already adopted the National Adaptation Plan of Action (NAPA) and Local Adaptation Plan of Action (LAPA). In addition to that as a party to the United Nations Framework Convention on Climate Change (UNFCCC), Nepal has been actively engaging and raising various issues of climate change in the international arena. Recognition of how climate change is likely to influence other development priorities may be a first step towards building cost- effective strategies and integrated, institutional capacity in developing countries to respond to climate change.

O-ST-3-899

## Assessing Impacts of Climate Change and Water Induced Disasters from Gendered Perspective in Darchula, Nepal

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Climate change induced natural disasters are predicted to be increasing and its impacts are predominantly floods, rainfall variation, temperature rise with melting water towers and low water during rainy season impacting hydro power generations in Nepal. Especially the water induced disasters have impacted on involuntarily displacement which is likely toincrease vulnerability of human communities, their livelihoods and ecosystems. Among the flood disasters linking to climate change is also seen in 2013 in Darchula in Mid June with unprecedented rainfall in Uttarakhand and Far West of Nepal. The Gendered perspective of impacts on climate change and coping with disasters so far has not been assessed in detail. Thus, this study was designed to understand and assess Impacts of Climate Change and Water Induced Disaster with Coping Strategies from Gendered Perspective in Darchula District, Nepal.The research findings based on focus group discussion and key informant interview indicates that the families living in Shree Bagad, Khalanga, Dhap, Ukku and Galfai area were effected severely and lost their fertile land and houses. According to the respondents both men and women highlighted that the poorest of the poor in the village were displaced and the richer communities migrated to Mahendra Nagar. 90% of the respondents mentioned the major hazards mapped in the regions are directly and indirectly linked to climate change. Theimpacts observed since BS 2050 onwards are floods and landslides, which has made the whole Darchula more vulnerable than the last 30 years. Finally, both the respondents felt that sufficient coping strategies by themselves and government is inadequate and climate change awareness for adaptation and building resilience capacity is needed.

O-ST-3-342

#### Solid Organic Waste Management System

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The problems of energy crisis and solid waste management, especially organic wastes, in Nepal, unrelated as they may seem, have long affected the economy and lives of people. An integrated approach of managing both these problems has been a matter of several scientific experiments and design. In essence, an efficient technology to manage both solid organic wastes and energy crisis could be extremely beneficial to the country. In this direction, the design and implementation of Solid Organic Waste Management System (SOWMS) is proposed. SOWMS basically feeds on organic residual compounds like agricultural feeds, poultry litter and kitchen waste to convert them into usable biogas. The most unique and fascinating feature of this is the culture of Methanococcus which has been regulated by the temperature maintenance brought about by insulation as well as supply of water through perforated pipes. The link between upper dome and the underground tank ensures free movement of the bacteria about the dome. This ensures that the bacteria are active every time. The availability and regular supply of feed ensures constant production of biogas. It is also unique in a sense that it is portable, can be adapted at all kinds of terrain surfaces and the residual slurry from the design body can be easily abstracted for agricultural use as manure. Better still, the design protocol has been successfully constructed and operated in ward no. 4 of Gothatar VDC in which 1 kg of organic waste accounted for about 45L of biogas.

### POSTER

### **Biological Sciences (P-BI-1)**

P-BI-1-891

### Isolation of *Bacillus thuringiensis* from Soils of different places of Nepal: Development of Eco-friendly Insecticidal Bio-pesticides

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*Bacillus thuringiensis* a ubiquitous, gram positive and spore forming bacterium. During sporulation, it produces intracellular crystal proteins (Cry-protein) which are toxic to insects. Because of its insecticidal activity it has been used for nearly sixty years to control certain insects' species of order Lepidoptera, Coleoptera, and Diptera. The genetic diversity of *Bacillus thuringiensis*strains showed differences according to the regions and habitat where they were isolated. In recent years, *Bacillus thuringiensis*s receiving increasing attentions for its use in integrated pest management programs for agriculture and forest insect pests. The aim of the present study was to identify the crystalline protein gene contents of the 8 local B.t. stains isolated from 12 soil samples of different environment .For, isolation sodium acetate selection and L-serine method was applied. Polymerase chain reaction (PCR) reaction was used for characterization of cry gene content of B.t strains. The universal primers specific to cry I and cry II were used to detect the cry gene type in the isolates. Bioassay was conducted on (Potato Tuber Moth) P.T.M (*Phthorimaea operculella*) which demonstrated their competency for bio-pesticide in application.

P-BI-1-149

## Origins and Affinities of Shakya, Bajracharya and Udaaya Group of Newar Population of Kathmandu

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Major population movements, social structure, and endogamy have influenced the genetic structure of the populations. To understand the origins, genetic structure and affinities of different groups in Newar population, we studied Shakya, Bajracharya and Udaaya population using high resolution Y Chromosomal, Mitochondrial and Autosomal DNA markers. Y-chromosomal Biallelic markers were used to dissect the paternal lineages and whole mitochondrial genome was sequenced to trace the maternal lineages. Based on the variations, putative Haplogroups were assigned. mtDNA Haplogroup result indicates the dominance of Macrohaplogroup M (90%: includes M2, M3, M5, M9, M30, M33, M35, M38, Z, D, etc.) along with the branches of R (R6, R9) and U (U2 and U7) Haplogroups. Their maternal Genepool was found to harbour around 50% of South Asian, 25% East/Southeast Asian and 20% Central Asian specific Genepool. Y-chromosome analysis revealed the presence of major haplogroups such as M117-O3a3, M17-R1a, M82-H1, M410-J2a, M15-D1 and M124-R2. Overall, South Asian and East/Southeast Asian signature were found prominent among the Newars, however Central Asian genetic signature was found prominent in Shakya. The analysis of Autosomal markers (MYBPC3, LCT, SLC24A, EDAR, etc.)

showed that the genetic affinity of Newar population is similar to the Tibeto-Burman populations. In conclusion, the Newar population of Nepal was found to harbour prominent Genepool from South Asia, East/ Southeast Asia. Further, analysis on Y-STRs and high density Autosomal markers will help in tracing the precise origin and affinity of the Newar population of Nepal.

P-BI-1-178

#### Assessment of Trees Outside Forests in Kathmandu Valley

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Local people of Nepal depend upon forest products as different resources for their subsistence. Trees outside forests act as substitutes of forest resources and also help for the forest conservation. They provide almost same ecological and ecosystem services as that of natural forests. This study was conducted in Kathmandu valley aiming to assess diversity of trees, sequestrated carbon, provided services and economic value of TOF. Grids of  $0.5 \times 0.5$  km (n=2800) were prepared for the whole valley. Plots were systematically distributed inside each grid. After visual interpretation of the plots, 20% were selected randomly to conduct inventory. Circular plots were used to conduct inventory. TOF are the less studied land use types in Nepal. Data of TOF assessment is supposed to be useful for the policy makers in conservation and development planning.

P-BI-1-165

### Effect of Biochar on Crop Growth and Productivity in Central Nepal

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Biochar is pyrolysis product of organic residues under oxygen limiting conditions, and when applied to the soil as an amendment, offers a number of benefits. It improves the pH and water-holding of soil and also acts as a catalyst for microbial activity and plant nutrient availability. A study was conducted at Saraswatikhel, Bhaktapur and Ramche, Rasuwa to examine the effects of biochar application on crop performance (height and yields). At Sarawatikhel, a controlled plot experiment using coffee plants in an agro-forestry system with vegetable intercrop was set up, while at Ramche, plots were established on farmer fields using local practices (12 farm fields). At each location two plots, one with and the other without biochar application (5 tons per hectare), were established. Different crops according to the season and farmers' preferences were planted and monitored during 2014-15 seasons. Clear effect of biochar on coffee plant height and radish growth were noted at Saraswatikhel, with biochar amended plots giving statistically significantly higher plant growth rates and radish fresh weight yields. However, on the farmer field trials in Rasuwa, the biochar treatment did not give statistically significant differences. This may be due to high data variability and low sample size (6 numbers only). Further field trials are needed to verify the beneficial effects of biochar on both soil guality and plant productivity.

P-BI-1-201

### The Effect of Water Stress and Temperature on Seed Germination of Six Threatened Species of Myrtaceae in Australia

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Temperature and water availability are two important drivers for plant regeneration as they influence seed germination. We studied the germination behaviour of six threatened species of Australia (viz. Eucalyptus argophloia Blalakely, E. conglomerata Maiden & Blakely, E. halli Brooker, Leptospermum luehmannii F. M. Bailey, L. oreophilum Joy Thomps and Melaleuca sylvana Craven & A. J. Ford) under a range of water stress and temperature conditions. The best seed germination temperature regime for E. argophloia and L. luehmanii was 25:15°C, for L. oreophilum and M. sylvana 35:25°C and for E. conglomerata and E. halli 30:20°C and 20:20°C, respectively. Among the six species, E. argophloia exhibited the highest germination percentage (81%, 64%, 96% and 93% respectively) followed by E. halli(24%, 18%, 34% and 36% respectively) across all the temperature regimes. Eucalyptus halli and M. sylvana germinated best at 0.0 MPa while optimum germination for E. argophloia. E. conglomerata. L. luehmanii and L. oreophilum were -0.1, -0.2, -0.4 and -0.2 MPa, respectively. A one way ANOVA showed significant temperature effects (P≥0.01) on the germination of only two species (viz. E. conglomerata and M. sylvana), whereas significant water stress effects (P≥0.01) were shown on the germination of all species except L. luehmannii. We conclude that all six species under study exhibited broad germination niches with respect to temperature and water stress due to the ability of their seeds to germinate under a wide range of temperature and soil moisture conditions. Hence, they are able to establish in new habitats or under changing climate, thereby reducing their threatened status.

P-BI-1-21

#### Analysis on the Effect of Paper Mill Effluent on Germination of Various Crops

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An attempt has been made to access the effect of Paper Mill effluent treated as well as untreated on germination of various crops to ensure the safe landing of such effluent for irrigational purpose. The effluent treatment plant of OTR Paper Mill consists of primary clarifier effluent (untreated), Aeration tank effluent (having biomass), secondary clarifier effluent (treated). The germination of various seed was determined on the basis of growth with respect to different effluent, keeping all other factors constant. Maximum rate of germination occur in Secondry clarifier treated effluent. Level of germination in different effluent was determined on the basis of simple pot experiment and basis of measurement of growth was only apical shoot growth. The primary clarifier water showed the reduced growth due to addition of various chemical added during pulping. The high germination in aeration tank effluent and secondary clarifier effluent supports that frequent addition of Urea, DAP and Carbon source (N,P) provide food sources for biomass as well as act as residual nutrients or as fertilizer in effluent .The previous research reveals that physicochemical properties of paper mill waste water don't permit its disposal directly into land for irrigation, however, after using the treatment methodologies the treated effluent can be used safely and good for crops in coming future. The result obtained supports the beneficial effect of Paper mill effluent on the growth behaviour of crops.

P-BI-1-222

# Diet Analysis of Indian Flying Fox (*Pteropus Giganteus* Brunn. ich 1782 Pteropodidae) in Sub-Tropical Mid Hills of Nepal

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This study was carried out this study to explore about the composition and proportion of various plant species (wild and commercial) in the diet of Indian Flying Fox, largest true flying mammal of Nepal. Fecal samples (regurgitated bolus and guano) were collected from the diurnal roost located at Kaski throughout year 2015. Night surveys were undertaken at feeding roost. Fecal samples were examined for seed, pollen or leaf remains using hand lens and light microscope. The percent importance value (%IV) of each diet characteristics was calculated on the basis of frequency and percent composition of each plant component. Altogether 23 different species belonging to 14 different families were identified. Twenty one species of 12 plant families were identified from fecal analysis where as additionally Euphorbiaceae and Elaeocarpeacee were confirmed from feeding roost. Five families; Moraceae, Rubiaceae, Musaceae, Verbcenaceae and Myrtaceae were identified from seed and eight families; Myrtaceae, Bignonaceae, Sapotaceae, Anacardiaceae, Rosaceae, Euphorbiaceae, Leguminose identified from pollen remain. Moraceae holds 35.38% of the Indian Flying Foxes' diet. Flowers of Bombax ceiba forms the major portion during winter (43.11%) and spring (32.62%). Fruits of Ficus bengalensis (25.66%) and Psidium guajava (52.91%) were identified during summer and autumn respectively. Species number and importance value contributed by wild food are 16 and 76.0% respectively which is higher than the commercially cultivated fruits and flowers species. Economic loss to large sized fruits should be the next step ahead, and conservation initiative for the species as pollinators and seed dispersals should be started.

P-BI-1-234

## Enhancing Effect of Fertilizer Nutrients on Rice (Oriza sativa L.) in the Acidic Soils of Central Terai Region, Nepal

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The productivity of rice (Oriza sativa L.) in Nepal is as low as 3.39 t ha<sup>-1</sup>. The productivity of rice (Oriza sativa L.) could be increased through adequate supply of plant nutrients, efficient use of irrigation water and use of improved and hybrid rice varieties. To evaluate the efficacy of fertilizer nutrients on rice, field experiments were conducted for the three consecutive years (2012/13, 2013/14 and 2014/15) in the Randomized Complete Block Design (RCBD) comprising of twelve treatments with three replications in the acidic soils (4.25 pH) of Agriculture Research Station, NARC, Belachapi, Dhanusha. Four levels of nitrogen (0, 80, 120 and 160 kg ha<sup>-1</sup>), three levels of P2O5 (0, 40 and 80 kg ha<sup>-1</sup>) and a constant dose of K<sub>2</sub>O (40 kg ha<sup>-1</sup>) were applied in the experiment. The highest increment of 40.61 % was obtained (4.58 t ha<sup>-1</sup>) over non- treated crop of rice when the crop was supplied with 160: 80:40 kg N:  $P_2O_5$ : K<sub>2</sub>O ha<sup>-1</sup> followed by the crop treated only with 120: 0:40 kg N:  $P_2O_5$ : K<sub>2</sub>O ha-1 (39.82) %). The highest net-return of NRs.1,06400.0 with a VCR of 17.1 was obtained when the crop was fertilized only with N and  $K_2O$  at 120 and 40 kg ha,<sup>-1</sup> respectively followed by the crop treated with 160:80:40 kg ha<sup>-1</sup> of N,  $P_2O_5$  and  $K_2O$  with a net –profit of NRs.1,04300.0 with a VCR of 11.2. The highest VCR of 37.7 was recorded by the crop which was fertilized only with 40 kg ha-1 K<sub>2</sub>O which produced the lowest net-profit (NRs.63,900.0) on rice. This paper discusses and highlights the efficacy of fertilizer nutrients on the productivity of rice crop.

P-BI-1-237

#### Response of Different Commercial Organic Fertilizers in Rice and Potato Production vis-a-vis their Effect on Soil Properties

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Three different commercial organic fertilizers that need registration in the Ministry of Agricultural Development for commercial sale in the country were evaluated for their performance in terms of their response on yield of rice (Oryza sativa) and potato (Solanum tuberosum) vis-a-vis their effect on soil properties during 2012 to 2013 in two growing seasons. The main objective of this experiment was to study the efficacy of Bansun super organic manure, Tribenic organic complexal and Khaniza organic fertilizer. Each organic fertilizer was evaluated in rice and potato in nine different treatments with three replications at Thecho, Lalitpur. The results showed that Tribeni organic complexal significantly increased plant height and tuber yield of potato and plant height, number of tillers, grain and straw yield of rice. Khaniza showed significant increase in plant height of potato only. On the other hand, Bansun organic fertilizer showed significant increase in number of tillers and panicle length of rice. Since these tested organic fertilizers did not show significant difference in all the tested parameters, these fertilizers should be tested further for another season to draw clear conclusions so that they could be promoted for wider dissemination in order to achieve the targets set by Agriculture Development Strategy (increase in organic matter up to 4% by 2025).

*P-BI-1-240* Effects of Biochar on Soil Properties in Coffee-Agroforestry in Mid Hills Nepal

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Biochar is a specially produced charcoal by pyrolizing biomass wastes under controlled temperature in an oxygen deficient condition for use as a soil amendment. While studies undertaken elsewhere indicate its effectiveness on reducing a range of ailments in agricultural soil such as acidity and leaching of minerals, the same has not been tested adequately in the diverse soil profiles along mid hills of Nepal. A study was conducted to test the effects of biochar in three coffee agro-forestry sites spread over three districts - Talamarang in Sindhupalchok, Panchkhal of Kavre and Chandanpur, Lalitpur between 2013 and 2015. In this study, biochar prepared from coffee wastes (pulps and husks) was applied to the soils around randomly selected coffee trees on each of these three sites. Based on a comparative analysis of soil samples before and after application of biochar over the study period, the findings indicate varying effects of biochar on soil properties. The prominent effects include significant increase in soil organic carbon (by 1.5 to 1.9%), total nitrogen (1500 to 2500ppm), available phosphorus (531 to 590ppm) and available potassium (142 to 248ppm). The mean pH values were registered only at moderate levels (5.2 to 5.4). However, the cation exchange capacity decreased slightly from 42 to 38cmolc/kg. These results were also comparable with the corresponding properties of biochar applied in the sites. This study concludes that biochar could have positive effects on degraded soils of mid-hills agricultural lands in Nepal and may be a beneficial soil amendment.

P-BI-1-249

### People's Attitudes Toward Striped Hyena (*Hyaena hyaena* Linnaeus 1758) Conservation in Low land, Nepal

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The striped hyena is one of the least studied carnivores in Nepal and this study aimed to explore people's attitudes toward striped hyena conservation. Structured questionnaire sheets were used to collect information on major threats, human casualties, and people's perception towards striped hyenas. People's perceptions toward striped hyenas and conservation were overall positive. During the study, 400 people completed the questionnaire sheets and it was discovered that 63% had positive attitude toward the striped hyenas. There were as 37% had negative attitude regarding the species conservation. It was found that local people had understood various aspects of striped hyena ecology. There were 65 % respondents who answered that the striped hyena entered to human populated areas due to the absence of food in the natural forests and habitat degradation. There were 19 % respondents who reported killing carnivores including the striped hyena due to human – carnivore conflicts.

P-BI-1-253

## Effects of Biochar Prepared from Different Feedstocks on Soil Properties and Plant Growth

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Biochar is a fine grained solid material produced when biomass such as crop residues is heated in a closed container in an oxygen limited environment. Biochar can prepared by using underutilized biomass collected from farmland. Biochar application helps in plant uptake of key nutrients which definitely helps in proper plant growth and productivity. This study was carried out to test gualities of biochar prepared from five different types of feedstock namely, coffee pulp and husk, Eupatorium species, leaf litter and grass, rice husk, and wood sawdust and to evaluate their effects on soil properties and plant growth. The plant growth experiment was carried out with Soybean (Glycine max) at Kathmandu University with five replications per treatment, i.e., each of the biochar types applied at a rate of 5 t/ha. The produced biochar was found to be rich in nutrients and of alkaline reaction. Plant growth analysis revealed that all of the growth parameters, namely, above ground biomass dry weight, below ground (root) dry weight, and plant height were observed to increase with biochar application, although statistically significant results were not obtained. This might be due to low treatment application rate, initial soil quality, and different soil environment conditions in the polybag trial. Soil properties analysis revealed that significant differences (p<0.05) in soil chemical properties (OM, pH, N, P, K, CEC) among treatments. Further investigation with actual field plots and longer duration trial are needed to confirm the long term effects soil amended with biochar.

P-BI-1-263 Macroinvertebrates as Indicators of Environmental Flow in Khimti Khola,

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Environmental flow is essential for maintaining river integrity downstream so that river ecology remains in acceptable conditions during the development. Construction of dams along the river is considered as one of the most important stressors as it is known to affect the downstream river ecology. Although the Khimti Hydropower at Khimti Khola is considered to maintain the required environmental flow, there are reports of downstream environmental degradation. Therefore, this study was carried out to assess the maintenance of environmental flow of the Khimti Khola using macro invertebrates as biological indicators. Macro invertebrates were sampled qualitatively following standard procedures at five sites during March and August 2015. Selected physico-chemical water parameters such as pH, temperature and conductivity were measured in the field itself using a portable probe. NEPBIOS/ ASPT was applied to estimate ecological water quality class. A total of 33 families of Macro invertebrates were observed and water quality class ranged from class I-III. The impacted sites were shown to have the least number of macro invertebrate taxa whereas the reference sites had more diversity as well as the presence of more sensitive taxa. Besides water abstraction, road construction downstream of the water abstraction was also observed to affect macro invertebrate assemblages. Thus, it is shown that the macro invertebrate assemblages are appropriate indicators of environmental flow and other perturbations in the river.

*P-BI-1-282* Soil Fungal Diversity of Manaslu Conservation Area (MCA), Nepal and Biotechnological Characterization of Selected Species

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The study was designed to explore significant soil fungal diversity of Manaslu Conservation Area (MCA) in an altitudes 1700-4300 m and from rhizospheric soils of some selected medicinal plants. Firstly, fungi were isolated and identified up to genus level using standard morphological techniques. Secondly, industrially and medically important dominant fungal isolates were screened for the production of six different biotechnologically important extracellular enzymes. Thirdly, selected species were characterized by DNA sequencing of D1/D2 domains of large subunit (LSU) (28S) of nuclear ribosomal DNA (nrDNA) for DNA barcoding and phylogenetic study. A total of fifty-nine isolates were obtained from soil samples. Morphological identification of fungal isolates revealed that *Penicillium* spp. were most dominant, followed by Aspergillus spp, Mucor spp and Nigrospora spp. Six Penicillium and five Aspergillus spp. were selected for enzyme screening. All the isolates considered for enzyme study, except Penicillium ruqulosum (31c), have shown extracellular enzyme activity with maximum isolates showing positive to Cellulase and Protease. Penicillium aurantiogriseum (A277) showed positive reaction to all six extracellular enzymes screened. The Maximum Parsimony (MP) tree was obtained with tree length of 490 and parsimonyinformative sites of 301. Penicillium spp. and Aspergillus spp. formed separate clades in the MP tree. The obtained D1/D2 sequences facilitated the identification of fungi at species level. The inter- and intra-species nucleotides differences suggested that D1/D2 domain is

sufficiently variable for the identification of filamentous fungi and relevant species. Based on the findings, various species can be further exploited for the industrial enzyme production through bioprocess technology.

P-BI-1-318

### Diatom Flora of Hasina Wetland of Morang District, Nepal

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Diatoms (Bacillariophyta, Algae) of Hasina Wetland, Sandar Dulari Municipality, Morang has been explored in 2015. The wetland consists of lacustrine, palustrine and riverine type of water. Samples were collected by squeezing macrophytes and their frustules were cleaned following nitric acid digestion method at Phycology Research Lab, Department of Botany, PG Campus, Biratnagar A total 59 diatom taxa belonging to 27 genera, 19 families and 13 orders have been reported from the wetland. Among the families, Gomphonemataceae was dominated (22%) followed Ulnariaceae and Naviculaceae (12% by each), Bacillariaceae (10%) and Pinnulariaceae (7%). The Genus Gomphonema represents the highest number of taxa (11) followed by Ulnaria (7 taxa) and then Navicula, Nitzschia and Pinnularia (4 taxa each). Genera with single taxa were Aulacoseira, Cyclotella, Caloneis, Amphipleura, Diploneis, Lemnicola, Planothidium, Cocconeis, Encyonema, Placoneis, Epithemia, Bacillaria, Hantzschia and Surirella. The rich diatoms observed were Epithemia adnata, Rhopalodia gibba, Gomphonema truncatum, Nitzschia palea, Ulnaria acus, U. ulna and Pinnularia amabilis.7Maximum species of diatoms were found during summer (40%) and minimum during monsoon (28%) seasons. Diatoms representing in all three seasons were Aulacoseira granulata var. angustissima, Fragilaria brevistriata, Ulnaria acus, U. capitata, U. ulna, Eunotia bilunaris, Navicula radiosa, Pinnularia amabilis, Lemnicola hungarica, Planothidium biporomum, Gomphonema affine, G. pseudoaugur, G. sagitta, G. truncatum, Epithemia adnata, Rhopalodia gibba, and Nitzschia palea.

P-BI-1-339

# Valuation of Goods and Services of Protected Forest (A Case Study of Panchase Protected Forest, Nepal)

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Panchase Protected Forest (PPF) has provided numerous ecosystem goods and services to the people living around the forest. Integration evaluation of PPF with ecology and economics is of utmost requirement for the sustainable management of the resources. The Contingent Valuation Method was employed to elicit Willingness to Pay (WTP) for ecosystem goods and services from the three differently benefitted settlements. Altogether, seventy-five (N=75) questionnaires were administered interpersonally to the respondents representing equally of each settlement. Friedman test, Multiple Liner Regression and Simple Descriptive Statistics were the major statistical tools applied for analyzing the data. The most prioritized good is fuel wood ( $\mu$ =1.44) whereas service is drinking water ( $\mu$ =1.55). WTP for ecosystem good is found to be affected by income and time taken to reach the forest and WTP for ecosystem services is found to be affected by income, level of education and distance to the forest. The total economic benefit derived from ecosystem goods and services of PPF is NRs 40040.31 household<sup>-1</sup> year<sup>-1</sup>. Beneficiaries are willing to pay high for fodder and soil conservation however; drinking water and fuelwood were ranked as an important goods and services respectively. People are positive towards the PPF and they agree that the forest is

contributing in enhancing local livelihood. People valued the forest highly to the extent that they are willing to contribute a part of their income (15.26%) to ensure for its continued existence. Educating the people could be a strategy to increase the WTP for ecosystem services and reducing the dependency on forest.

P-BI-1-341

# Efficacy of Clove Oil as an Anesthetic for use in Handling and Transportation of Common Carp, *Cyprinus Carpio* Fry

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The use of anaesthetics becomes essential in the transportation medium for mitigating physiological stress and reducing metabolic rates of fish. Clove oil is now emerging as safe, eco-friendly, effective, and economic fish anaesthetic. Efficacy of clove oil as an anaesthetic was evaluated for the handling and transportation of common carp, *Cyprinus carpio* fry. The lowest concentration of clove oil that produced induction ( $\leq 5$  min) and recovery ( $\leq 10$  min) found was 125 µl/L at temperature between 18.2 to 19.3 °C. Induction and recovery times were dose-dependent. An inversely proportional relationship was observed between concentrations of anaesthetic and induction time. The effective sedative dose at 21.2±2.4 µl/L of clove oil (18.02 µl/L eugenol) was found suitable for transportation in plastic bags with pure oxygen for 24h. The mortality rate (%) of fry was significantly higher (5.4±0.44%) in the control (without sedative) than sedative doses of clove oil (P<0.05). Post transportation mortality of fish after 7 day of treatment in control was also higher (3.8±0.91) compared to the fry treated with sedatives (P>0.05). The present findings revealed that clove oil is promising to be used as anaesthetic and sedative for handling and transportation of common carp fry.

P-BI-1-355

## Ethnobotany of Tharu Community Inhabited at Pakali VDC, Sunsari district, Eastern Nepal

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The ethnobotany of Tharu community of Pakali VDC, Sunsari District has been studied in 2069 B.S. The investigation identified a total 119 plants belonging to 92 genera and 52 families using for different purposes such as traditional medicinal practices, cultural and religious ceremonies, edible, fodder and others. Maximum plants were used to treat more than 60 human diseases like stomach problems, worms, skin disease, diarrhea, dysentery, cough, rheumatism, fever, and eye problem. Their taxonomic features including vernacular and Tharu names with parts used and uses for different ailments have been described in detail.

P-BI-1-378

## Feeding Traits and Production Systems of Lulu Cattle in Manang and Mustang of Nepal

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Lulu is dwarf and indigenous cattle breed (*Bos taurus*) surviving in very harsh condition and suitable to raise at an altitude from 2600 m to 4000 m. It is necessary to identify the feeding traits and production systems of Lulu cattle. Fifty farms raising Lulu cattle in Manang and

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Mustang districts of Nepal were selected and interviewed using a structured questionnaire. Farmers kept Lulu cattle, either in pure or crossbred. The types of Lulu production were commercial (2.0%), semi-commercial (8.2%) and subsistence (89.8%). The nature of feeding for Lulu cattle was stall feeding (36.7%), stall feeding and grazing (57.1%) and grazing only (6.2%). The time of grazing was 3 to 12 hours/day. The daily milk yield of Lulu cattle was 1.4 litre with 5.2% of milk fat, 9.4% of solids not fat and 3.8% of milk protein on an average. Unmanaged winter forage and pasture affect their decreasing numbers. Thus, the farmers need to be trained for developing winter feed resources in the Lulu cattle farms.

P-BI-1-383

## Germination and Growth Performance of *Moringa oleifera* under Different Seed and Nursery Condition in Subtropical Region of Nepal

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Moringa oleifera is the most common, extensively utilized of all the Moringa species found in Nepal. It has high commercial use because of its nutritious and medical value for which it has been widely cultivated in tropical regions of Nepal and India. However, it's cultivation in subtropical regions of Nepal is constrained by the limited knowledge on its seed germination and growth performance. The overall objective of the study was to assess growth performance of the seed types and nursery technique to recommend nursery technique for its promotion. This study was carried out to determine the seed germination percentage and initial seedling growth rate of two different seed types (Seed type 1= Chitwan & Seed type 2=Bara) of Moringa oleifera under two different nursery techniques (open and shade) in controlled conditions of nursery in Sub-tropical region. The overall germination percentage of both seed types was found higher in open condition. Seed type 1 had higher germination percentage than seed type 2. The result of the study indicated significant difference in mean seedling growth rate with respect to different nursery technique (p=0.001) at 5% level of significance. This means higher seedling growth rate was found under shade condition for both seed types. However, there was no marked difference in the average growth per month of the species with respect to applied two treatment seeds types in the nursery (P>.05). Open light condition is suitable for germination and shade condition is suitable for seedling growth of Moringa species in sub-tropical climate of Nepal. Germination should be carried out in open condition and then germinated seedling should be allowed to grow under shade condition while establishing its nursery for better growth of seedlings for plantation of Moringa in subtropical climate of Nepal. Similar experiment should be carried in other season to find their growth performance to corresponding seasons.

P-BI-1-391

#### Pollen analysis of High Altitude Wild Rock Honey in Kaski District

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Himalayan wild rock honey forms the abundant different variety of pollen grains, due to Nepal's diverse climatic conditions. Pollen analysis is an indispensable method to authenticate honey origin and characteristics. It is very effective to determine and control the geographical origin of honeys and it also provides information about other important quality aspects. The Himalayan cliff bee (*Apis laboriosa*), the giant honeybee (*Apis dorsata*) and the dwarf honeybee (*Apis florea*) are wild type, whose sole source of nectar is flower containing different pollen grains. Microscopic analysis of pollen was carried out in the honey samples of

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from different places of Northern part of Kaski district at altitude ranging from 2000 to 3500 metre from sea level during 2013 at Pokhara University, department of Pharmacy, Natural Product Chemistry. Twenty two honey samples were examined under the microscope to explore the pollen diversity using the method described by Werner VON DER OHE *et al.*, (2004). The pollen morphotypes recorded were from different families *Ericaceae, Saxifragaceae, Asteraceae, Ranunculaceae, Betulaceae* comparing with the standard. The result shows the diversed multifloral origin of the honey.

P-BI-1-401

### Diversity and Distribution of Invasive Alien Plant Species along Road Network in Central Nepal

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Invasive alien plant species (IAPS) are spreading rapidly in Nepal and can have irreversible environmental and economic damage if not managed timely. Detail information on diversity and distribution of IAPS form a basis for managing plant invasion. The road networks act as dispersal corridors and source areas for plant invasion. A detail survey of IAPS distribution was carried out during June-July 2013 along road network in Central Nepal to access the diversity of IAPS, prepare their distribution map, and identify the factors governing their dispersal. IAPS distribution was assessed through systematic location of sample plots (10×10m<sup>2</sup>) at an interval of 10 km in plain and 5 km in hilly areas. Among the 18 species of IAPS recorded from roadside vegetation, Bidens pilosa had the highest frequency whereas Eichhornia crassipes had the lowest. Likewise, Ageratina adenophora was found as most dominant species in terms of coverage. IAPS richness showed unimodal pattern of distribution along the elevation gradient. While comparing the vulnerability of land use type to invasion, grazing and fallow land was more susceptible to invasion in comparison to other land use types (Agricultural land>Shrubland>Forest>Wetland). Middle mountains had greater IAPS richness than other physiographic regions. The study revealed that extensive road networks, land use changes, and open border with India are acting as facilitators as well as dispersal pathways for IAPS in Central Nepal. Plant invasion has been emerging as a serious environmental problem in Central Nepal and timely action needs to be taken to prevent it.

P-BI-1-437

#### Soil Fertility Management in Rice and Cauliflower through Bhushakti

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Bhushakti is an organic fertilizer basically produced from press mud by Indu Shankar Sugar Factory, Sarlahi in Nepal. Bhushakti is prepared as biocompost as well as biofertilizer. This organic fertilizer was tested in rice and cauliflower in Khumaltar and Pokhara during 2014-2015. Research on both crops was carried out with seven different treatments replicated three times. Bhushakti showed good response to plant height, panical length, grain and straw yield of rice. Plant height, panical length, grain and straw yield of rice differed significantly with the treatments. Similarly in cauliflower, number of leaves per plant, curd depth, average curd yield (20.4 t ha<sup>-1</sup>) was produced by the combined application of vermicompost and half dose of chemical fertilizer followed by Bhushakti (15.9 t ha<sup>-1</sup>). Application of chemical fertilizer alone produced a curd yield of 12.19 t ha<sup>-1</sup> which was found higher than that produced by half dose

of Bhushakti plus half dose of RDF. Application of organic manure at 15 t ha<sup>-1</sup> produced 13.1 tha<sup>-1</sup> of curds which was lower than the yield produced by the application of Bhushakti. This indicates that for the production of cauliflower, organic fertilizer or organic manure application is inevitable. Soil analysis report too showed that application of Bhushakti is at par with 15 to 20 tons of organic manure in all the tested parameters.

P-BI-1-485

### Investigation of Species Resiliency to Climate Change - Modeling Germination Phenological Response of Some Rare and Threatened Species of Myrtaceae of Australia

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Climate is one of the main drivers of ecosystem change and functioning. Modeling of germination response to climate change is one of the best methods to determine species regeneration response and its future probability of recruitment and abundance. A mechanistic model TACA-GEM combines germination phenology with physiology which interacts with temperature, soil moisture and frost, and simulates species ability to germinate and establish, and helps in the prediction of species future abundance. Germination behavior of four threatened species of Australia Eucalyptus argophloia, E. conglomerata, E. halli, Melaleuca sylvana were studied under controlled temperatures (35/25 °C, 30/20 °C and 25/15 °C) and water potentials (0, -0.1, -0.2, -0.4, -0.5, -0.7 and -1.0 MPa) at the University of Queensland, Australia. Non-linear polynomial regression was used to determine the optimum temperature and days needed to achieve the highest germination percentage to identify the regression function of GDD and germination percentage. Species-specific germination parameters temperature, moisture and GDD thresholds identified from germination experimental components with non-linear regression functions were implemented into TACA-GEM. The model resultant suggest that germination potential for all the species declined by the climate change of 2080s except for M. sylvana indicating that the projected change may increase germination and abundance of this species in future. This study indicates that the germination resiliency exhibited by M. sylvana may help this species adapt projected climate change. Thus, similar studies implemented may help in identifying resilient species that can aid in building climate adaptation and forest management plans in Nepal.

P-BI-1-493

# Assessment of Conservation Threats and Habitat Management of Chinese Pangolin (*Manis pentadactyla*) in Balthali VDC of Kavre, Nepal

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Chinese pangolin (*Manis pentadactyla*) is a strange and shy animal which survives on highly specialized diets of ants and termites. The increase in threats like illegal trade, habitat destruction, lack of awareness and continuation of old traditional cultures has lead pangolin to a high risk of extinction in Nepal. The study was set to fulfill the gap of knowledge on distribution and conservation threats to pangolin. The objectives of the study were assessing distribution map, habitat preference and conservation threats of pangolin and its habitat. The data was collected through direct field visits and using literatures. Different indirect signs of pangolin like burrows were used to prepare distribution map of pangolin using Arc GIS-10.2.1 software and Land use land cover map, 2010. Binary regression was used to assess the

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habitat preference of pangolin. Key threats to pangolin and its habitat was assessed by scheduled questionnaire survey, group discussion, key informant survey and direct field visits. Distribution pattern of pangolin was found to be clumped. Red soil, forest with low ground and crown cover of class 0-50%, elevation class from 1300m to 1600m and west aspect were the most preferred habitat parameter by pangolin. Habitat degradation, habitat fragmentation, hunting for meat and illegal trade by humans, grazing, deforestation, mining, forest fire, forest products collection, exploiting chemical fertilizers and developmental activities were the major threats to pangolin and its habitat. There is necessity of habitat management and conservation of pangolin in Balthali VDC.

P-BI-1-524

#### Ethanol Production from Xylose Metabolism

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Bio-ethanol, simply an ethanol produced from the fermentation of biomass has become subject/matter of interest as alternative source of energy. Increase in interest to bio-ethanol is attributed to its cleanliness in terms of reduced green house gas (GHG) emission and sustainability due to feasibility in use of plant biomass (second generation biomass) as substrate for the fermentation. The high amount of the pentose sugars in the lignocellulosic hydrolysates and the presence of organisms to convert pentose to ethanol has led to development of process for production of biofuel/bio-ethanol. However, the efficiency of production of ethanol is less from such pentoses like xylose, which necessitates the application of molecular techniques to derive organisms with ability for efficient conversion of such biomass into ethanol. Saccharomyces cerevisiae is naturally ethanol producing yeast from glucose fermentation but is unable to utilize xylose. The inefficient conversion of xylose into ethanol is due to the inability of organisms to use it as substrate for fermentation which is attributed to lack of xylose import into cell and limited use of imported xylose in pentose phosphate pathway, a major pathway of xylose metabolism and ethanol production. Introduction of glucose/xylose transporters (GXS1 and GXF1) from Candida intermedia into the wild type S. cerevisiae has rendered it with ability to accumulate xylose and slight increase in use of xylose. Further incorporation of xylose isomerase from Clostridium phytofermentans along with transporters is expected to form recombinant S. cerevisiae capable of efficiently converting xylose into ethanol.

P-BI-1-571

## Study of Antifungal Activity of *Lantana camara* L. leaves Extract against Some Plant Pathogenic Fungi

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*In-vitro* studies were carried out to determine the antifungal activity of methanolic extract of leaves of *Lantana camara* L. against *Bipolaris sorokiniana* (Sacc.) Shoemaker, *Colletotrichum gloeosporioides* (Penz.)Penz.&Sacc., *Fusarium oxysporum* Schltdl., *Rhizoctonia solani* J.G. Kühnand *Verticillium alboatrum* Reinke & Berthold by poisoned food technique. The results revealed that methanolic extract of leaves of *L. camara* had strong antifungal activity with significant inhibition on the growth of *B. sorokiniana* and *V. albo-atrum*.

P-BI-1-587

## Diversity of Tree Species in Community Forests of Palpa District, Central Nepal

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Tree diversity, distribution and composition based on two different management committee community forests: Barangdi-Kohal joint managed community forest (JM) and Bansa-Gopal women managed community forest (WM) of Palpa district, was studied during April 2013 to July 2014. Both community forests had nearly same altitudinal range, aspect, slope and same forest type i.e. Schima-Castanopsis forest but differed in different environmental variables. There is restriction of cattle grazing in JM forest but no restriction in WM forest. Total density of trees in WM forest was higher (817.65/ha) than that of JM forest. Whereas largest basal area (82.08 m2/ha) was found in JM forest than in WM forest (59.93 m2/ha). Trees with small diameter size were more in WM forest than in JM forest. Species richness and diversity is higher in WM forest ( $p \le 0.05$ ) in tree richness. The median of tree richness was higher in WM forest (7.50) than in JM forest (6.0). This study concluded that the community forest managed by women have higher tree density, because women are closely attached with forest, and are mainly focused to conserve tree species for fuel wood and fodder collection.

P-BI-1-620

#### Grain Yield Stability of Early Maize Genotypes in Nepal

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Genotypes with high and stable performance are desirable for maize breeding program. The objective of this study is to estimate grain yield stability of early maize genotypes across different environments of Nepal. Three early maize genotypes namely Arun1EV, Arun-4 and Arun-2 along with Farmer's varieties were tested using randomized complete block design replicated three times at seven different locations namely Dailekh, Kaski, Dhankuta, Nawalparasi, Chitwan, Makawanpur and Tanahun, in summer seasons of four consecutive years from 2007 to 2010 under farmer's fields. The results of these studies showed that Arun-4 was more stable followed by Arun-1EV as compare to other tested genotypes. The overall higher mean grain yield and regression coefficient (b) near to unity showed that Arun-4 and Arun1EV is the most adaptive genotype across the tested environments. Therefore these two genotypes were recommended to farmers for general cultivation.

P-BI-1-649

# Habitat Suitability Modeling of Common Leopard (*Panthera pardus*) in Banke National Park of Nepal

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Common leopard *Panthera pardus* is a widely distributed large carnivore species threatened by habitat loss and increasing illegal poaching. However, evidence based information on

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suitable available habitat and the factors that influence their distribution is lacking. This study aimed to assess the environmental factors associated with common leopard distribution and generate habitat suitability map of leopard in Banke National Park. The widely accepted tool GIS was used to prepare environmental layers whereas Maximum Entropy Model (Maxent) was used to analyze the association of environmental layers and prepare the habitat suitability map. Transect surveys along the existing forest trails and riverbeds in 5x5 square kilometers sampling grid were used to collect both direct and indirect evidences of presence of leopard. Maxent result showed that environmental layers; topography, land use and land cover and human influence criteria had influenced habitat distribution. Among the criteria road, slope and stream had positive association with leopard distribution. About 22% of the area was found to be highly suitable for leopard in such a newly established protected area. Further detailed survey on distribution and ecology of leopard is essential to formulate conservation strategy and develop habitat management guidelines.

P-BI-1-657

### Taxonomic Study of Some Species of Thalictrum L. (Ranunculaceae) in Nepal

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Ranunculaceae commonly known as "Buttercup family" is a large family of about 2300 species of flowering plants in 56-62 genera. They have sub-cosmopolitan distribution mostly found in tropical, sub-tropical, temperate and sub-alpine zones. Some of the important genera of the family are Aconitum, Anemone, Aquilegia, Clematis, Delphinium, Ranunculus, Thalictrum, etc. The present study deals some species of Thalictrum L. to investigate the interrelationship among different species based on morphology, anatomy, palynology, stomatal study, phenology and distribution. Some species of this genus is medicinally valuable containing different types of alkaloids as secondary metabolites. They are mainly concentrated in subtropical to alpine region at an altitudinal elevation ranging from 1200 to 4500m. There are 22 species and 3 subspecies of Thalictrum reported from Nepal. In the present study, Angiospermic phylogenetic Group (APG III) was used for classification purpose. Only five species of Thalictrum were examined in which the method of study includes literature review, collection and preparation of herbarium, identification and description of the species, anatomical study, illustration, distribution maps, construction of keys. Apart from this, stem and stomata anatomical studies and pollen study had also been done. The work was based on the herbarium specimens housed in TUCH and KATH based on which the distribution map was also done. This study showed that vegetative and reproductive morphological characters are significance in identifying and delimiting the taxa. This study helps in providing information about some species of *Thalictrum* found in Nepal.

P-BI-1-661

#### Taxonomic Study of Some of the Species of the Genus Crotalaria L. of Nepal

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Around 702 species of *Crotalaria* are described worldwide, mostly from the tropics and 18 species are reported from Nepal which belongs to the family Fabaceae. In the present taxonomic study of only five species of *Crotalaria viz. C. alata, C. albida, C. anagyroides, C. cytisoides* and *C. sessiliflora* were examined. The work is largely based on morphological variation. Apart from this, anatomical, palynological and ecological distribution has also been

studied. The work has been based on the herbarium species from the TUCH and KATH along with all five species collected from central part of Nepal. The species of Crotalaria showed ranges of morphological, anatomical and palynological characters, based on which taxa were delineated. Morphological as well as anatomical with palynological characters are of much significance in identifying and delimiting the taxa within the genus. The dendogram obtained based on cluster analysis showed two distinct clusters: the cluster 1 included the taxa that have trifoliate leaf which falls under the Section IX Trifoliolatae of Series Foliatae (*C. anagyroides* and *C. cytisoides*); whereas cluster 2 represented all the taxa with simple leaf under the Series Simplicifoliae. The results of cluster analysis revealed that species belonging to the Series Alatae and Calycinae are closer to each other than with the species of series Trifoliolatae.

P-BI-1-666

### Taxonomic Study and Uses of Genus Dioscorea L. (Dioscoreaceae) in Nepal

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A taxonomic revision of the genus Dioscorea L, in Nepal had been conducted. Dioscoreaceae is the monogeneric family for Nepal and represented by genus Dioscorea L. It is a tuberous plant reported to be an old species native to South East Asia. So far more than 600 species have been reported from all over world. Dioscorea is a genus of twinning herb, climber with underground part tubers or rhizomes with simple or compound leaf. Aerial tubers (bulbils) consist at axial of leaf. Descriptions included vegetative, floral parts and fruits of male and female plants based on field observation and herbarium specimens. 15 species had been collected so far from different geographical region of Nepal out of which 13 species had been taxonomically identified and two species were unidentified. Vernacular name, ecology, distribution and utilization of species were being studied. Plants are dioecious, inflorescence axillary, pendent and simple or compound, bract 3, tepals arranged in two whorls of 3, inserted on hypanthium. Stamens 3 or 6, Style 3, trilocular with 2 ovules per locule.Capsule with 3 longitudinal wing, ovate-oblong, dark brown or straw yellow. Mainly 7 species were used as food. Tubers and bulbils were being used as source of carbohydrate to supplement food. Specimens of all identified species collected by authors were deposited in TUCH and KATH herbarium, Generally, Dioscorea spp. were found in the elevation range from 130-3100m and high species diversity at 600-1600 m asl.

P-BI-1-697

## Study on Human-Rhesus Interface in Pokhara Valley (Case Study from Pumdivumdi/TalloKodi)

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Human population growth and activities like deforestation, agriculture and urbanization lead to an ever increasing encroachment of wildlife habitats. Reduction of wild animals' natural habitats altered into small marginal patches which has led rhesus to enter into human settlement for food. Simply, this is the main point of human-rhesus interface in most of the cases of hilly areas in Nepal. This research focus on human verses rhesus (*Macacca mulata*) interface with conservation issues for primates. The objective of the research was to analyze economic impact on livelihood of people, to find incidence ratio of raided crops and explore local deterrent agents adopted by people to prevent crops. Primary data were collected using questionnaire survey, key informants interview and direct observation. Questionnaire containing both open ended and closed ended questions was prepared and administered on

the respondents. Secondary data were collected which includes published and unpublished reports, blogs, websites etc. This study revealed that respondents has severe negative attitude towards rhesus due to crop raiding. Potato has high risk of being destroyed having high incidence ratio in the month of March to July. Similiarly majority of people prefer keeping dogs in their house to protect crops. Hence, further investigation and subsidy from government sides to affected people is recommended.

P-BI-1-719

## Fishes from Lower Trophic Levels have Higher Mercury Concentrations: A Case Study of Jagadishpur Reservoir, Nepal

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A total of 54 fish samples, belonging to seven species, from the Jagadishpur reservoir were investigated for mercury (Hg) concentrations in fillets. Stable isotopes of nitrogen and carbon were investigated to analyze their respective trophic positions in the fish community. Fish were collected with locally available fishing gears and transported to the laboratory for analyses in frozen conditions. Fish diet played a major role in defining Hg concentration creating a high variability in fishes from the same trophic position. Fish community contained Hg concentration below the standard (0.3 mg/kg) set for human consumption without having adverse health impacts. Furthermore, sediment had very low concentration of Hg in an average 27.22 (±3.86) ng/g. Additionally, long-range transportation of Hg through Indian monsoon might not have polluted the reservoir as there was very less chance of cold condensation effects in tropical region of Nepal.

P-BI-1-731

## Effect of Processing and Drying Conditions on Essential Oil and Fixed Oil Content of Dried Ginger

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Two Nepalese local ginger varieties viz., Nashe and Boshe collected from Palpa district were processed variously (peeled sliced, unpeeled sliced and peeled whole) and dried in a cabinet dryer at 40oC to study the effect of processing methods on essential oil and fixed oil content of dried ginger. Essential and fixed oil content of dried Nashe and Boshe variety ranged from (1.86-2.46%; 4.86-9.59% and 1.14-1.94%; 5.05-5.36%) respectively. The highest essential oil content was detected in peeled whole Nashe ginger (2.46 $\pm$ 0.13%) and unpeeled sliced Boshe ginger (1.94 $\pm$ 0.01%). Likewise, the highest fixed oil content was observed in unpeeled and sliced ginger for both varieties (9.60 $\pm$ 0.12% for Nashe and 5.36 $\pm$ 0.25 for Boshe). The effect of

drying method and temperature on the quality of dried ginger was studied on peeled and sliced ginger of Nashe variety by comparing sun drying with cabinet drying (30OC, 40OC and 50 OC). Essential and fixed oil content of Nashe variety dried by sun drying and cabinet drying ranged from 1.87-1.9% and 4.44-5.26% respectively. The highest essential oil (1.99±0.18%) was retained in ginger dried at lowest temperature (30OC), while the highest fixed oil content was retained in sun-dried ginger (5.26±0.31%).From this study, it was found that Nashe variety has much higher essential oil and fixed oil content than Boshe variety of ginger. Effect of processing (peeling and slicing) on retention of essential and fixed oil was significant and can be concluded that higher essential and fixed oil can be obtained by the use of mild processing conditions.

P-BI-1-766

### Status and Conservation of Himalayan Vultures After Banning of Diclofenac in Nepal Himalaya

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The population of resident Gyps vultures have undergone dramatic decline (>97%) in numbers since the mid 1990s. The veterinary drug diclofenac has been identified as main cause of catastrophic decline of these naturally scavenging birds in 2004. There are extensive studies on lowland vultures but a very little is known regarding highland species. Himalayan Vulture (Gvps himalavensis). Aiming to overcome this gap we have initiated participatory long term monitoring and conservation project for Himalayan species in Nepal Himalayas. We spent six walking days for preliminary presence absence survey and 10 days for extensive survey of vultures each in 2013 and 2014 in the line transects from Muktinath to Pokhara of Annapurna region covering all potential sites. We made collaboration with local government bodies to monitor banned veterinary drug diclofenac in all the veterinary retailers and declared the Manang and Mustang Districts as Diclofenac Free Zones (DFZ). We launched conservation education in schools and community groups to convey the message on flood conservation. We counted maximum 183 of G. himalayensis and least two critically endangered G. bengalensis vultures. We recorded average 22.9 of G. himalayensis per day and 1.525 per km line transect in 2013 which was almost twice as many recorded during surveys that were conducted between 2002 and 2006 where the mean number was 12.4 per day. Our results suggest the rate of decline has retarded in the area after implementation of conservation programs.

P-BI-1-811

#### Taxonomic Study of Some Species of Clematis L. (Ranunculaceae) in Nepal

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The genus *Clematis* L. has ca. 1000 species and cultivars throughout the world. There are 32 species of *Clematis* L. in Nepal including infraspecific taxa of which *C. phlebentha* is endemic to the himalayas. The plant is characterized by climbing habit by means of twining petioles or petiolules, presence of showy sepals and absence of petals, numerous stamens and carpel, single pendulous ovule, persistent, plumose style. The present study aims to understand the inter-relationship between five species of *Clematis*; *C. buchananiana, C. connata, C. gouriana C. montana* and *C. napaulensis*, based on their morphology, anatomy, phenology, palynology & distribution. The work is based on the herbarium specimens housed at TUCH and KATH and some personal collections. The species of Clematis showed wide range of morphological,

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anatomical and palynological characters, based on which taxa were delimited. The dendrogram obtained based on cluster analysis showed two distinct clusters. Cluster one includes two species *C. montana* and *C. napaulensis* with whorled phyllotaxy and cluster two includes three species namely *C. buchananiana*, *C. gouriana* and *C. connata* with opposite leaves. The baseline data of this study may be useful for the preparation of Flora of Nepal.

P-BI-1-827

Comparative Study on the Effects of Nutritional Status, Environmental and Stress Factors on Estrus Synchronization and Subsequent Reproductive Performance During Winter and Summer Seasons in Water Buffaloes in Nepal

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The aim of this research was to study the effects of nutritional status and environmental and stress factors on estrus synchronization and subsequent reproductive performance during winter and summer seasons in water buffaloes in Nepal. In each season 14 non-pregnant buffaloes were selected and anthelmintic drug was fed and supplemented with minerals mixture for two weeks. Then, 7-day CIDR Co-synch protocol of estrous synchronization was applied in each animal. Body condition score (BCS) and blood were collected from each animal for analysis of nutritional parameter (glucose, total protein, cholesterol, non-esterified fatty acid) and stress factor (cortisol) before implication of protocol. Season didn't affect significantly the pregnancy rate (p<0.05) instead rather season affects significantly the serum glucose (p<0.05), cholesterol (p<0.01), protein (p<0.05) and cortisol (p<0.05), protein (p<0.01) body condition score (BCS) (p<0.01) between pregnant and non-pregnant experimental buffaloes.

### **Biomedical Sciences (P-BS-1)**

P-BS-1-133

## Extended Spectrum β-Lactamases Production Among*Klebsiella* spp. Causing Urinary Tract Infection

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Urinary tract infections (UTIs), the most common infections encountered in the clinical practice, being associated with different members of the family Enterobacteriaceae. *Klebsiella* spp. producing extended spectrum beta-lactamases (ESBLs) has increased against commonly used antimicrobials by resistance gene, rapidly transferred, and has worsened the scenario. Therefore, it is necessary to investigate the prevalence of ESBL positive strains in hospital to formulate the policy of empirical therapy. To assess ESBL producers among multidrug-resistant *Klebsiella* spp. causing UTI. This study was carried out in Kathmandu Medical College Laboratory, Sinamangal, and Kathmandu from September 2014 to March 2015. A total of 4790 clean-catch mid stream urine samples from suspected urinary tract infected patients were collected. The identification of Gram negative bacteria was done by gram staining and further *Klebsiella* spp. was identified by culture and biochemical tests. Antibiotic susceptibility test of the bacterial isolates was done by modified Kirby-Bauer disk diffusion method as recommended by CLSI. Multiple drug resistant isolates were screened for possible ESBL producers were subjected to combined disk assay. Four hundred and

ninety-nine (10.4%) isolates belonging to 10 different species were isolated from 4790 urine samples. Gram negative bacteria constituted 72.7% percent. *Escherichia coli* (54.5%) were the predominant bacteria followed by *Klebsiella* spp. (14.0%) and others. Amikacin (94.5%) and nitrofurantion (94.2%) were the most effective drugs against Gram negative bacteria. Among 70 *Klebsiella* spp. 39/70 (55.7%) were MDR and among them 19/39 (48.7%) were confirmed as ESBL producers. It calls for regular surveillance and improved antibiotic stewardship for *Klebsiella* spp.

P-BS-1-153

### Serological Diagnosis of Human Neurocysticercosis Caused by Taenia solium Cysticerci

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Neurocysticercosis (NCC) is the commonest tropical disease of the human nervous system caused by larval stage of pork tapeworm, Taenia solium. Besides, clinical symptoms and neuroimaging findings, immunological tests are performed for NCC diagnosis. For immunological techniques, two methods antibody and antigen detBection methods are used, and serum and/or cerebrospinal fluid are utilized diagnosis specimen.Crude soluble antigen (CSA) was prepared from cysticercus larvae collected from pig meat in Chitwan. The protein profiling of CSA separated by SDS-PAGE revealed the polypeptide fractions of 158, 124, 86, 72, 58, 50, 44, 42, 38, 26, 24, 20, 17and 11 kDa. ELISA was performed using the CSA and the sera of the NCC suspected patients visited to hospital (n=45), reveled 82.22% to be NCC positive. There was no significant different in male and female cases for NCC positive (51.35% and 48.65%). The highest NCC cases (54.05%) were found in the age group of 20-30. Clinical symptoms showed that 51.35% patients had seizure. Immunoblotting were performed using patient serum samples which were positive for NCC by CT Scan/MRI imaging. The result showed that serum had immense reactivity at fraction of 100, 50, 39 and 24 kDa polypeptide. Among them, 39 and 24 kDa polypeptide fractions produced significant consistency with 100% (10/10). These bands were completely absent in the healthy controls showing their greater application in diagnostic markers for NCC diagnosis. Hence, the antigen having the size of 39 and 24 kDa possess higher potentiality on diagnostic application, future vaccine candidate development and production of synthetic peptides.

P-BS-1-169

# Efficacy of Veterinary Drugs on Coccidiosis Control in Rainbow Trout, Onchorhynchus mykiss

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Coccidiosis, is an infectious disease caused by paraite Emeria aurati, has been considered as one of the major problems to cause fish mortality in rainbow trout. Search for effective drugs became essential to control the parasite. Efficacy of three veterinary drugs Prolium-K, Anvicoc and Metronidazole, as these drugs are already in use for livestock to prevent coccidiosis, were evaluated in trout infected with coccidiosis. Trout with an average weight of 130.0±36.6 g were stocked at a density 24 fish m<sup>2</sup> raceway of three private trout farms in Nuwakot. The fish were fed with the respective drug treated pallet feed at 3% of biomass for seven days. The dose of drugs Prolium-K, Anvicoc and Metronidazole was 600 mg, 500 mg and 1000 mg per kg feed, respectively. Recovery from coccidiosis was significantly high

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(P<0.05) in fish fed with drugs treated feed after 7 and 15 day of feeding compared to control fish. Coccidiosis prevalence rate decreased by 92.3%, 33.3% and 80.6% at 7 day and 100%, 74.2% and 80.6% at 15 day after treatment, respectively, for fish treated with Prolium-K, Anvicoc and Metronidazole. Emeria aurati were not present (negative) in intestine samples of treated fish examined after 21 days of feeding. Prevalence of the parasite in fecal sample was 33% in fish treated with Anvicoc and Metronidazole, and 0.0% for Prolium-K treated fish. The results of the present study suggested that the Prolium-K and Anvicoc could be used for controlling the prevalence of coccidiosis caused by Emeria aurati in rainbow trout.

P-BS-1-203

## Seroprevalence of HIV, HBV, HCV and Syphilis among the Applicants Seeking Foreign Employment

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HIV. HBV. HCV and syphilis are sexually transmitted infections which have increased in an alarming rate worldwide. Most of these infections remain undiagnosed and are transferred from one country to another through people travelling for employment or other purpose. This cross-sectional study of applicants seeking foreign employment was carried out at Al-Mashoor Diagnosis Centre, New Baneshwor, Kathmandu with an objective to study the seroprevalence of HIV, HBV, HCV and syphilis. Screening of HBsAg, antibodies to HIV and HCV was done using 3rd generation ELISA kit and syphilis card test in sera of 13,659 applicants seeking abroad employment. Initial reactive sera were re-tested for reconfirmation using same kit as well as another kit. Seroprevalence of HBsAg was 0.315%, HIV- 0.059%, HCV- 0.117% and syphilis- 0.49%. The seroprevalence rate of all infections was higher in male than female which was statistically not significant (P value > 0.05). Significantly higher seroprevalence of syphilis was observed in age group 41-50 years but no significantly different seroprevalence of HIV, HBsAg and HCV was observed between the different age groups. Significantly higher seroprevalence of HIV was observed in Dalits but no significantly different seroprevalence of HBsAg and HCV was observed among different ethnic group. Seroprevalence of syphilis was seen higher in Indo-Aryans and the difference in seroprevalence was significant. Further studies on these infections should be carried out throughout the country with larger sample size for better understanding and there is need of promoting wider access to monitoring and screening, care and treatment services for STIs.

P-BS-1-205

#### Prevalence of Intestinal Parasites among School Age Children

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Intestinal parasitic infections comprise major public health problems causing significant morbidity and mortality in developing countries including Nepal. Intestinal parasites are among the most common infections of school age children associated with stunting, physical weakness and low educational performances. This study aimed on determining the occurrence of intestinal parasites in relation with different factors, such as age, sex, water treatment strategy, medicine intake etc. The study was conducted from August 2014 to December 2014. Both protozoa and helminthes were examined among school age children of Kushadevi HSS, Kushadevi, Kavre. A total of 203 stool samples were examined both macroscopically and microscopically. Microscopic examination was done by wet mount

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preparation in normal saline and iodine following concentration by formol-ether sedimentation technique. Prevalence rate was found to be 16.25%, 20.6% among males and 12.4% among female children. Helminthes dominated over protozoa in infection rates and Trichuris trichiura (whipworm) accounted for highest number of infection (24.24%). Distribution of intestinal parasites was maximum in 6-10 year old children (27.8%) followed by age group below 6 years (18.2%). Intake of medicine against helminthes was found to reduce the infection rate by 8.1%. However, treatment of water did not significantly reduce the infection rate, which was similar in both the groups. This study reveals that intestinal parasitic infections are prevalent in the study area, which is directly linked to unhygienic living conditions. Therefore, it demands a good delivery of various intervention strategies like provision of safe drinking water, improvement in environmental sanitation, awarene.

*P-BS-1-323* Metabolite Profile of Nepalese Yarsagumba *Ophiocordyceps sinensis* by Planar Chromatography for Qualitative Evaluation

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Yarsagumba Ophiocordyceps sinensis is most acclaimed herbal medicine of Nepal used in Ayurvedic and Tradition Chinese Medicine (TCM) formulations. However, uncertainty of efficiency, safety and variation in quality are major concerns in marketing value of Yarsagumba. In present practice commercial value is based on specimen size and colour. These days due to high popularity varieties of Yarshagumba products are available in market as health supplement and tea. In case of expensive herbal medicine as Yarsagumba as more and people are collecting and selling and there are more chances of counterfeit products. Pharmacopoeias worldwide have incorporated metabolite profile of herbal product for identification. Planar chromatography or thin layer chromatography (TLC) can be used to verify the identity of the product by fingerprint of the metabolites for qualitative evaluation. We used different extractants and characterized TLC solvent system and spray reagent that can separate metabolites with low, medium and high polarity and observed under ultra-violet lamp to obtain metabolite profile of O. sinsensis. This is a simplified system which could be done in small laboratories for identification of genuine material. Planar chromatography has many advantages as it is low-cost, picture like image with unique feature of colour and R value of chemical components can be used for visualization. This method can also supplement other chromatographic and spectroscopic evaluation. In absence of readily other means the TLC fingerprint can be valuable tool to assess constituents present for qualitative evaluation.

P-BS-1-36

Comparision of Various Fluoroquinolones Against Nalidixic Acid Resistant (NAR) Salmonella serovars Isolated from Enteric Fever.

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The increase of nalidixic acid resistance (NAR) and reduced ciprofloxacin susceptibility along with full fluoroquinolones resistant isolates have jeopardized the treatment of enteric fever. The aim of the study was to compare the effectiveness of various fluoroquinolones in NAR *Salmonellatyphi* and *S. paratyphi* A and comparision of anitibiotic susceptibility test by disc diffusion and E Test. During the study period, 365 blood samples from clinically diagnosed enteric fever patients visiting to National Public Health Laboratory (NPHL) were collected and

processed for blood culture in BD BACTEC System. The isolates were identified by conventional biochemical tests and serotyping. Out of which 13(3.56%) were culture positive for enteric fever. Ten of the isolates were *S. typhi* and three were *S. paratyphi* A. Antibiotic susceptibility test to 11 antibiotics was performed by Kirby Bauer disc diffusion method. MIC to ciprofloxacin and levofloxacin were determined by E Test. Out of 13 isolates, 100% were resistant to nalidixic acid. Among ten *S. typhi*, one isolate was Multidrug Resistant (MDR) showing resistance to cotrimoxazole, tetracycline, nalidixic acid and ciprofloxacin wille two were all five fluoroquinolones resistant isolates. All nalidixic acid resistant isolates were with decreased susceptibility to ciprofloxacin with MIC >0.12mg/ml and to levofloxacin with MIC >0.25mg/ml. While comparing the result of disc diffusion and MIC determination by E Test, the association was statistically insignificant (p=0.411 for ciprofloxacin and p= 0.612 for levofloxacin). MIC determination has paramount importance in the detection of reduced ciprofloxacin susceptibility. Ciprofloxacin and levofloxacin can no longer be considered as the drug of choice in treating enteric fever.

P-BS-1-367

# Study of Transcription Factor Liic (TFIIC) in DNA Damage Repair (DDR) Pathway in Saccharomyces cerevisiae

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DNA is stable in nature, but still it is prone to damage in a due course of time. In order to keep the information in the DNA safe, DNA damage response pathways (DDR) have evolved in the cell. RNA Polymerase III transcribed genes are one of very actively transcribed genes and have been found to be difficult to replicate, making it prone to damage. Stalling of replication fork at tRNA genes during DNA replication triggers the suppression of tRNA transcription during replicative stress in yeast, points out to the fact that there must be some mechanism to safeguard these DNA segments and involvement of RNA Pol III transcription machinery in the process. In this study, mutant based analysis was done and the mutant was found to be sensitive to genotoxin and had DDR pathway affected.TFIIIC is a largest and most important transcription factor of RNA Pol III and have a high affinity towards the DNA, especially B-box region, which exhibits extra transcriptional, functions as well. This study suggests TFIIIC could be responsible in relieving replicative stress due to fork stalling while replicating DNA. TFIIIC thus could have a role in the removal of PIC (pre initiation complex) by the Mec1/Ddc2 complex upon activation of replicative stress pathways due to stalling of replication fork in RNA Pol III genes. Along with that it may also help in the suppression of RNA pol III to exclude the possibility of replication fork and transcription machinery collision during replication of DNA.

P-BS-1-389

# Evaluation of Genexpert MTB/RIF Assay for Rapid Diagnosis of Mycobacterium tuberculosis Complex and Detection of Rifampicin Resistance

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*Mycobacterium tuberculosis* complex (MTBC)remains one of the leading causes of death from an infectious agent. Early diagnosis is essential to interrupt transmission. The GeneXpert MTB/RIF assay, based on real time PCR and molecular beacon technology, is an innovative diagnostic device for the diagnosis of TB and rapid detection of RIF resistance in

clinical specimens. The aim of the study was to determine the performance of the GeneXpert MTB/RIF assay for rapid diagnosis of TB and detection of rifampicin resistance (as surrogate marker for MDR) in smear-positive/negative pulmonary and extra-pulmonary specimens obtained from suspected TB patients. A total of 378 clinical specimens collected during the study period (March-August, 2014) were subjected for the fluorescence microscopy followed by the GeneXpert MTB/RIF assay. Among those, 147 were cultured on LJ medium. The GeneXpert MTB/RIF results and microscopy results were compared with the results of standard culture methods.With reference to culture, overall sensitivity and specificity of the GeneXpert MTB/RIF assay was 96.30% and 68.82% respectively, while these were higher for pulmonary specimens. It had lower sensitivity with extra-pulmonary specimens i.e. 75%. In case of smear microscopy, sensitivity and specificity was found to be 77.78% and 82.60 % respectively. Smear microscopy also showed poor sensitivity for extra-pulmonary specimen (25%).GeneXpert MTB/RIF assay is a simple rapid method, and routine staff with minimal training can use the system. Despite its lower specificity, its sensitivity is sufficient enough to use this method as an initial screening test for rapid diagnosis of TB and detection of rifampicin resistance.

P-BS-1-39

# Effect of Different Plant Spacing on the Production of Hybrid Cauliflower (*Brassica oleraceae* var. *Botrytis*) under the Agro-climatic Conditionsof Midhills Region Nepal

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A field experiment was conducted at farmer's field in Banepa, Kavreplanchowk during spring season 2015 to find out the optimum plant spacing on cauliflower production. Four plant spacing viz. (i) 45×45 cm in single row spacing, (ii) 52.5×45 cm in double row spacing, (iii) 52.5×30 cm single row spacing and (iv) 52.5×30 cm in double row spacing were included in the study. Yield and yield contributing characters were significantly influenced by different spacing. 52.5 x45 cm in double row spacing showed the best response for all the parameters. Maximum plant height (31cm), curd diameter (18 cm), maximum curd weight (682 g plant-1) and yield (17.3 t ha-1) were recorded in the plots where the plants were spaced 52.5×45 cm apart in single row spacing.

P-BS-1-409

### Brewing Potential of Yeasts Screened from Amylolytic Starter (murcha) of Eastern Nepal

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Amylolytic starters (murcha and its variations), produced/sold by many ethnic groups of Nepal as a means of subsistence, are used for cereal-based alcoholic fermentations. Microbiologically, these starters are mixed cultures of wild yeasts, molds and bacteria. However, very little literature exists regarding details of these essential fermentation agents. In the present work, screening, characterization, strain improvement, and assessment of brewing potential of yeast isolates were carried out using murcha samples collected from 10 sites (Saangu, Udaypur, Kerabari, Dhankuta, Belbari, Laxmimarga, Danda Ghopa, Bishnupaduka, Panmara and Letang) representing 5 districts (Morang, Sunsari, Dhankuta and Udaypur and Taplejung). Survey results showed that murcha preparation almost

exclusively entails use of mother culture (small portion of murcha from previous batch) and specific plant/herb parts. Of the yeasts screened, isolates from murcha collected from Udayapur (Udayapur district) and Laxmimarga (Sunsari district) were found to have highly desirable properties: they both produced product (alcohol) with clean flavor and fermented molasses broth with TSS up to 30° brix to produce 13-14% ethanol (abv). Both the yeast isolates were strains of *Saccharomyces cerevisiae*, as confirmed by auxanography (sugar assimilation- and sugar-fermentation tests). UV-mutational study showed that the selected yeasts must be exposed for at least 20 s (UV-C) to achieve detectable destruction/mutation of cells. The mutant/surviving colonies appeared slightly elongated and petite on microscopic examination. The fermentation property was altered in about 10% of the UV-exposed cells. The cultures have been preserved for further genetic analysis to be carried out at a later date.

P-BS-1-425 Ilichiana (Zucc.)

## Molecular Characterization of *Taxus baccata* Subsp. Wallichiana (Zucc.) Pilger: An Endangered Anti-Cancerous Plant of Nepal

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Nepal is rich in species diversity of forest trees; physiographic and climatic variations have created habitats for various forest tree species. However, many forest tree species are providing food and services to the rural communities. Due to over-exploitation, important and valuable species, such as Himalayan Yew is becoming rare and even under threat of extinction. All the merchantable size forest trees have been logged illegally. The Government of Nepal has already banned this plant for export under the Forest Act. This research study helps to understand the molecular status of Taxus in its natural habitat. Himalayan yew (Taxus baccata L.) is a gymnosperm with a wide range and a discontinuous distribution. We used RAPD markers to analyze the genetic variation among 16 yew genotypes assembled from natural yew forests in Manaslu Conservation Area. Seven 10 mer primers were used as single primers for amplification. A total of 132 amplified bands were obtained for the 3 primers assayed from which 100.00 polymorphism was obtained. The size range of the amplified DNAs was between 100bp to 8,000bp as obtained by comparing with 1kb Marker DNA. Genetic variation among population was estimated using the POPGEN32 software package, VERSION 1.31.RAPD bands separated on agarose gels were scored and transformed into a binary matrix where presence of band was scored as 1 while absence of band was scored as 0. Similarity and cluster analysis were conducted using Nei's coefficient and the Unweighted Pair Group Method with Arithmetic mean.

P-BS-1-442

### *Helicobacter pylori* Outer Membrane Adhesins Show Marked Deviations from Canonical Autotransporters

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*H. pylori* blood group antigen and sialic acid-binding adhesins BabA and SabA belong to a larger paralogous family of "*H. pylori* outer membrane proteins" ("Hops"), which show

larger paralogous family of "*H. pylori* outer membrane proteins" ("Hops"), which show remarkable sequence conservation at their N- and C-termini. Though having a characteristic modular organization of classical autotransporters (ATs), Hop adhesins hold a striking, well conserved paired cysteine pattern of the passenger domain and the small size of the C-terminal  $\beta$ -domain than the known ATs. A closer examination of Hop and Hor family *H. pylori* 

outer membrane proteins (OMPs) showed a common 8-stranded transmembrane (TM) region that in Hops is disrupted by a large functional  $\alpha$ -helical domain at the position of the first extracellular loop. In BabA, we have identified a ~50 kDa stable, crystallizable fragment (termed BabA adhesin domain or BabA<sup>AD</sup>) of residues 25–460 of the 721 residue mature protein inserted inside the first extracellular loop (L1) connecting first and second TM bstrands. We found that Hop adhesins represent a novel OMP topology, which is expected to have important consequences on OMP secretion on the cell surface. Here, we provided a hypothesized working model for  $\beta$ -barrel assembly machinery (BAM) complex together with a C-terminally located  $\beta$ -barrel domain of *H. pylori* OMPs exhibiting a channeling function for the passage of the extracellular domain across the outer membrane bilayer. Hence, our future aim of understanding OMP biogenesis pathway in this pathogen holds a promise for the future development of broad-acting assembly inhibitors against large number of host colonization factors.

P-BS-1-475

### Media Design for Cellulolytic Microbes Isolated from Different Sources and Their Characterization

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Research on cellulolytic bacteria is one of the growing fields for the bioethanol production from agricultural waste and there is a necessity for the identification of a suitable media which is cost effective, gives a good result with less amount of contamination. In this research three potential media (TSB, NB and Gelatin) were selected and monitored for the growth of microorganisms and their activity. The hydrolysis capacity of the enzyme was measured for individual media. Nitrogen/protein source was taken as a major parameter for the media design. Tryptone and soy-peptone were used as protein sources in TSB media; yeast extract, beef extract and peptic digest was used as protein sources in NB media while bacteriological gelatin was used as a sole protein source in gelatin media. In this research 11 cellulolytic microbes from different places and sources like soil, animal and hot-spring and a noncellulolytic microbe as negative control were used for the media design. Suitability of the media was found through the observance of the growth guality, observance of color and the measurement of hydrolysis capacity of the cellulolytic microbes. Zone of clearance was found between 8 mm to 34 mm and Hydrolysis capacity (HC) was found between 1.6 to 6.8 for cellulolytic bacteria. Gelatin media was found as a suitable universal media for the growth of cellulolytic bacteria growth in the context that gives a better result, less contamination and less color hindrance than TSB and NB media.

P-BS-1-497

#### Micropropagation of Nepali Large Cardamom (*Amomum subulatum* Roxb.) And Isolation of Its Major Contaminants during Tissue Culture

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The genus Amomum subulatum Roxb., commonly known as 'Large Cardamom' is the third most expensive spice in the world and is only cultivated in Nepal, India and Bhutan. It is thus a major commercial commodity of Nepal in the foreign markets. However, lately its production is endangered in Nepal due to the effects of climate change. The purpose of this research was to optimize the in-vitro growth of large cardamom so that a monoclonal culture could be

established and to study any major contaminants of such cultures. In this research, shoot tips of *Amomum subulatum* were cultured using simple micropropagation methods. Modified MS medium with 3% sucrose, six varied concentrations of BAP and 0.1mg/L NAA was used as the various mediums for growth for large cardamom shoot tips. The effects of the 6 different BAP concentrations were examined on the growth characteristics of large cardamom explants. The maximum growth of shoot tips was seen on media containing 1mg/L BAP. Thus, sub-culture of shoot tips was only performed on media containing 1mg/L BAP. The main bacterial contaminants of the cultures were Gram stained and found to be Gram negative. In the future, this research and its results can aid in the growth of large cardamom in-vitro to produce disease free, monoclonal plantlets. Knowledge about the characteristics of the major contaminants can help researchers combat any in-vitro contaminations to such culture more effectively. If in-vitro production of large cardamom can be optimized and scaled to an industrial level, then the effects of climate change on large cardamom production can be significantly reduced.

P-BS-1-527

### Bacteriophage Treatment Against Foodborne Pathogens, *Salmonella* spp and *Escherichia coli*

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Bacteriophages are viruses that only infect and lyse bacterial cells. Presently, they have emerged as a promising agent for reducing bacterial pathogens in foods. They have also been proposed as an alternative to antibiotics in animal health and as bio preservatives in food. Phages can be used to control pathogens in food at all stages of production in the classic Farm-to-fork continuum food chain. In post-harvest control of food borne pathogens, Salmonella spp and Escherichia coli lytic bacteriophage can be considered as an effective tool. Salmonella is a gram-negative bacterium that is one of the principal causes of foodborne diseases. Once ingested, the microbe can cause fever, diarrhea, abdominal cramps, and even life-threatening infections. E. coli is a gram-negative bacterium and attributed a third of cases of childhood diarrhea in developing countries. Serotype O157:H7 is referred as a Shiga toxin-producing E. coli which is classified under the enterohemorrhagic E. coli (EHEC) strain that produces two types of toxins: Shiga toxin 1 (Stx-1) and Shiga toxin 2 (Stx-2) that can cause a wide spectrum of disease ranging from mild diarrhea to hemorrhagic colitis, hemolytic uremic syndrome and thrombotic thrombocytopenic purpura. Phages have been isolated against Salmonella spp, which has a broad spectrum host showing lytic activity against both Salmonella typhiand Salmonella paratyphi. Similarly, lytic phages have been isolated which has shown broad activity against different strains of drug resistant E. coli. These results have shown the potential uses of naturally occurring bacteriophages as a preventive measure for elimination food related illnesses.

P-BS-1-557

### Genetic Diversity of Nepalese Populations of Swertia chirayita (Roxb. Ex Fleming) H. Karst as Revealed by ISSR Marker

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Swertia chirayita is highly valued but vulnerable medicinal plant species of Nepal. Its populations are declining in natural habitats due to over exploitation. Genetic diversity assessment of these wild populations would assist in its conservation and breeding programs.

Twenty seven Inter-Simple Sequence Repeats (ISSR) primers were used to assess the genetic diversity and population genetic structure of 42 genotypes representing six natural populations of S. chiravita, from western, central and eastern Nepal. Of the total 479 bands amplified by 27 ISSR primers, 473 bands (98.18%) were polymorphic indicating very high level of genetic diversity at species level. Percentage polymorphism value for different primers ranged from 83.3% to 100% with an average of 98.18%. PIC value ranged from 0.88 to 0.93 with an average of 0.91. Cluster analysis performed with NTSYS pc statistical package using Jaccard's similarity coefficients generated from ISSR binary data matrix generated from bands amplified by all 27 ISSR primers separated 42 individuals into four major clusters at the similarity level of 0.34. The average value of H and I values equaled 0.276 and 0.423 respectively at species level. The coefficient of genetic differentiation (GST) amongst populations of S. chiravita was found to be high (0.548) with restricted gene flow (Nm=0.4829). Analysis of Molecular Variance showed that genetic diversity within populations is slightly higher (50.9%) than among populations (47.6%). The present genetic diversity assessment of S. chiravita populations has been of immense importance to understand the cause of its vulnerability and has furnished valuable insights for its conservation and sustainable utilization.

P-BS-1-558

### Synthesis and Applications of Novel Polyfullerenes and Their Blends: A Review

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Carbon exists in many allotropic forms such as diamond, graphite, fullerene, coal, coke etc. They differ in their physical properties and to some extent in chemical properties. Fullerene is latest allotrope of carbon discovered containing 18 to 100 carbon atoms among which C<sub>60</sub> fullerene is mostly addressed. It is spherical in shape with 60 vertices, 32 faces and 90 bonds. Carbon atoms of  $C_{60}$  are sp<sup>2</sup> and sp<sup>3</sup> hybridized of which sp<sup>2</sup> hybridized carbon provides it remarkable properties. The compounds, derivatives and polymers of fullerene find their applications in medical science, engineering, material science etc. because of their outstanding physical properties. Fullerene can be reduced reversibly up to six electrons because of it's triply generate low lying lowest unoccupied molecular orbitals (LUMOs). Such a high electron affinity makes its compounds and derivatives applicable in conducting polymers as a best electron acceptor. Polyfullerenes (PFs), fullerene-containing polymers as well as their blends with remarkable properties are used in organic photovoltaics (OPVs) as an electron acceptor but original fullerene can not be used directly as it moves and crystallizes out on heating the material. Compatibility of polymers, band gap, electron affinity, thermal stability, functionalization of fullerene, conducting properties, solubility oxidative degradation etc are key parameters to be taken into account. Synthesis and applications of novel PFs and their blends are reviewed.

P-BS-1-600

#### A Study on Knowledge, Attitude and Practice Regarding Swine Flu among Secondary School Going Children in Various School at Lekhnath Municipality, Nepal

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Human cases of H1N1 have been confirmed in countries all over the world including Nepal. Influenza A H1N1 is a preventive disease, if the public is aware of necessary precaution

preventive method, more damage and harm can be reduced. Awareness regarding Influenza A (H1N1) is important for individual protection as well as to contain the spread of disease. This study was conducted in secondary school of Lekhnath. Kaski during 2015 outbreak of swine flu. A total of 294 students were interviewed using the pretested questionnaire by nonprobability propulsive sampling. With the help of pretested questionnaire all of the students were analyzed which tested their knowledge. After that the awareness program was conducted with the help of power point and poster presentation to the student. The students were reanalyzed for their comparative knowledge before and after the presentation regarding the pandemic influenza. Study reveals that in pre-test 221 (75%), 202 (69%) student had medium knowledge where as in posttest 280 (95%) students had adequate level regarding general knowledge and mode of transmission respectively. Also, 105 (36%), 89 (30%) and 125 (42%) students had low level knowledge in the pretest whereas 244 (83%), 280 (95%) and 239 (81%) students had adequate level in posttest regarding the prone person to swine flu, affecting organ and treatment respectively. In pretest 203 (69%), 244 (83%) students had medium and adequate level whereas in posttest 226 (76%), 277 (94%) students had medium and adequate level regarding sign and symptoms and preventive measures respectively. This result shows awareness program to school students is effective. Student being a part of a family and society can upgrade their knowledge to them and as a result whole country will be benefited. So health worker, policy maker, scientists, researcher and corresponding authority must focus students for this type of awareness program.

P-BS-1-62

#### DNA Barcoding and Phylogenetic Analysis of Fishesof Pokhara Valley

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Despite extensive taxonomic studies, identification of fishes can be problematic often even to the experts. DNA barcoding can be a promising tool for species identification and biodiversity surveys through the use of short, standardized gene targets, such as cytochrome coxidage gene of ~652 bp of mitochondrial DNA. This tool can be more broadly applied if a comprehensive reference sequence library for all fish species can be constructed. Here, we make a small contribution to this grand challenge by barcoding some freshwater fishes from Pokhara Valley. The standard barcode fragment of COI was used to barcode 14 individuals, representing 14 taxonomically recognized species belonging to 13 genera, 7 families and 5 orders. After editing sequences, specimens and sequence data were archived and investigated using analytical tools available on BOLD and MEGA. The GC content was found to be 44.97% on average. Mean genetic distance between families was 18.7%. The synonymous changes were much greater than the non-synonymous changes, especially in the 3rd codon position where variation is dominated. There were 174 conserved, 43 variable, 14 parsimony-informative and 29 singleton amino acid sites; while 367 conserved, 285 variable and 218 parsimony-informative sites were present out of 652 bp nucleotides. The NJ, ML and MP analysis indicated different clades corresponding to the recognized groupings. Molecular species identification was in concordance with current taxonomical classification in all cases achieving success rate of ~94%. In addition to DNA barcodes, our study also provides supporting data in the form of specimen images, morphological characters, taxonomic bibliography, preserved vouchers and COI sequences.

P-BS-1-63

### Detection of MLH1 and MSH2 by Immunohistochemistry Assessment in Nepalese Patient with Hereditary Nonpolyposis Colorectal Cancer

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Hereditary non-polyposis colorectal cancer (HNPCC), also known as Lynch syndrome is the most common inherited colon cancer and accounting for 5-10% of total colon cancer. HNPCC is caused by the presence of several mutations in MLH1 and MSH2 mismatch repair gene (MMR) which lead to the production of proteins that can be detected using commercially available monoclonal antibodies (anti-MLH1 and anti-MSH2). This study pursued to investigate the potential utility of these antibodies in determining the expression status of these proteins in paraffin-embedded formalin-fixed tissue and to identify key technical protocol components associated with successful staining. Colorectal cancer sample of 43 patients of Nepal were examined and immunohistochemistry was used to determine which tumours lacked expression MLH1 and MSH2 gene. Based on the IHC result, 39.5% (n=17) of patients were grouped as HNPCC positive, where 18.6% (n=8) of them showed abnormal staining pattern for MLH1, 11.6% (n=5) showed abnormal staining pattern for MSH2 and 9.30% (n=4) showed abnormal staining pattern for both antibody. Meanwhile 60.5% (n=26) were found negative for HNPCC. The key protocol point associated with successful staining was an antigen retrieval step involving heat treatment with Tris-EDTA heated at 121°C for 2 minutes. Tumours with mismatch repair defect were frequently found at the age less than 50 years (p<0.05) than tumours with no mismatch repair defect. This study demonstrates the potential utility of immunohistochemistry in detecting LS probands and identifies key technical components for successful staining. Immunohistochemistry can be done in local laboratories to find mismatch repair proteins defect on the selected cases before referring for the expensive molecular test.

P-BS-1-652

#### Incense Plants, Their Uses and Diversity in Upper Manang, Central Nepal

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The local people of Upper Manang are highly knowledgeable and totally dependent on incense plants. People have no access to modern facilities and hence they rely largely on wild resources for incense plant. Present study aims to document the incense plants, its uses in other purposes as well and its diversity along different elevation gradients in Upper Manang. Survey was conducted in 40 different households from which a total of 31 plants were found to be used as incense. Juniperus indica is the most common plant used by the people of different household as incense as well as for the religious purpose. Few other plants like *Tanacetum gracile, Nardostachys grandiflora, Betula utilis*, etc are also used mixed with *Juniperus indica*. The plants used as incense were also found to be used in other purposes.The ecological sampling was done an altitudinal gradient of 3300 to 4300 m and total of 66 plots (10m×10m) was taken. Latitude, longitude, altitude, aspects and grazing intensity were recorded in each plot. Total 24 incense plant species out of 31 species were recorded from studied plots. DCA was used to assess gradient in species composition. A Generalized linear model was used to elucidate the pattern of species richness. The incense plants with their different life forms were also regressed against the environmental variables

like altitude, RRI, and grazing. Incense species showed a unimodel pattern with altitude and a linear pattern with grazing but it did not show any relation with RRI.

P-BS-1-664

### Prevalence of katG Gene Mutants Among Rifampicin Resistant *Mycobacterium tuberculosis*

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The emergence of strains of Mycobacterium tuberculosis resistant to drugs is becoming a serious public health problem. Treatment regimens for MDR-TB are more complex, less potent, more toxic, and more expensive than first-line regimens, which will be too costly for resource-poor nations like Nepal. Rifampicin (RMP) and isoniazid (INH) are the most important primary drugs used in treatment of tuberculosis patients. Resistance to rifampicin and isoniazid is mainly achieved through mutations in the rpoB gene and katG gene respectively. DNA samples from phenotypic MDR- TB were collected from German Nepal Tuberculosis project (GENETUP) in collaboration with tuberculosis hospital. Total 33 DNA samples were subjected to ARMS PCR using three different codon specific primers (516,526 and 531). These three codons occupy large portion of total mutation responsible for rifampin resistance. Total DNA samples were bearing mutation in any of the three codons mentioned. In our study, the highest number of samples had mutation in codon 531 (96.97%) followed by codon 16(18.18%) and codon 526 (12.12%) respectively. Polymerase Chain Reaction -Restriction Fragment Length Polymorphism (PCR-RFLP) assay was carried out on the above mentioned samples for detection of Ser315Thr katG mutation. The katG Ser315Thr mutation was observed in 24(72.72%) out of 33 samples. This result shows that 72.72% of Rif<sup>r</sup> isolates are also isoniazid resistant. Thus ARMS PCR can be used as an important molecular technique for detection of rifampin resistance in Mycobacterium tuberculosis strains as well as surrogate marker for MDR TB and PCR-RFLP technique can be used for detection of isoniazid resistance in MTB in developing country like Nepal.

P-BS-1-674

#### Molecular Analysis of Beta-lactamase Gene in Multi-drug Resistant Pseudomonas Aerugenosa from Clinical Samples

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*Pseudomonas aeruginosa* is one of the most prevalent opportunistic nosocomial pathogen that may present high rates of antimicrobial resistance. Beta-lactamase producing *P. aeruginosa* is important etiological agents of hospital infection. The aim of this study is a molecular detection of ESBLs and MBLs genes in the clinical isolates as well as the prevalence of MDR *P. aeruginosa* in hospitalized patients in Kathmandu valley. A total of 50 clinical isolates from patients in different hospitals in Kathmandu will be taken and their antimicrobial sensitivity pattern will be determined. Detection for the ESBLs or MBLs producer will be done by plate screening method that involves double disk synergy test. Then PCR tests will be done for determination of ESBLs (blaOXA and blaVEB) and MBLs genes (blaIMP and blaVIM) and sequencing of the amplicons will be carried out. Amplification of the gene will indicate the resistance among *P. aeruginosa* isolates due to production of respective enzymes. It also gives the prevalence of the genes in MDR isolates. Therefore, determination of antibiotic sensitivity pattern and ESBLs and MBLs production by these bacteria can be

Abstract Book

important in control of clinical *Pseudomonas* infection. Further studies in epidemiology, antimicrobial resistance mechanisms, proper antibiotic stewardship, and rapid diagnostic method for detection of MDR *P. aeruginosa* will provide an avenue to develop strategies to curb its dissemination.

P-BS-1-676

### Comparative Study of Antimicrobial Activity of Catharanthus roseus, Cuscuta reflxa and Punica granatum

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The present work is aimed at antibacterial activities of leaves of experimental plants viz. *Catharanthus roseus, Punica granatum* and *Cuscuta reflexa*. Crude methanol extracts was used for carrying out In vitro antimicrobial activity against gram positive bacteria *Bacillus* subtilis and *Staphylococcus aureus* and gram negative bacteria *Escherichia coli* and *Salmonella typhi*. Assessment of antimicrobial activity of experimental plants was done by agar well diffusion method. MIC of the extract against the isolates range between 25 mg/ml to 200 mg/ml and result was taken after 24 hours of incubation at 37 OC. The result indicates antibacterial activity of experimental against the isolates.

P-BS-1-678

### Screening of Extracts from Medicinal Plants and Actinomycetes for the Inhibition of Enzymes of Diabetic Target

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Prevalence of diabetes has been estimated to be 9% among global adults and over 80% of deaths due to diabetes occur in low-and middle income countries like Nepal. Screening of inhibitors against enzymes like,  $\alpha$ -amylase, glycogen synthase kinase, aldose reductase,  $\alpha$ glucosidase, 12-lipoxygenase, etc. as well as inhibitors of anti-glycating agents from secondary metabolites of plants and bacteria could be a significant step for the therapy of diabetes. From the human civilization, different plants have been used to treat different diseases and various ethnical group of Nepal are still using. Also, actinomycetes are well known for bio-degradation, mineralization and secondary metabolites production including enzyme inhibitors. In this study, 50 medicinal plants based on ethno-botanical information and 50 soil samples were collected from different region of Nepal and total 48 strains were isolated and identified using morphological characteristics. Then the isolated strains were fermented at 28°C for 7 days to extract secondary metabolites. The methanol extracts of few medicinal plants and ethyl-acetate extracts of some actinomycetes were assayed against recombinant human aldsoe reductase (rHAR). The percentage inhibition of rHAR by extract of B. cilliata, A. pyrethrum and R. arboreum among 9 medicinal plants and extract of M1 and R5 among 19 bacterial strains was found to be higher. Further, the inhibition glycogen synthase kinase (GSK-3 $\beta$ ),  $\alpha$ -glucosidase,  $\alpha$ -amylase will be assayed and those extracts showing better inhibition will be used to assay cytotoxicity in vitro and in vivo. Thereafter, molecular characterization and structure elucidation will be performed.

P-BS-1-685

### Metabolic Reconstruction Analysis and Quorum Quenching in Management of Antibiotics Resistant Salmonella.

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Increasing mortality coinciding with the emergence of multi-drug resistant and scarcity of new antibiotics has put Salmonella as worldwide public health concern. Apart from mutation and degradation of antibiotics in building resistance, bacteria have also developed resistance to alternative mode of actions of antibiotics. Recent efforts of exploring cellular energetic and quorum sensing to develop potential new novel therapeutic agents' as an alternative to antibiotics has led to understanding metabolic flux that generates reactive oxygen species (ROS) by augmenting cellular respiration in explaining additional mode of some antibiotics' bactericidal effect. The ferrous ion imported to tandemize heme biosynthesis for increased respiration appears to be toxic when bacteria tend towards anaerobic respiration to mitigate ROS effect. Moreover, during FNR mediated anaerobic shift the ferric insoluble iron formed from Fenton reaction of ferrous ion is exported through increased efflux pump. In addition to these the bacteria develop virulence and resistance through biofilm production. Biofilm production is reported to be synchronized through quorum sensing that not only mask the bacteria from exposure to antibiotics but also increases expression of multi-drug efflux pumps. Thus, using flux balance analysis (FBA) putative mechanism of cellular energetic have been postulated in finding new molecule capable of potentiating the ROS production. In addition, guorum sensing and biofilm production has been established and guest for guorum guenching molecule is the future target of the study to develop as a potential drug candidate in management of antibiotics resistant bugs.

P-BS-1-710

#### Abundance of *Culex quinquefasciatus* in Bhaktapur District, Nepal

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This study was based on altitudinal variation in determining the abundance *Culex quinquefasciatus*; vector of Lymphatic filariasis (*Wuchereria bancrofti*) at Thapa Gaun, Jhaukhel and Lama Tole, Nagarkot VDCs of Bhaktapur district, Nepal. A total of 3040 (1621 from Thapa Gaun and 1419 from Lama Tole) mosquitos were collected from April- August, 2011 by using aspirator and torch. Vector abundance showed its highest value 34.35% in Jhaukhel and 26.17% in Nagarkot in the month of July but the lowest abundance 12.78% in jhaukhel in April. Month wise percentage abundance showed no signification correlation on statistical analysis. The results showed that *Culex quinquefasciatus* problem still remain alive in Bhaktapur district due to existing infrastructure and inadequate research. Identification and enumeration of all potential mosquito breeding sources and quantify the relative role of different habitats in terms of daily mosquito emergence for prioritizing the areas for control operation is recommended.

P-BS-1-717

#### Sickle Cell Disease: A New Diagnostic Approach

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Sickle cell disease (SCD) is a hereditary abnormality of Red Blood Cells (RBCs). It is caused by point mutation in both the  $\beta$ -globin gene (substitution of adenine to thymine) at  $\beta^{th}$  codon position replacing negatively charged amino acid glutamate with neutral amino acid valine. This leads to conformational change in hemoglobin molecule. This abnormal hemoglobin (HbS) gets polymerized and forms insoluble, rigid and distorted forms of RBCs. Aggregation of sickle RBCs obstructs blood flow in vessels and capillaries leading to hemolysis and hematological complications, even death.Several reports show that, prevalence of SCD is high in Nepalese Tharu community especially in Western Terai region of Nepal (20-26 June 2014 (http://nepalitimes.com/issue\_archive/90712). If both the parents are carrier, the chances of transmission of disease to the offspring will be 25%. Due to autosomal recessive nature of inheritance, it is asymptomatic in carrier patients; hence, explains the unreliable nature of diagnosis by phenotypic method. However, early diagnosis in childhood and taking therapeutic drugs would reduce the complication of the disease. Amplification of  $\beta$ -globin gene adjacent to 6<sup>th</sup> codon and restriction digestion of PCR products can be highly accurate and reliable method for screening of SCD. This provides advantages over diagnosis by phenotypic complication. Thus as my thesis project I will be conducting research which will help in a) screening of SCD individual, carrier and healthy patients in highly prevalence area and help future management of disease by providing proper information. b) DNA sequencing of the  $\beta$ -globin gene helps to study mutation prevalent among Tharu population.

P-BS-1-795

#### Prevalence of Parasitic Infection among the Children in Bhairahawa

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The study was carried out to determine the prevalence of parasitic infection among the children visiting Pakhlihawa secondary school Rupandehi, Bhairhawa Nepal. A total of 133 fecal samples from the students were examined by direct smear wet mount and concentration technique to enhance the rate of recovery of parasite. Result was correlated with their socioeconomic status and hygienic behavior and Body mass index (BMI). The chi-square test was used for analytical assessment. The prevalence rate was 63.20%, girls being highly infected (61.90%) than boys (38.09 %) (p> 0.05). Single parasitic infection was detected in 74 (88.09%) children, while 10 (11.90%) children had mixed infection. The overall recovery rate of parasite in sedimentation was found to be 58.40% followed by wet mount 48.80% and floatation 8.2%. The commonest helminthic parasite was found to be Ascaris lumbricoides (82.71%; n=67) followed by Hymenolepis nana (7.40% n=6) and Trichuris trichura (1.23%; n=1). Among the protozoan Entamoeba histolytica accounts (66.66%; n=2) and Giardia lamblia (33.33%; n=1) The highest positive rate was found among children of 0-4 years and least among those 5-8 years (p > 0.05). Infection rate was higher among the children between BMI 31 to 40 (67.44%). Children drinking water from pond (100%) were more infected than that drinking water from boaring and handpump. (p< 0.05). Intestinal parasitic infection was found among 63.20% school children. Awareness on infectious diseases, improving hygiene, and application of supportive programs for parents to elevate socioeconomic conditions may reduce the burden of infection.

P-BS-1-796

### Enumeration, Isolation and Optimization of Chloropyrifos Degrading Bacteria from Different Soil Sample of Nepal.

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In the present work, three isolates of organism capable of degrading chloropyrifos were obtained from different areas of Nepal. All together four soil sample were collected, 8inch below the surface level, where farmers are using pesticide indiscriminately for many year. The physio-chemical study of soil showed that pH of collected sample was in the range of 6.5-7. Enumeration of orgamism was done using pesticide incoperated mineral salt media. The isolates were able to grow from100ppm - 400ppm in chloropyrifos assimilated media and above 400ppm till 1600ppm no growth was observed. Ideal chloropyrifos concentration utilized by the isolates were found to be 200ppm. The optimum growth temperature for isolates was found to be 28 degree celcius, however it was 37 degree celcius for one out of three isolates. All the isolates had it's unsurpassed growth at pH 7. Before large scale culture capable of degrading chloropyrifos optimization of temperature, pH and concentration along with time is essential.

P-BS-1-798

### Experimental Study of Atmospheric Pressure Argon Plasma Jet Induced Strand Breakage on Large DNA Molecule

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Atmospheric pressure plasma jet (APPJs) has been extensively studied for biological and medical application in recent years. Plasma bullets are generated in region of high voltage electrode and propagate towards aqueous media. It has been shown that bactericidal effect is primarily due to inactivation of DNA repair mechanism or DNA damage response in microorganism. In this experiment, influence of environmental medium on efficacy of argon plasma jet in breakdown of large (λ-DNA) DNA molecule was studied with characterization of APPJ by electrical and optical methods. The DNA was suspended in four different solutions physiological saline (PS), water, phosphate buffered saline (PBS) and tri-EDTA (TE) and exposed to plasma jet in different time (60s, 90s, and 120s). The molecular responses of  $\lambda$ -DNA was analysed in gel electrophoresis. Water was found to be the most effective medium in causing breakage with the most significant damage at 120s. PBS showed linear degradation pattern. The results suggested that a broad spectrum of efficiency of  $\lambda$ -DNA is possible by modulating the properties of solutions with plasma and that level of reactive species is affected by interactions between plasma and the solutions. The free radical scavenging properties of medium would have played significant part in preventing the strand breakage and therefore must be kept into account while exposing microorganism as well as human cells during experiments. The crucial role of medium properties highlights the need for further studies of organisms in their natural surroundings.

P-BS-1-799

#### Prevalence of Rheumatic Symptoms in Urban Population of Kathmandu Valley

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Rheumatic disease encompasses spectrum of musculoskeletal, arthritis and connective tissue disorder that vary in pattern, severity and location of symptoms. Increasing evidence

Abstract Book

suggest that illness result from environmental exposures in genetically susceptible individuals. This study investigates relative contribution of gender and environmental risk factors for development of different type of rheumatic disease. In this cross-sectional study, random respondents were recruited from ward number 9 of Kathmandu Metropolitan City on the basis of any kind of symptoms associated with disease related to rheumatic disease. A five part questionnaire with background information and migration, social history, family history, medication and symptoms in Nepali language were asked to the respondents. Out of 211 respondents, 202 provided with some kind of symptoms and their data were used for analysis. Female (68.32%) respondents were twice the size compared to male (31.68%) respondents. Age group of 25-54 years (73.13%) shared high symptoms. By matching the symptoms, potential fibromyaglia (43%), Osteoporosis (22%), Rheumatic Arthritis (21%) and Uric acid (13%) were prevalent. The major difference in expression of symptoms can be attributed to difference in hormone as well as presentation of pain between two genders. Anatomical difference and physiological difference also contribute to this variation. Future study based on clinical symptoms as well as laboratory parameters would yield better representation of rheumatic disease.

P-BS-1-80

### Isolation and Molecular Characterization of *Bacillus thuringiensis* from Different Habitat of Nepal and Their Toxicity to Potato Tuber Moth (Lepidoptera)

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Potato tuber moth (PTM), Phythorimae operculella (Zeller) is a pest of many solanaceous crops including potatoes. It is one of the major constraints to potato production worldwide. Farmers rely extensively on broad spectrum chemical pesticides to check the pests but this has serious side effects on human health, ecosystem and the beneficial insects. Biopesticides based on Bacillus thuringiensis (Bt) have been very popular and successful. This research was focused on the isolation and molecular characterization of Bt from wide range of habitat of Nepal. A total of 28 different soil samples were collected from different parts of Nepal. Sodium acetate selection method and quick isolation methods were used to isolate Bt. Gram staining was done to select Gram - positive bacteria. Bt was confirmed by Comassie Brilliant Blue (CBB) staining which stains the crystals into purple blue. A total of 9 Bt strains were isolated. Most of them were bipyramidal. The cry gene types of the isolates were determined by PCR using universal primers specific to cry1 and cry2 genes. 5 of the isolated strains were positive for cry1 gene and 3 strains were positive for both cry1 and cry2 genes. Cry1 subgrouping reveal the presence of cry1Aa gene in four strains, cry1Ab gene in seven strains and cry1Ac gene in 6 strains. The bioassay of isolated strains against PTM showed their effectiveness. The lowest LD50 value was 6.67±1.749 µg/ml crude protein for strain d1 and highest LD50 value was 36.71±5.68 µg/ml crude protein for reference strain B. thuringiensis kurstaki. These isolated strains thus have necessary attributes for biopesticides production and good to use for sustainable agriculture.

P-BS-1-805

### Effect of Hormone on in Vitro Propagation of *Paulownia Tomentosa* Steud.and to Evaluate Its CO<sub>2</sub> Sequestration Ability Under Changing Climate

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Carbon emission in atmosphere is supposed to be the main cause of global warming. The rate of storage of atmospheric carbon dioxide in above and below the ground biomass over

the course of time is referred as CO<sub>2</sub> sequestration. Paulownia tomentosa Steud.is one of the best plant in community forest owing to multifaceted significance. In this study micropropagation of Paulownia tomentosa Steud.was done optimizing the technique for higher survival rate and its CO<sub>2</sub> sequestration ability was monitored. For mass propagation, actively growing juvenile shoots from axillary branches of mother plants were collected and surface sterilized with freshly prepared 0.1% w/v aqueous solution of mercuric chloride. MS basal medium supplemented with different concentration of Benzyl amino purine (BAP) 0.5 mg/l, 1.0 mg/l, 2.0 mg/l, 2.5 mg/l and 5.0 mg/l and Naphthalene acetic acid (NAA) 0.1 mg/l for bud break and shoot proliferation were prepared. Single node about 0.5 - 1.0cm long were cultured and incubated at 16hr photoperiod, 3000 lux light intensity at 25 ± 2°C. CO2 sequestration was done by measuring height and diameter of previously planted plants. Induction of shoot was observed best at concentration of BAP at 1.0 mg/l and NAA at 0.1 mg/l. The average CO<sub>2</sub> sequestration by Paulownia plant was found to be  $1489.38 \pm 489.91$ .  $1882.03 \pm 537.97$  and  $1954.96 \pm 578.77$ kg during first, second and third phase respectively. Significant difference within five months was found to be 465.58±144.57 Kg. This study might be an evidence for national policies makers on global warming, climate change and biodiversity conservation.

P-BS-1-810

#### Preparation and Characterization of Chitosan from Shell of Fresh Water Prawn

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In this research, chitin and chitosan were prepared from exoskeleton of fresh water prawns of Nepal. The chemical structure and degree of deactylation (DD) in chitin and chitosan were studied through FTIR spectroscopy and XRD analysis complemented with titration methods as well as ash and moisture content measurements. The deacetylation process was monitored by variation of reaction time. It could be inferred that the chitin could be deacetylated to a considerable degree. The distinction between chitin and chitosan could be made through the nature of absorption bands in the frequency region of O-H, N-H stretching and amide group vibrations. It was found that the degree of deacylation leveled off after a certain time indicating that the DD could be controlled via reaction time control. Further, targeting at antibacterial packaging materials applications, the biodegradable blends with commercially available copolyester were prepared and their mechanical properties were evaluated.

P-BS-1-836

#### Attitudes Towards Menstruation of Pre-menstruating Adolescent School Girls

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Menstruation is a physiological process that occurs though out reproductive life of every woman. However, wrong beliefs towards menstruation still prevail in societies of Nepal. A pilot study was conducted on 24 school going pre-menstruating girls with the help of questionnaire to study the influence of socio-economic factor in source of information and level of awareness of facts of menarche and reproduction. Among the girls studied, 73% of them were aware about menstruation as a physiological process. Media was found to be a good source (33%) to get information about menstrual health rather than other sources like school curriculum, family, friends and health workers. 56% of the subjects knew about changes in

puberty. However, only 42% of students were found to discuss issues like puberty, love, marriage, pregnancy and contraceptives while remaining 58% chose to be silent on the issues. Most of the people in country like ours believe that menstruation is a part of the curse or some diseases. However, school adolescents in Nepal seem to be well informed about the process of menstrual cycle in girls. Though 56% of the students knew about the changes that occur in puberty, only 42% of the students discussed on this topic which suggests that menstrual cycle still exists as a taboo in our society. Further dissemination of knowledge on menstrual health should be carried out in school pre-menstruating girls to change their attitudes and beliefs towards menstruation that will improve the status of reproductive health.

P-BS-1-841

### Elevational Shifts of Freshwater Communities cannot Catch up Climate Warming in the Himalaya

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Climate change has immensely threatened the biodiversity at global, regional and local levels. Loss of biodiversity is irreversible and has economic ramifications. Regular monitoring for assessing changes in biodiversity is costly and challenging for any country and especially true for underdeveloped region such as Hindu Kush Himalavan Region. In such cases, species distribution modeling (SDM) could effectively anticipate the climatically suitable area which serves in efficient biodiversity conservation and planning. Here, we investigated potential community compositions of benthic invertebrates at present in two selected regions (central and eastern) of the Hindu Kush Himalayan Region and predicted changes in community compositions in future decades using SDMs. We then quantified the climate-induced range shifts of benthic invertebrates along the elevational gradient and tested whether the community shift catches up with climate warming. We found that taxonomic richness of benthic invertebrates was expected to increase in the Himalaya in future. The upward shifts in benthic invertebrate communities were intrinsically driven by the increases in warm-dwellers and changes in cold-dwellers. The predicted model shows that benthic invertebrate communities would not catch up the rate of climate warming and would accumulate clear climatic debts in both regions, with the eastern region having a larger debt. Our findings suggest that the ongoing warming effect would cause continued elevational range shifts of mountain communities where locally cooler area act as trajectories and mountain top would act as barrier, but the summit trap effect will most likely lead to population extirpation in the distant future.

P-BS-1-869

#### Role of Type III Polyketide Synthase in Forming Colored Products

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*Mycobacterium marinum* is close relative of *Mycobacterium tuberculosis* with 3000 orthologs and 85% amino acid identity with *M. tuberculosis*. Although the species is ubiquitous pathogen of fish and amphibia but it shows opportunistic pathogenic behavior in case of human. It causes skin leisions and act as good model to understand virulence and pathogenic behavior of *M. tuberculosis*. Our study mainly focused on the enzyme such as polyketide synthase (pks) resulting in production of secondary metabolites like polyketides and

increasing virulence pattern of bacteria. Similarly, the pks modifying enzyme like sulfotransferase and methyltransferase gives sulfated and methylated products that together with the formation of biofilm can increase the pathogencity of bacteria. This study is about the gene encoding type III PKS from *Mycobacterium marinum* and overexpression of it in respective gene knockout strain followed by the formation of colored metabolites *i.e* depicted in biofilm and planktonic culture showed role of polyketide syntahse in production of novel metabolites. The extraction of metabolites and concentration of it using multi-rotavapor and further study using Mass spectrometry can guide toward the study of secondary metabolites in knockout strain of bacteria.

P-BS-1-870

#### Comparative Morphology of Eclipta Prostrata L. Growing in Different Habitat

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Eclipta prostrate L. commonly known as "Bhringiraj", is a well known medicinal herb of the family Asteraceae. Although the plant is hydrophytic able to survive in waterlogged conditions it can also grow well in relatively dry soils. Looking at its unique adaptability to water bodies as well as in dry soils a comparative study of the morphological and anatomical adaptive feature of E. prostrta collected from different habitats was done in the present work. In general, root lengths and shoot lengths were longer in waterlogged conditions and the length decreased as the conditions becomes drier. Length of internodes and the leaf area were highest in the moderately moist conditions, which decreased, in the dry and waterlogged conditions. Number of lateral roots increased with increase in the amount of water. Girth of the stem was found highest in waterlogged than dry and moist conditions. Common hydrophytic features were seen in the internal structures of the plants in all the habitats studied but there was distinct variation in the intensity of these features. In the stems from waterlogged conditions the cuticle was almost undetectable. Thickness of the cuticle and size of the epidermal cells increased with scarcity of water. Size of the air spaces in the cortex was largest in waterlogged condition and smallest on the dry habitat. Amount of vascular tissue decreased with increasing availability of water. The cells in the medullary region were more compact in drier environment. In root, central stellar region was comparatively larger in the dry than water logged habitat. Size of the air space in the cortex increased with increase in the amount of water. Epidermal cell and the thickness of the cortex decreased with increase in water availability. The plant is a good example of phenotypic plasticity changing its morphological features with availability of water in the growing environment.

### Chemistry, Engineering, Physics and Technology (P-CE-1)

P-CE-1-886

#### **Some Characteristics of Poset**

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A poset is a set in which a relation as less than or equal to holds for some pairs of elements of the set but not for all. A poset differs from an ordinary set in many ways. Here we have dealt with some of the characteristics of partially ordered sets. These characteristics are furnished in the form of theorems. Besides discussion, in some cases, we have furnished

their proof which includes our own proof also. The said characteristics are important especially from the point of view of their practical applications.

P-CE-1-119

### Phytochemical and Biological Studies of the Selected Medicinal Plants of Dhading and Makwanpur Districts of Nepal

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Ten different medicinal plants were collected from Dhading and Makwanpur districts of Nepal and phytochemical and biological screenings were performed. Methanolic extracts of bark of *Myrica esculenta* showed high toxicity against brine shrimp nauplii having LC<sub>50</sub> value 20.89  $\mu$ g/mL. Among the ten selected medicinal plants, total phenolic content and total flavonoid content were found highest in bark of *M. esculenta* with the values 262±69.64 mg/g gallic acid equivalent and 151.23±4.63 mg/g quercetin equivalent, respectively. The antioxidant properties of ten samples were evaluated by using DPPH assay and their IC<sub>50</sub> values were calculated. IC<sub>50</sub> value of *M. esculenta* was found as the lowest (46.81  $\mu$ g/mL) and closest to that of ascorbic acid (41.34  $\mu$ g/mL) taken as standard. Two pure compounds IPC<sub>1</sub> and IPC<sub>2</sub> were isolated from methanolic extract of bark of *M. esculenta* by column chromatography. The compound IPC<sub>1</sub> was proposed as  $\beta$ -sitosterol with the aid of Co-TLC and melting point of authentic sample. The compound IPC<sub>2</sub> is under process for its structure elucidation.

P-CE-1-146

#### Variation of Solar Wind Parameters During Intense Geomagnetic Storms

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Geomagnetic storms depend upon the orientation of the magnetic field in CME. Dependence of solar wind parameters during geomagnetic activity has been studied. We have taken interplanetary solar wind data and geomagnetic indices for the purpose of this study. These satellite data and Dst indices (ranging from -100nT to above) are interpreted by using the method of cross correlation. The study suggests that the strength of the geomagnetic storm is strongly dependent on the southward component of interplanetary magnetic field (Bz). We also perform discrete wavelet analysis in order to observe the discontinuity present in our dataset during geomagnetic storm.

P-CE-1-25

### Quantum Analysis of Young's Interference Experiment for Electromagnetic Fields

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The coherence and the polarization of the fields have been analyzed from classical as well as quantum-mechanical point of view, with a special emphasis on the interference phenomenon in Young's interference experiment. The long-established classical theory easily explains the field coherence and polarizations with field correlation functions and Stokes parameters and the concept of quantum-mechanical analysis of interference has been limited to scalar fields.

This work aims to extend the concept of a full electromagnetic field where the quantum counterpart of the Stokes parameters are defined in terms of quantum polarization matrix G(1)(r, t; r, t) and expressed in terms of expectation values of the field components. In particular, a two-photon field interference was investigated that showed results parallel to the classical theory; the intensity fringes for a pure state field has distribution similar to one in the classical case, as well as the Stokes parameters of the field on the screen could be explained in terms of the Stokes parameters of the incident field.

P-CE-1-324 Oxido by Varving

### Structural and Optical Properties of Aluminum Doped Zinc Oxide by Varying Number of Coatings

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Aluminum doped Zinc Oxide (AZO) thin films were deposited on the glass substrates by the wet route method using a spin coater. The prepared thin films were transparent and crystalline as confirmed by X-ray diffraction. The effect of number of coatings on structural and optical properties of AZO thin films was investigated. The crystalline quality was improved on increasing the number of coatings and better crystalline thin film was obtained with 15 times coating. The band gap energy was measured using UV-Vis spectrophotometer and its values varied from 3.20 to 3.26 eV.

P-CE-1-27

### Simulation and Analysis of Kinetics of Anaerobic Co-digestion of Poultry Litter and Rice Husk

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The anaerobic co-digestion of poultry litter and rice husk can provide useful energy and still useful manure which is its by-product. Where energy is scarce, tapping energy from such sources and materials can be beneficial. The determination of best gas yielding ratios of poultry litter and rice husk and comparison between experimental and simulated values using computer software can give us the anomalies in gas production in the real world scenario. Analysis of kinetics of anaerobic co-digestion will help us further understand the characteristics and the nature of the process, which can be used to optimise the process, and hence, enhance production. Characteristics such as biogas production rate (R<sub>m</sub>), biogas yield potential (P), time of digestion and duration of lag phase ( $\lambda$ ) will be determined using the Modified Gompertz Equation. This work has evaluated the influence of rice husk in the anaerobic co-digestion of poultry litter by taking different ratios of both. The experiment was carried out in mesophilic conditions on a pilot scale in a laboratory. It is concluded that rice husk does not play a significant role in the cumulative production of biogas in anaerobic codigestion with poultry litter but it does help in increasing the biogas production rate by allowing the C/N ratio in the digester to be balanced with its high carbon content. A 20%-80% mix by weight of rice husk and poultry litter, respectively, produced the maximum volume of gas per gram of volatile solid with a production rate of 6.45 mL g-1 VS d-1.

P-CE-1-305

#### Proficiency Tests of Harshaw 6600 Plus TLD Reader and Dosimeters

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The Harshaw 6600 plus TLD Reader is a fully automated, state of the art instrument used for extremity, environmental and whole body thermoluminescence dosimetry (TLD) measurement with a capacity of 200 TLD cards at a time. In assessing whether the reader is ready for its intended use, it is important to have a reliable proficiency test data of the instrument. Moreover, it is imperative to address the question of the statement of uncertainty of the dosimeter. In an attempt for this, a study was undertaken to verify the reliability of the reader/ dosimeter against the TLD system for personal and environmental monitoring CEI IEC 61066 (1991-2012). The type tests performed were six in total: Reproducibility, Batch Homogenity, Linearity, Detection Threshold, and Effect of Light Exposure on Dosimeter and Effect of dropping on dosimeter. The inbuilt Sr-90 source of the reader was used to irradiate the dosimeters following the indications given on the standard. The reader was tested using Harshaw TLD-100 LiF: Mg.Ti based TLD cards. Results show that all IEC criteria were met by the Reader and Dosimeters.

P-CE-1-362

#### Development and Characterization of Metal Matrix Composite by Vertical Centrifugal Casting Technique

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This paper reviews the development of hollow composite castings by vertical centrifugal casting technique and studies the effect of varying rotational speed and pre-heat temperature of the mould on characterization to come up with lighter yet stronger and economical hollow machine components. To meet this objective, a vertical centrifugal casting machine was designed and fabricated. Metal matrix composite castings were then prepared using aluminium as base metal. Different weight percentage (wt%) of SiO2 reinforcement (6%, 8% and 10%) was added with varying rotational speed (800, 1000 and 1200) revolutions per minute (rpm) respectively and varying pre-heat mould temperature. The surfaces of composite cylinder samples were analysed using optical microscope. This study provides an insight into the effect of rotational speed on distribution of the reinforcement. The castings vielded uniform microstructure where different volume fractions of reinforcement were clustered on the surface according to the value of rotational speed. Results of microscopic view showed that the rotational speed of 1200 rpm than (800 and 1000) rpm would result in better distribution of the reinforcement across the thickness of the casting with fine grain size. Lower preheat temperature (100 and 200)°C resulted in porosity with surface defects while raising the preheat temperature to 300°C yielded defects free castings especially at 1200 rpm. Brinell hardness test of Al-SiO<sub>2</sub> showed that hardness value (40, 43 and 45) increased reasonably upon increment of the reinforcement wt% (6%, 8% and 10%) respectively.

#### Some Characteristics of Poset

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A poset is a set in which a relation as less than or equal to holds for some pairs of elements of the set but not for all. A poset differs from an ordinary set in many ways. Here we have dealt with some of the characteristics of partially ordered sets. These characteristics are furnished in the form of theorems. Besides discussion, in some cases, we have furnished their proof which includes our own proof also. The said characteristics are important especially from the point of view of their practical applications.

P-CE-1-370

### The Effect of Momentum of a Classical Object on Positive Vacuum Energy Component

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The positive vacuum energy component (it is capable of collecting vacuum particles with halfinteger spin) located on the right part of a central scalar field (CSF) could vary in direct proportion with the negative energy component located on the left part of that CSF, while the negative energy component varies in inverse proportion with the classical kinetic energy component of the CSF. These triplet relationships imply that as the momentum of a classical object decreases (and reaches zero), the positive vacuum energy component increases (and finally acquires the third background energy level). This is a required condition that gets the real neutron field to jump from proton to electron sector (from third to second background energy level). With this jump, symmetry breaking of CSF takes place. The possible results are a pair of real and virtual antihydrogen vector bosons of opposite charges. In this phenomenon, as the virtual antihydrogen vector boson collapses, new vacuum energy is released what gets the negative energy component accelerating. Clearly well, a positive vacuum energy component is transported from right to left part of a CSF that fills the gap created by virtual antihydrogen vector boson's collapse. This keeps the classical system balanced and the excited part of the vacuum or free space (positive vacuum energy component) conserved. These results are experimentally verifiable in our laboratory by constructing an analog model of CSF.

P-CE-1-398

### Effect of Plant Extract as a Green Inhibitor for the Electrochemical Corrosion Study of Grille Steel in 1 M HCI Solution

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Corrosion control of various structural metallic materials is widely practiced using green inhibitors that are inherent in the plant extracts. Different concentrations (i. e. 200, 400, 800, 1600 and 2400 ppm) of plant extracts of *Callistemon, Catharanthus roseus, Laurus nobilis* and *Areca catechu* were used as a green inhibitor in this study to investigate the effects of

them on the electrochemical corrosion behavior of the locally available grille sheet in a very aggressive acidic solution of 1 M HCl at 28±1°C using immersion and corrosion potential measurement methods. The use of these four plant extracts enhanced the corrosion resistance property of the grille sheet made by mild steel in 1 M HCl solution. Corrosion resistance property of the grille sheet was generally increased with increasing the concentration of the plant extracts and all four plant extracts were acted as adsorption inhibitors since they obeyed adsorption isotherm. It was found that all the green corrosion inhibitors used in this study were acted as mixed type corrosion inhibitor from the result of the corrosion potential measurement.

P-CE-1-463

### Effects of Sodium Hexametaphosphate and Borax as Green Corrosion Inhibitors to Mild Steel in 1 M HNO<sub>3</sub> Solution

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Effects of sodium hexametaphosphate and borax on the corrosion behavior of grille sheet made by mild steel was investigated using corrosion rate and open circuit potential (OCP) measurements in 1 M HNO<sub>3</sub> solution at 28±1°C. The corrosion rate was estimated using weight loss method and the open circuit potential was recorded using a simple two electrodes system potentiometer. Both corrosion inhibitors used in this study enhanced the corrosion resistance property of the mild steel in such an aggressive environment of 1 M HNO<sub>3</sub>. The corrosion rate is generally decreased with increasing the concentration of the inhibitors used in this study. However, the sodium hexametaphosphate is found to be the more efficient corrosion inhibitor for the mild steel than borax on thebasis of the corrosion rate measurement. The adsorption of the inhibitors on the surface of the mild steel obeyed Langmuir adsorption isotherm. From the open circuit potential measurement, it was found that both the green corrosion inhibitors used in this study acted as mixed type corrosion inhibitor.

P-CE-1-567

#### Total Phenolic Content and Antioxidant Activity of Some Underutilized Medicinal Plants of Dhading District

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Wide varieties of medicinal plants in Nepal have been traditionally used for the treatment of various diseases and disorders. In this research methanolic extract of ten less known medicinal plants (used against stomach disorders in North-West Dhading district, Nepal) were evaluated for their total phenolic content and antioxidant activity. Extraction was done by sonication method. Total phenolic content was determined by Folin-Ciocalteu method. Highest phenolic content (334.86 mg GAE/gm) was found in *Geranium wallichianum* (Geraniaceae), whereas lowest phenolic content (95.05 mg GAE/gm) was found in *Millettiafruticosa* (Fabaceae). The anti-oxidant activity was studied using standard DPPH radical scavenging assay (RSA) and ascorbic acid was taken as standard compound. All the plants showed good antioxidant activity. *G. wallichianum* (10.36  $\mu$ g/mL) and Desmodium gangeticum (11.89  $\mu$ g/mL) showed lower IC<sub>50</sub> value than standard ascorbic acid (12.83  $\mu$ g/mL) indicating the best antioxidant. Lowest antioxidant activity was shown by *M. fruticosa*. The significant positive correlation of antioxidant activity of plant extracts with total phenolic

content was observed after analysis. The results suggest that most of these medicinal plants have significant antioxidant activity. Identification and purification of the bioactive compounds from these extracts and in-depth study of their working mechanism definitely remains an interesting chapter for future research.

P-CE-1-572

#### Quality Assessments of Tiles Available in Local Vendors of Kathmandu Valley on the Basis of their Physico-Chemical and Sintering Properties

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Sintering of ceramic bodies is generally practiced to produce a coherent bodies with controlled microstructure with low porosity as well as water absorption capacity because the presence of large number of pores in tiles have generally shown low mechanical strength. Depending on the degree of sintering, porosity and water absorption capacity of tiles may vary. In general, different ceramic tiles, which is generally classified into different types based on their water absorption capacity which is directly related with their porosity, density and other properties. Hence, the quality assessment of different tiles is based on their physico-chemical and sintering behavior. However, the physico-chemical and sintering properties of tiles available in local markets of Nepal are not reported in the scientific community. Considering these facts, the present research work was focused to estimate the porosity, water absorption, bulk density of the tiles available in local vendors of Kathmandu valley using ASTM standards and to correlate the sintering properties of different branded tiles with the help of these physico-chemical properties.

P-CE-1-589

### Removal of Arsenic(V) from Aqueous Solution using Wheat Stalk Dust/Polyaniline Composites

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The presence of high level of arsenic in water has motivated us to develop cost effective technologies for arsenic removal from water sources. Recently, adsorption methods using biomass and agriculture waste based bio-adsorbents have gained popularities. In this context, an attempt is made to develop a novel adsorbents based on natural biomass with simple and cost effective method of chemical modifications. For this purpose, wheat straw dust (WSD), an agriculture bio-waste, was chemically modified using conducting polymer, polyaniline. The wheat WSD was coated with polyaniline by two different approaches to make polyaniline coated wheat straw dust (PAni/WSD). The morphology and chemical structure of developed absorbent were evaluated with the aid of scanning electron microscopy (SEM) and Fourier-transform infrared spectroscopy (FTIR), respectively. For the evaluation of adsorption efficiency and the influence of various experimental parameters such as pH, adsorbent dosage, and contact time of developed adsorbents, batch adsorption experiments were carried out. The novel PAni/WSD adsorbent has been shown to possess enhanced arsenic (V) removal efficacy.

P-CE-1-590

#### Surface and Bulk Properties of AI-Ga Liquid Alloy at 1023 K

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The study of alloying behaviours of the liquid alloys has great impact on the selection of constituents for the material synthesis and designing. The mixing and demixing of the alloys in the liquid state leading to the ordering and grain boundary formation on solidification can be predicted on the basis of the surface and bulk properties of the liquid alloys. In this work, we have computed the surface tension and viscosity of the liquid Al–Ga alloy at 1023 K by different theoretical approaches. The surface concentrations of Al has been computed throughout the entire bulk concentrations by different theoretical models, such as Renovated Butler model, Prasad's model, Quasi-chemical model and Guggenheim's model. The surface concentrations then have been utilized to compute the surface tension of the alloy by aforestated models. The viscosity of the liquid alloy has been computed by employing different theoretical approaches, such as Moelwyn–Hughes, Kozlov and Kaptay equations. Theoretical analysis reveals that that Ga atoms segregate in the surface whereas Al atoms remain in the bulk in the liquid state of the alloy.

P-CE-1-638

### Effects of Green Corrosion Inhibitors Extracted from Plants on the Corrosion Behavior of Mild Steel in 0.5 M NaCl Solution

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Effects of different concentrations of plant extracts of *Callistemon, Catharanthusroseus, Laurusnobilis* and *Arecacatechu* plants as green corrosion inhibitors were investigated on the corrosion behavior of the mild steel in 0.5 M NaCl solution at 28±1°C from immersion test and electrochemical measurements. The use of these four green corrosion inhibitors enhanced the corrosion resistance property of the mild steel in 0.5M NaCl solution. Among the four inhibitors used in the present study, the most efficient inhibitor was found to be plant extract from *C. roseus* and was followed by extracts from *L. nobilis,Callistemon* and *A. catechu* based on the corrosion rate measurements. The corrosion rate is generally decreased with increasing the concentration of all the plant extracts used in the present study. The adsorption of all four green inhibitors on the surface of the mild steel obeyed Temkin adsorption isotherm. From the open circuit potential measurement, it was found that the green corrosion inhibitors i.e. plant extracts of *Callistemon, C. roseus* and *A. catechu* used in this study acted as anodic corrosion inhibitors and that of *L. nobilis* acted as mixed type corrosion inhibitor.

P-CE-1-644

#### Graphene as an Electrode for Solar Cells

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Solar cells need materials that allow light to get through and conducting, benefiting from the properties of graphene being very conductive and transparent at the same time. The unique

property of graphene is suitable to be used in energy storage and conversion, a concept using graphene as a transparent electrode in solar cell. Graphene grown on a copper substrate using chemical vapour deposition process is transferred on to a glass substrate. Structural and electrical characterization of the fabricated structures which consists graphene deposited on a target substrate is performed for using it as an electrode in solar cells which shows the transference is effective and graphene is conductive. Raman spectroscopy is used to provide the information of the graphene transferred on the target substrate. The application of graphene as an electrode in solar cell can be realized still, the synthesis and transfer process needs to be improved in order to establish its viability for the production of solar devices. Graphene grown on a copper substrate is transferred on to the glass using wet chemical process. The transference was successful which is identified by the characterization of the graphene. Graphene film on the substrate encountered some cracks after the transference which can be improved by maintaining the quality and uniformity of graphene during the transfer for increasing the efficiency of solar cells. The analysis of the topography of the graphene with AFM showed that graphene lies on the top of substrate, with some defects resulting during transfer process. The structure of graphene on the target substrate was not uniform resulting in varying layer and thickness. However, the graphene transferred is still conductive. Thus, it is possible to use the graphene as an electrode in solar cell.

P-CE-1-654

### Synthesis and Characterization of Magnetite Nanoparticles and their Nanocomposites with Epoxy Resin

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In this poster, we demonstrate the synthesis of magnetite nanoparticles (NPs) via different methods such as precipitation, sol gel and sonochemical methods, and preparation of nanocomposites with thermosetting polymer, the epoxy resin. The NPs thus obtained were characterized by X-RAY diffraction (XRD), Fourier transmission spectroscopy (FTIR) and optical microscopy (OM). The XRD results showed that the NPs obtained were pure and crystalline. In addition, nanocomposites of the nanoparticles with epoxy resin were fabricated and their mechanical properties were studied by microindentation method.

P-CE-1-708

### Phytochemical Screening and Antimicrobial Activity of *Asparagus racemosus* Willd.and*Asparagus curillus* Buch.-Ham. ex Roxb

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Asparagus racemosus Willd.is an important medicinal plant of tropical and subtropical regions of Nepal and India. Its medicinal usage has been reported in the Indian and British Pharmacopoeias and in traditional systems of medicine such as Ayurveda, Unani, and Siddha. Asparagus curillus is also one of the species found in higher altitude of Nepal. Its roots are used as substitute for *A. racemosus*. Phytochemical investigation was done for these two species of Nepalese Asparagus as per Methodology for Analysis of Vegetable Drugs by I. Ciulei.1982. Phytochemical screening revealed the presence of coumarin, flavonoid, catecholic tannin, reducing compound in alcoholic extract of *A. racemosus* while its aqueous extract revealed polyuronoid, reducing compound, plyoses, saponin, gallic tannin,

catecholic tannin, etc. Similarly alcoholic extract of *A. curillus* revealed catecholic tannin, reducing compound and aqueous extract revealed polyuronoid plyoses, saponin, gallic tannin as main phytochemical compounds. Comparative antimicrobial activity of ethanolic extract of these two species has been evaluated using Kirby-Beaur Agar well diffusion method. The extracts were screened for their antimicrobial activity on nine different strains of human pathogenic microorganisms such as *Escherichia coli, Salmonella typhi, Bacillus subtilisi, Pseudomonas auriginosa, Staphylococcus aureus, Klebsiella pneumoniae, Enterococcus faecalies, Sachharomyces ceravisae and Candida albicans.* Among them *A. racemosus* has shown selected antimicrobial effects against *B. subtilis,E. coli, E. faecalis, S. ceravisae* and *C. albicans* with zone of inhibition of 25 mm in an average. While *A. curillus* showed effects on *S. ceravisae* and *C. albicans* only with zone of inhibition about 12 mm.

P-CE-1-713

### Synthesis, Characterization and Study of Optical and Antimicrobial Activity of Copper Nanoparticles

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Copper nanoparticles, due to interesting properties, low cost preparation and many potential application have attracted a lot of interest in the recent years. In this study, copper nanoparticles were synthesized through the chemical reduction of the copper sulphate with ascorbic acid (Vitamin C) in the ambient condition without inert atmosphere. In this process, ascorbic acid acts as both reducing agent and protective agent to prevent oxidation during the synthesis and storage of the copper nanoparticles. Polyethylene glycol (PEG-400) was used as capping agent and size controller. The obtained copper nanoparticles were characterized by X-ray diffraction (XRD), Scanning electron microscopy (SEM) and UV-visible spectrophotometry. The average diameter of the copper nanoparticles was found around 28 nm. The surface plasmon resonance peaks immediately after the synthesis appeared at 566 nm. The color of the solution in water changed from light-red to black and the nanoparticles mostly precipitated after 1 month, which is attributed to the oxidation of the copper nanoparticles to the copper oxide (I), as was confirmed by optical absorption measurements. The antimicrobial efficacy of synthesized copper nanoparticles was tested with various gram +ve and gram –ve bacteria (microorganisms).

P-CE-1-727

#### Applications and Challenges of Visible Light Communication

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In the recent days, Visible Light Communication (VLC), a novel technology that enables standard Light-Emitting-Diodes (LEDs) to transmit data, is gaining significant attention. However, to date, there is very little research on its deployment. The enormous and growing user demand for wireless data is placing huge pressure on existing Wi-Fi technology, which uses the radio and microwave frequency spectrum. Also the radio and microwave frequency spectrum is heavily used and overcrowded. On the other hand, visible light spectrum has huge, unused and unregulated capacity for communications (about 10,000 times greater bandwidth compared to radio spectrum). Li-Fi, the wireless technology based on VLC, is successfully tested with very high speed in lab and also implemented commercially. In the near future, this technology could enable devices containing LEDs, such as car lights, city lights, screens and home appliances, to form their own networks for high speed, secure communication. Through this paper wide overview of need of VLC, applications of VLC and

design challenges for VLC are observed. The potential application areas of VLC that are identified include smart lighting of buildings, vehicular Communication, defense & security,indoor positioning,road safety, hospitals & healthcare, aviation etc. Aside from the high bandwidth availability of VLC, it has the advantages of very high speed, enhanced security of local networks, less susceptible to interference, less expensive due to co-existence with illumination devices and obviously no fear of health hazards due to radiation. This paper also presents a through survey on recent advancements in the domain of VLC starting from its emergence to commercialization.

P-CE-1-780

#### Phytochemical Analysis and Resistance Modifying Potential of Extracts from Heracleum nepalense Root and Lantana camara Flower

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In last decade, emergence of antibiotic resistance pathogens have become major health related problem worldwide. Plants, in ancient era, were used to cure several diseases as they were considered to be rich source of potential bioactive compounds. Nowadays, pharmaceutical companies process and extract phytochemicals with bioactive potential from medicinally important plants. In this study, the phytochemical characterization, antimicrobial activity and resistance modification activity in different extracts of Heracleum nepalense root and Lantana camara flower were studied. Extraction was carried out by cold extraction method (maceration) followed by fractionation in different solvents with varying polarity. Phytochemical screening of each fraction was carried out thin-layer chromatographic technique. Each extracts were then examined for their antimicrobial activities against gram negative and gram positive pathogens by bioautography technique. Further, the resistance modifying activity for the antibiotic ciprofloxacin was observed using different obtained extracts. To describe modulation of antibiotic activity by extract, different extracts were used in combination with antibiotic to ciprofloxacin resistant Salmonella typhi by microdiluton test. The most pronounced results were obtained with ethyl acetate fraction in all of the extract. The results from this study are indicative of antimicrobial activity of both the plant extract and its potential in modifying the resistance.

P-CE-1-787

#### Study of Phytochemical, Antimicrobial and Antioxidant Activities of Different Medicinal Plants Found in Nepal

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Phytochemicals has played a vital role on comprising drugs to different groups such as antispasdomics, emetics, anticancer, antimicrobials etc. Thus main purpose of this study is to find the phytochemicals presence, antimicrobial activity and antioxidant potential of methanol and ethyl acetate extract of different plant sample collected from different parts of Nepal. Plant parts such as leaf, flower, seed, and stem bark were used for extraction process. Plant extract showed presence of phytochemicals such as alkaloid, terpenoid, saponin, coumarin, tannin, reducing sugar, glycoside and steroid. Antimicrobial activity was assessed by measuring the diameter of ZOI (Zone of inhibition) of four concentrations of extract where ZOI was larger in 200  $\mu$ g/mL and least in 25  $\mu$ g/mL. Comparatively *Bacillus* species were inhibited more by all of the plants showing ZOI ranging from 10-22 mm in both solvent. Whereas in ethyl acetate, different plant extract were effective against *P. aeruginosa*. In antioxidant assay, DPPH free radical scavenging activity was expressed as % inhibition with L ascorbic

acid as standard showing 5.62 and 6.39  $\mu$ g/mL for methanolic and ethyl acetate extracts respectively. Methanolic extract of *J. recurva* (black seed) and *M. esculenta* (leaf) showed effective antioxidant activity with IC<sub>50</sub> value of 6.34 and 8.24  $\mu$ g/mL, whereas the ethyl acetate extract of *M. esculenta* (bark) showed effective activity with IC<sub>50</sub> value of 8.19  $\mu$ g/mL.

P-CE-1-809

### Effect of Floating Electrode on the Length of the Capacitively Coupled Atmospheric Pressure Plasma Jet and its Characterization

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Atmospheric Pressure Plasma Jet (APPJ) has got a lot of attention in recent year due to its possible application in material processing, surface modification, biomedical material processing and thin film deposition. This paper reports the use of floating electrode for enhancement of APPJ jet length in Argon environment along with its characterization and its use in polymer treatment. Floating electrode is found to decrease the applied voltage needed to sustain plasma jet thereby increasing the jet length. It is observed that there is significant increase in jet length with increase in applied voltage and decrease in distance between floating electrode and jet nozzle. The optimum distance between nozzle and floating electrode was found to be 0.5 cm. In optical characterization, the electron temperature was found ~0.6 eV using line intensity ratio method and from stark broadening method, electron density was found in the order of  $10^{16}$ m<sup>-3</sup>. The treatment of polymer along with floating electrode shows the application of plasma jet produced using floating electrode.

P-CE-1-812

### Time Reversal Symmetry Breaking in Two Band Long Josephson Junction in Ground State

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We have studied general properties of superconductor. After understanding these general properties, we have focused our research on time reversal symmetry breaking at the ground state of superconductor. We started our work from establishing BCS Hamiltonian for our system i.e. two band superconductor. After this we developed partition function on the basis of this Hamiltonian. Our calculation then was focused on deriving free energy. This free energy was minimized. As a result we found a standard equation which was found to be helpful to study time reversal symmetry breaking. Our work is very useful to study various properties of the superconductor theoretically. Nowadays, we are studying the two band superconductor but in near future we are planning to study three bands as well as more number of bands in our physics department.

P-CE-1-813

### Surface Treatment of Polycarbonate by Atmospheric Pressure Dielectric Barrier Discharge using 50 Hz Power Supply

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Modification of polycarbonate (PC) surface is important for various purposes like printing, dying, adhesion enhancement etc. In this paper, we report the surface modification of

polycarbonate by cold non-thermal plasma using Atmospheric Pressure Dielectric Barrier Discharge (APDBD) with relatively large electrodes. The surface analysis and characterization are performed using contact angle measurement and weight loss effect. The plasma treated polycarbonate exhibit improved surface characteristics. The surface energy of the PC was found to be increased and contact angle was found to be decreased. Sputtering and Etching effect was characterized by weight loss technique and it confirmed that sputtering and etching was occurred after plasma treatment on the PC surface.

P-CE-1-833

#### Ultrahigh-Purity GaAs Grown by Liquid Phase Epitaxy Method: Its Application on Spatial Light Modulator

#### Madhu Sudan Kayastha

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In this work, GaAs epi-layer is grown on semi-insulating GaAs using liquid phase epitaxy technique at various conditions such as with/without ultra-high pure hydrogen gas and different purification time. The purity of grown epi-layer were studied by Hall effect, photoluminence, and capacitance-voltage measurement. Ultrahigh purity (UHP) GaAs epi-layer can be grown reproducibly by baking sources in ultra-high pure hydrogen gas environment. We succeeded in achieving high purity n-type GaAs epi-layer, with a low electron carrier concentration of  $5.84 \times 10^{12}$  cm<sup>-3</sup> and high mobility of 312,000 cm<sup>2</sup>/Vs at 77K, which is the highest ever reported. Highly efficient surface normal spatial light modulators (SLMs) using ultrahigh-purity GaAs layers grown on n+ GaAs substrate have been demonstrated with a low operating voltage (32 V) with a high extinction ratio (25 dB) at room temperature based on electroabsorption (EA) effect.

P-CE-1-846

### Synthesis and Study of Some Physical Properties of Cuprous Oxide Nanoparticles

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The current work studies the synthesis of cuprous oxide ( $Cu_2O$ ) nanoparticles with various particle shapes and study of their antimicrobial properties. Using sodium borohydride (NaBH<sub>4</sub>) as a reducing agent and gelatin as a surfactant, cuprous oxide nanoparticles with various sizes have been successfully synthesized. The samples were characterized by XRD and SEM analysis. The results indicate the shape of as-prepared cuprous nanoparticles has close relationship with thermodynamic conditions, kinetic conditions, dripping rate and stirring rate.

P-CE-1-847

### Synthesis of Hydroxyapatite Nanoparticles and Study Their Composite Fibers with Biodegradable Polymers

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The present work features the synthesis of hydroxyapatite nanoparticles (nano-HAp) by various wet chemical methods and using biogenic sources such as eggshells and bovine

Abstract Book

bone. The resultant nanoparticles were characterized by Fourier transform infrared (FTIR) spectroscopy, powder X-ray diffraction (XRD), and scanning electron microscopy (SEM). FTIR spectra confirmed the presence of major functional groups ( $PO_4^{3^-}$  and OH) in prepared HAp samples, with small additional peaks of carbonate ion  $(CO_3^2)$  and adsorbed water. The presence of the carbonate ion is possibly due to interaction between atmospheric carbon dioxide and the nano-HAp precursor alkaline solution sample. The XRD patterns showed that all the prepared HAp powders are crystalline and confirmed the formed phase as apatite (JCPDS 09-432) with no other phases such as  $\alpha$ -tricalcium phosphate ( $\alpha$ -TCP),  $\beta$ -tricalcium phosphate (β-TCP) and calcium deficient hydroxyapatite (CDHA). The average size of the nanoparticles was found in the range 15-30 nm as calculated by Debye-Sherrer's formula. The nanopowders were further incorporated into commercially available biodegradable polymer blend Ecovio (a trade name of BASF SE) via melt mixing and subjected to melt spinning at 190 °C. The morphological, mechnical an dthermal properties were also investigated.

P-CE-1-848

#### Investigations of Antibacterial Properties of Some Heavy Metals Containing **Avurvedic Drugs**

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Avurveda uses integrated treatment system to cure diseases and promote human health, in which herbal formulation is an important part. The use of Ayurvedic formulations was the sole medicinal practice in South Asia before the introduction of modern medicines. Besides plant formulation, other inorganic components are also added to reinforce the drug's effect. Among those inorganic components, heavy metals form an important part. The use of metals in drug manufacture is termed as Rasasastra. On the other hand, heavy metals, frequently used in Ayurvedic medicines, are supposed in general to be poisonous as well as carcinogenic. However, these days many experiments are being performed using these compounds for the treatment of disease especially chronic ones including cancer. We can assume that these metals have toxic effects on microorganism as well. In this work, in an attempt to understand the structure and antibacterial properties of some heavy metals containing Ayurvedic drugs, we have performed spectroscopic, microscopic and antibacterial assay. The drugs were received from the government controlled Ayurvedic manufacturer Singhadurbar Vaidyakhana Vikas Samiti (SDVKVS), Kathmandu, Nepal. The drugs investigated include Arsenic containing (such as Rasamanikya and Swashkuthar Rasa), lead containing (such as Mahayogaraja Guggulu) and mercury containing (such as Rasasindur, Sutasekhar Rasa, Siddhapraneshvara Rasa and Navarasa) formulations. It was found that some of the formulations were found to be strongly sensitive against Streptococcus and Escherichia coli.

P-CE-1-849

#### Comparison of Electrical Characteristics of Atmospheric Pressure Dielectric Barrier Discharge with High Frequency and Line Frequency

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This paper reports an experimental study of atmospheric pressure dielectric barrier discharge (APDBD). The discharge was produced in parallel plate electrodes connected to high voltage

power supply operating at frequencies 50 Hz and 27 kHz in argon environment. The characterization of the APDBD was carried out by the means of high voltage and current probes. The decay time and the power consumption rate were found to increase with increase of the power supply. The phase difference between current and voltage was also calculated. The characteristics of the discharge have been studied under different values of applied voltage and the electrode gap.

P-CE-1-866

#### Medicinal Plants Used for Wound Healing Activity and Skin Allergies Found in Kaski District of Nepal

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The practice of traditional medicine by the use of different medicinal plants is widely used all over Nepal. About 60% of Nepalese depend on traditional medicine, which has not been documented yet; only limited uses have been followed. The use of this knowledge is transferred from their generation to generation which are about to extinct. This study is conducted for the exploration, documentation and conservation of ethno medicinal plants used for Wound Healing activity and Skin Allergies found in Kaski District of Nepal. Ethno botanical survey was done on 5 different place of Kaski district as Armala, Phumdi Bhumdi, Naudanda, Ghandruk and Kotre. Primary data were obtained from semi-structured questionnaires with Local healers and layman including 200 respondents, 40 in each study area and secondary data were obtained from books, journal and internet. From the survey, 90 medicinal plant species belonging to 51 different families were documented. Juice 43(47.78%) and paste 39(43.33%) were found to be used in highest numbers. Mostly Banamara (Eupatorium adenophorum) 78(39%), Titepati (Artemisia dubia) 52(26%) and Tamater (Lycopersicon esculentum) 42(21%) were found to be used. It is concluded that people of Kaski district have wide knowledge on traditional medicine and still use different medicinal plants for wound healing activity and skin allergies. Mimosa rubicaulis and Reinwardtia indica which don't have much studies on its biological activity till the date will be screened further for in vitro and in vivo test on activity of wound healing and skin allergies and also isolation of compounds will be done.

P-CE-1-868

#### Anti-diabetic Medicinal Plants Used by Local People in Kaski District, Nepal

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Diabetes is a complex disorder disturbing metabolism of carbohydrate, fat and protein. The 2012 report by International Diabetes Federation showed more than 371 million people (8.3% of world population) had diabetes. Despite the development and validation of new antidiabetic drugs by scientific criteria, research still continues to isolate natural product without

adverse effects. Traditional medicine is a part of Nepalese culture. Biodiversity of our country offers immense opportunities for ethnobotanical studies. More than 2300 plant species are used in Nepalese traditional medicine by 125 ethnic groups. Present study aims to investigate anti-diabetic medicinal plants used by local people in Kaski District during different periods of year 2015- 2016. Gandruk, Hemja, Lamachour, Khudi and Kotre were different places where survey was performed. Information was collected through questionnaire and personal interviews during field trips. The investigation reveals 54 species belonging to 35 families which are used to cure diabetes. Among them 10 plants is being used in the herbal and ayurvedic formulation for antidiabetic purpose. Asparagus racemosus, Momordica charantia, Berberis aristata, Syzygium cumini, Aegle marmelous, and Gymnema sylvestre were the most widely used plants among the respondents. These plants are consumed either in the form of juice, powder or boiled extract of leaves, roots, seed, fruits, bark and flower. The popularity of plants with traditional uses among the local people is vanishing due to migration and reliability on modern medicine. This finding inspires us to isolate new lead compounds for the development of effective anti-diabetic compounds based on traditional uses.

P-CE-1-87

#### Assessment of the Intricate Connect between Innovation and Technology Transfer: Case Study of CSIR-CSMCRI, Bhavnagar, India

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There has been an urgent and ever-increasing demand that the federal government funded R&D laboratories enhance not just the viable connect between the research happening in the laboratories with the challenges faced by the industry, but also ensure that the fruits of such endeavors ultimately get translated into tangible societal benefits and overall improvement in the quality of life. Upsurge in competitiveness to grab the limited research grants and strict scrutiny of the 'relevance' of such studies, financed by taxpayer's money, has given impetus towards innovation and technology transfer. The CSIR-CSMCRI, Bhavnagar, is an interdisciplinary, chemical science cluster laboratory which has been performing exceedingly well on both these frontiers - i.e. basic research and translation of this research into industriallyrelevant and socially-beneficial technologies that are acceptable to the market. An in-depth analysis of the primary data pertaining to the last five financial years (i.e., 2010-11 till 2014-'15) has revealed that this Institute, with a pool of less than 100 scientists and around 200 project personnel, has published more than 900 peer-reviewed research papers with an average impact factor of 3.0. During this five-year period, while more than 200 foreign and 50 Indian patents were filed, quite impressively, 178 foreign and 30 Indian patents were granted. As a step towards human resource development initiatives, a total of 88 students successfully completed their PhD defense in these five years, while 177 scholars were undergoing the doctorate programme. On an average, the external cash flow (ECF) generated was ca. INR 10.5 crores and the total royalty earned from the commercialization of technologies was INR 1.31 crores. A detailed assessment of these R&D output indicators has been carried out in the research paper which reflects the institute's contribution towards basic science, technology transfer and commercialization, and the development of second line of Scientists/Researchers through its human resource development activities. The paper also endeavors to discuss the bottlenecks and challenges faced by the Institute while carrying out market-driven, industrially relevant research and technology commercialization.

P-CE-1-871

#### Nepalese Medicinal Plants Used for Fever in Kaski District of Nepal

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Plants have been widely used as a valuable source of medicine for centuries in maintaining human health. Indigenous knowledge and Traditional medicine is the basis of modern medicine and become backbone for Noble drug discovery. However plants used in traditional

medicine and become backbone for Noble drug discovery. However plants used in traditional medicines are still not well studied although there is remarkable progress in synthetic chemistry. This study is focused to find out the plants that are being used traditionally to treat fever in Kaski district. Field works were conducted in randomly selected 5 villages of Kaski district: Aarmala. Naudanda. Pumdi-Bhumdi, Ghandruk and Kotre. Information about medicinal uses of plants was collected by interviewing 200 people from these communities using semi-structured questionnaire. In the present study, 51 plant species belonging to 46 Families were documented for the treatment of fever. The widely used species are Ghodtapre (Centella asiatica-50%), Tulsi (Ocimum santum-22.5%), Chillo batulpaate (Cissampelos pareira-19.5%), Aiselu (Rubus ellipticus-10%). Leaves are used in majority of cases followed by Roots. Plants are used in the form of decoction, juice, infusion with or without solvents such as water. These species may be used for the development of new, cheap, and effective antipyretic agent of herbal origin. Therefore, the herbal heritage of this area must be protected for future which may ultimately lead to the development of molecules for human health as well as national economy. The TLC patterns of most frequently used plants were performed and In vitro antioxidant activity of the 70% MeOH extracts was evaluated by DPPH free radical scavenging assay.

P-CE-1-872

#### Medicinal Plants Used in Hepatic Disorders in Kaski District of Western Region, Nepal

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Many plants are found to be used in hepatic disorders such as jaundice and hepatitis by traditional medicinal practitioners and local people with indigenous knowledge on medicinal plants. A survey on medicinal plants used in hepatic disorders in Kaski District of Western Region, Nepal was carried out from September to December, 2015. The data were collected from total 200 respondents of 5 different villages by oral interview with the aid of a semi-structured questionnaire. From the survey, a total of 41 plant species belonging to 29 families were found to be useful in the treatment of jaundice and hepatitis. Among them, mostly used were the whole plant of *Cuscuta reflexa* (85%) and fruits of *Carica papaya* (50%), *Saccharum officinarum* (46.5%), and *Cucurbita pepo* (44.5%). Recipes used were documented and herbal remedies were mostly prepared from freshly collected plants used alone or with water. The preferred method of preparation was crushing while doses of most plants were as per required till cure. With the help of survey data, the TLC patterns of the available plants were performed and *in vitro* antioxidant activity of 70% MeOH extracts of those plants was evaluated by DPPH free radical scavenging assay. Kaski district is rich in medicinal plants

used traditionally and efforts should be made to improve documentation, conservation and standardization of the medicinal plants found in Kaski district. Further scientific and biological activity studies can be carried out to intensify the importance and commercial value of these medicinal plants.

P-CE-1-893

#### TLC Profile and Antioxidant Activity Analysis of Nepalese Crude Drugs

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Medicinal plants are one of the major sources of drugs all over the world.Nepal has rich diversity for medicinal plants. About 1624 medicinal and aromatic plants reported from Nepal and among them 700 are used in traditional medicine. Identification of medicinal plants, rational use and consumption within the domestic market and export of valuable one in good price can improve the economical status of country and people. But it is possible only with proper identification and quality control of crude drugs, which is essential for the effective therapeutic action of traditional medicine. Thin Laver Chromatography (TLC) profile is one of the main identification criteria for the crude drugs. It is used in our study to determine phytochemical constituents through followed by antioxidant activity analysis of Nepalese medicinal plants. The spectrophotometeric study (short UV, 254 nm; long UV, 365 nm), Dragendorffs reagent, 10% H<sub>2</sub>SO<sub>4</sub>, 10% aqueous Ferric chloride and DPPH are useful in detection of alkaloid, flavonoid, terpenoid, bioflavonoid and phenolic constituents. In vitro antioxidant activity of the 70% MeOH extracts was evaluated by DPPH free radical scavenging assay. On the basis of traditional use and local availability of Nepalese medicinal plants, we selected following 12 plants; Calotropisprocera(Aank), Cheilanthesalbomarginata(Rani sinka), Chromolaenaodorata(Banmasa), Desmostachysbipinnata Linn. (Kush), Ficushispida(Khasreto), Sapium insigne (Khirro), Mallotusphillippensis(Sindure), Mesuaferrea Linn.(naakershar), Monochoriavaginalis (Neelojalkumbhi), Prunuscerasoides (Paiyun), Solenaheterophylla (Bankankro), Stephaniaglandulifera(Batulepate).

### Environment (P-EN-1)

P-EN-1-895

#### Real Time Measurement of Solar Radiation in Kathmandu Valley

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Nepal is identified as one of the countries with huge potential to exploit solar energy. About 300 sunny days with insolation of 4.7 kWh/m<sup>2</sup>/day, as reported by SWERA, reflects the real potential of solar energy. Solar Photovoltaic System has established itself as major alternative energy resource for electricity in Nepal. The accumulated total installed solar photovoltaic system in Nepal has exceeded 35 MWp. However, solar atlas of Nepal based on real-time measurement of insolation is yet to be produced. This paper reports the results obtained from a pyronometer with data logger installed at the rooftop of administrative building of Nepal Academy of Science and Technology for real-time measurement of insolation over a period of

one year starting from April 2013 to March 2014. The maximum average insolation was recorded in the months of April and May with a value of 5.12 kWh/m<sup>2</sup>/day and minimum average value of  $3.32 \text{ kWh/m}^2$ /day was recorded for the month of December 2013.

P-EN-1-906

# Complementary Nature of Solar and Wind Energy Resources at NAST Study Site in Pyuthan District of Nepal

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Wind speed, solar radiation and other physical variables were measured from a 30 meter tall meteorological mast at Neto, Pyuthan. Wind speed was measured using cup anemometer, while solar radiation was measured via pyranometer. For every 10 minute interval, an average value of the physical variable (eg. wind speed) was calculated by the dataloggerHence, time series of the 10-minute interval averages were produced for all the measured physical variables. On analysing the wind speed and solar radiation time series averaged over the duration of months, it was found that wind energy resource was quite complementary to the solar energy resource. The 'average solar radiation' was found to peak around noon, while the 'average wind speed' peaked twice- around 5am and around 2pm. Remarkably, the minimum 'average wind speed' occurred around 10am, at which time the 'average solar radiation' was close to its peak value. Thus, local solar and wind energy resources in the study site in Pyuthan indicate diurnal complementarity of the two.

P-EN-1-212

## Morphometry with Reference to Trace Metals in the Sediment of Panchpokhari; an Alpine Lake Series of Nepal

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Panchpokhari is a natural and oligotrophic lake series consisting of five small and shallow lakes located across a high mountain valley in the alpine region at an elevation of 4160masl. It lies in between the latitudes of 28º2.41'- 28º2.54' E and longitudes of 85º42.96'-85º43.25' N in the Central Himalayan region of Nepal. The main objective of this study was to investigate the morphometry of lake and assess trace metals contamination in the bed-sediments. A sediment core (of 30cm) was retrieved from the deepest basin of Lake 1 by using inflatable boat in the month of May 2013 (pre-monsoon) season. Among the five, lake 1 was the largest, covering an area of 34,084 sq. m., with a maximum depth of 11m, and shaped like that of a human foot print. The sediment core was then sectioned into 0.5cm increments with a core slicer for dating. Sediment dating based on <sup>210</sup>Pb indicated that the lake has a sedimentation rate of 0.1 cm per annum. The sediment core analysis revealed a history of about 200 years. A second sediment core (of 26cm) was retrieved and sectioned into 2cm increments for trace metal analysis. Analysis of more than 41 trace metals including Fe, Mn, Cd, Pb, Rb, Sn, Cr, Ni, Cu, Zn, Ni, As, Hg, Co, Mo, etc. showed different distribution patterns of trace metals depth-wise. The results indicated that the average concentration of metals were in the order of Hg<Cd<Ag<Bi<Se <Mo<Be<Sb<Sn<As<U<Sc<Co<Th<Cs<Ga<Cu<Pb<Ni<Li<Cr<Zn<Rb<Mn<Ba<Ti<Fe in the lake-bed sediment. The recent sediment layers (top 10 cm) appeared to have higher concentrations of these trace metals. This might be an indication that the lake has received a
higher load of trace metals in the recent period, possibly due to long-range transport of pollutants. This theory requires further detailed examination.

P-EN-1-280

# Fuel Crisis, and its Effect on Agroforestry Market Chain: A Case Study of Ethnic of Central Nepal

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Agroforestry practices has been one of the viable options to enhance livelihood among the peoples of Makwanpur in Nepal. This practice provides income among ethnic groups(Chepangs, and Tamangs) for supporting livelihood in these areas. The "Undeclared Economic Blockades" in the country since last five months starts from September 2015 had created a lot of problems in the economy of Nepal, and its spill over effect had also affected the marketing of Agroforestry products. It was very difficult to take food stock in the market, this has caused an increase in local consumption This study is mainly designed to analyze the impact of border blockades in terms of income from the Agroforestry product in Raksirang Village Development Committee (VDC) in Makwanpur district. A purposive sample of 50 households (14 percent) was randomly selected to collect primary data. More than 60 percent respondent had a delay in sale, were able to receive low rates for their products at farm, and has to pay right rate for transporting the products in the market center.Self consumption of Agroforestry was higher during a period of Blockades as a new coping strategy. The market price of food commodity (mainly rice, pulses, and vegetable oils) was raised by more than 50 percent in an average. Income from sale of Agroforestry was much lower after economic blockades compare to before blockades. A buffer stock required to mitigate the crisis. The government should continue to supply essential things (food/non food) from own resources in case of a crisis situation.

P-EN-1-112

# Ichthyo faunal Diversity and Physico-Chemical Factors of Melamchi River, Sindhupalchok, Nepal

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The fish community and physico-chemical parameters, at five sites of Melamchi river, were studied by monthly sampling from Jan-2011 to Dec-2013. It is a tributary of larger Indrawati River basin that originates from the high snowy mountain of the Jugal Himal at an elevation of 5,875 meter. Eleven fish species belonging to two orders and five families were recorded during this period. The order Cypriniformes was dominant with ten fish species. The most common fish species recorded from five sites was *Schizothorax plagiostomus* followed by *Neolissochilus hexagonolepis* and *Psilorhynchus pseudecheneis*. Shannon Wiener fish diversity index and species richness recorded highest at site 2 and lowest at site 5, whereas, evenness index was highest at site 3. The cluster analysis revealed that similarity between fish species decreased as the distance between the sites increased. Fish species were distributed within four groups with respect to the significant habitat characteristics in RDA (redundancy analysis). Pearson's coefficient correlation showed highly significant positive correlation between fish abundance and factors like water temperature, total alkalinity, turbidity, chloride, and calcium and negative correlation was observed with pH, nitrate, and magnesium. River water was well-oxygenated and alkaline at all sites. However, high level for

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turbidity (43.25/ NTU) was observed at site 5, which exceeded compliance levels of WHO (2011) indicating the impact of agriculture and deforestation in river area. To improve fish diversity and water Quality of this river proper monitoring is an urgent need.

P-EN-1-453

# Climate Change Trend and Effects on Agricultural Productivity in Saptari District of Nepal

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Climate change impacts are inevitable and Nepal is one of the vulnerable countries in case of climate change impacts. Climate change affects agricultural production with precipitation, temperature and pest infestation. The main objective of the study was to understand the trend of climatic parameters and their linkages on agriculture. The meteorological data from Rajbiraj station, household questionnaire survey, group discussion and interview with key informants has been used to establish the linkages of climate change and agriculture. The rainfall is found decreasing by 8.21mm per year from 1980-2013 AD. Similarly, the years like 1999, 2001 and 2010 were completely dry during winter. Meteorological data trend match with the perception of people towards rainfall pattern. Based on the data of 1975 to 2006, the average temperature in Nepal is increasing by 0.027°C per decade. However, the maximum annual temperature is decreasing by 0.051°C per year and minimum annual temperature is increasing by 0.010°C per year in Saptari. The increase in temperature over 30 years is also observed by 94% of the respondents. The agricultural production has also changed along with the climate change. About 90% of the farmers experience rise in crop production (rice, wheat and mustard). However, appearance of new agricultural pest and visit of summer pest in winter is a major concern of farmers, which indicates that climate change also affects on pest insurgency. The important adaptive measure to increase the yield of agriculture is found to be change in crop species.

P-EN-1-466

# Contribution of Multiple Water Use Technology towards Climate Resilience of Poor and Marginalized Community of Kaski District

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Multiple Water Use Technology (MWUS), established in drought affected area, is an adaptation measures taken to minimize environmental shocks resulting from climate change. MWUS is a resilient technology, works on the basic natural flow law (gravitational force). It has been considered as one of the promising tool in other countries but the impact on the rustic areas of Nepal has not been studied yet. The study was conducted to understand the contribution of MWUS as climate resilience tool in the drought problem areas of Dhikur pokhari, Nagdada, Kaski district. The management approach of marginalized community in the study area has been analyzed considering the parameters like drought, water collection time and water distribution features. Questionnaire survey was conducted among the adopter and non-adopter of MWUS technology to understand the contribution of it towards climate resilience. The water collection time has been decreased from half an hour to two minutes. Similarly, amount of water available and use increased by three times after technology. It has also helped to increase the agricultural production (production increased by 28% for rice, 20%

for Maize and 4% for Buckwheat). The technology has fulfilled water need as well as helped to grow agricultural products for economic benefits. Lifestyle of people in the study area has ameliorated after the installation of the technology. The invested money for the technology was paid off within a year, making it a viable alternative option for marginalized community.

P-EN-1-489

### Use of Bicycle as a Mode of Transportation among College Youths

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This study was carried out to enumerate the bicycle users in the HSEB+2 private colleges of Kathmandu Metropolitan City. Using simple random sampling method, 40 higher secondary schools from 11 different wards of KMC were selected. In 45% of the total colleges, there were bicycle users. However, out of 23,000 students in the 40 colleges, only 38 students used bicycle as a regular transportation medium. There were no female students who rode bicycle to attend the college. Based on the travelling days, travelling distance and cost comparison with public transportation, it was found that a student who uses a bicycle would save Rs. 4592 to Rs. 6314 in a year. In relation to a motorcycle which gives a mileage of 40kms, a bicyclist would save up to 0.36 tonnes of  $CO_2$  in a year. Similarly, 38 bicyclists would save 12.56 tonnes of  $CO_2$  and the total 23,000 students would prevent 7,900 tonnes of  $CO_2$  from being released into the atmosphere. The questionnaire survey documented several challenges of fewer cyclists going to colleges. Over speeding, overtaking and careless driving by big vehicles is the major problem for bicyclists. The respondents see the risk of accidents due to the lack of proper cycle lane in the city. Despite knowing the reasons behind accidents, only 13% of respondents always put on safety helmets while riding a bicycle.

P-EN-1-541

### Comparative Study of Soil In Different Land Type in Chitre, Parbat

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Soil is the mixture of minerals, organic matter, gases, liquids, and the myriad of organisms that together support plant life. This study was carried out in Chitre VDC ward-9, Parbat district selecting three types of lands agriculture, newly planted and barren land to compare the status of macro nutrients, soil pH, EC and Organic Carbon (OC). To analyze soil nutrients standard methods was adopted. The nutrient status of newly planted area was found to be better than other considered land type. The soil pH was found to be varied from 6.01-7.06 with most of the samples were slightly acidic to nearly neutral. The electric conductivity lied between 21 to 58.3 mS/cm. The range of organic carbon in the study area was found to be 2.72% to 9.13%. Organic carbon was found to be more in coffee planted area. The Nitrogen % of soil sample rangesfrom 0.0040-0.1040 % with highest % in newly planted area. Phosphorus amount ranges from 301.71- 345.82 Kg/ha in agriculture land, 127.04 - 253.19 Kg/ha in coffee planted area and 205.55 - 360.82 Kg/ha in barren land.The value of available potassium in soil samples from agriculture land, coffee planted land and barren land was 172.03 - 196.22 Kg/ha, 131.71 - 193.54 Kg/ha and 91.39 - 236.54 Kg/ha respectively with least value in barren land. The highphosphorus present in coffee planted area can be due to open grazing before the plantation. The crop type is recommended to be chosen considering the nutrient status of different land type.

P-EN-1-545

# Chemistry of Waters from Different Sources in West Seti and Tamor River Basins, Nepal

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To characterize the geochemical composition of water in the glacierized river basins, 18 water samples were collected, representing surface water, ground water, rain, and ice-melt, from West Seti and Tamor River basins on the southern side of the Nepalese Himalayas during pre-monsoon of 2015. The physical parameters- pH, conductivity, temperature were measured in the field and major ions (Na+, Ca<sup>2+</sup>, Mg<sup>2+</sup>, Si<sup>4+</sup>, SO<sub>4</sub><sup>2-</sup>, NO<sup>3-</sup>, HCO<sup>3-</sup>, Cl<sup>-</sup>, Fl<sup>-</sup>) in the water samples were analyzed in the laboratory.Very low and within the WHO and the NDWS guideline concentration levels of chemical species recorded for the water samples indicating currently a safe level of the water quality for maintenance of the ecosystem. The preliminary results suggest that Bicarbonate (HCO<sup>3-</sup>) has a significant correlation with Ca<sup>2+</sup> and Mg<sup>2+</sup> suggesting carbonate rock weathering as the dominant geochemical process in the region. The concentrations of Ca<sup>2+</sup>, Mg<sup>2+</sup>, HCO<sup>3-</sup> in the water of West Seti is strongly higher than the waters in Tamor basin. We highlight that a drier precipitation conditions of West Seti has strong controlled on the chemistry of the waters.

P-EN-1-547

### Effect of Biochar Amendment on Soil Quality and Crop Productivity

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A pot trial was carried out to investigate the effect of soil treatment with biochar and selected soil amendments on crop yield (Brassica juncea) in the acidic sandy loam soil from Panchase, Kaski Nepal. Biochar was produced from maize residue. Pot trial was carried out with biochar (4 t/ha), biochar+nitrogen fertilizer (15% biochar of fertilizer's recommended dose) and compost (19.66 t/ha). The experimental design was a factorial randomized design with three replications of each treatment. Biochar produced from maize residue was found to be nutrient rich and alkaline. Significant increase (P=0.05) was observed in soil quality such as pH, cation exchange capacity and available potassium of biochar treated soil as compared to the control soil. Biochar+fertilizer treated soil showed significant increase in organic matter percentage. Numerically higher but insignificant crop yield was observed with biochar+fertilizer treatment followed by biochar alone and compost treatment. Further investigation with either higher application rates of biochar or longer duration trials are required to find out the long term effects of soil amendment with biochar.

P-EN-1-585

# Ecotourism Before and After April 25, 2015 Earthquake- A Case Study of Langtang National Park

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Major part of the world is affected by earthquake regularly though some are not felt due to low intensity. In context of Nepal, a minor earthquake frequently occurs. But, it was a long time after 1990's severe quakes, a great earthquake called Gorkha Earthquake hit with a

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magnitude of 7.8, followed by more than 417 aftershocks of magnitude 4 and above. The Langtang valley that used to be Nepal's third-busiest trekking destination, popular with independent 'tea-house' trekkers suffered the worst destruction during the earthquake as a huge landslide swept off the peak of Langtang Lirung to bury the village below. This frenzy news frightened away many potential tourists. In order to assess the ecotourism before and after earthquake, methods of social survey were used and international tourists were found to decrease by 80-90% compared to the same period the year before. This has directly affected local employment and the park's total revenue. In order to revive this dramatic decline in inbound tourist flow, reconstruction work such as of hotels, trekking trail is at pace. Result of the study state that there is still potentiality of ecotourism despite of such a high destructions. Organizations like LNP, WWF Nepal, Hariyo Ban Program, GoN, LACCoS, UNICEF, GOAL contributed greatly in the recovery and enhanced awareness about the existing potential around the globe, Kishori group, Survodava Youth club, Bufferzone group, Gosaikunda Area Development Committee, Eco-club, Snow leopard conservation group formed at local level is promoting ecotourism by conserving biodiversity. To convey the message that Nepal is safe to visit, National Tourism Promotion Committee (NTPC) has unveiled a new promotional logo and slogan 'NEPAL: BACK ON TOP OF THE WORLD' by launching Visit Nepal Year -2016. LNP too, is conveying message 'Langtang is rising' instead of 'Langtang will raise' to motivate the international tourist to visit. Both the public and private sector should set up a leadership organization that embraces and considers tourism management for efficient recovery.

P-EN-1-698

### Challenges and Strategies of E-Commerce in Nepal's Agriculture

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The main goal of this study is to investigate the challenges and solutions of E-Commerce in Nepal's agriculture. This study is based on a descriptive- analytical type of field research. The questionnaires were designed in a likert scale. The questionnaire consisted of two parts: challenges to E-Commerce and E-Commerce implementation strategies for agro-product marketing in Nepal. The population of this research was a panel of faculty members of engineering, computer science, Information Technology, Business studies including agroproduct producers/farmers, consumers and E-Commerce facilitators of different parts of Nepal. A sample of people was selected by using random sampling. The result from factor analysis poses four major factors of challenges on E-Commerce in Nepal's agriculture, which are i) Technical-Educational factor (i.e. lack of internet in rural areas, & farmer's low levels of literacy), ii) Cultural factor (i.e. lack of the culture of using computer for marketing purpose, iii) Security factor (i.e. lack of security standards in electronic banking systems), and, iv) Public factor (i.e. lack of public awareness about E-Commerce, and lack of rules and regulations regarding consumer law). According to the results, it seems that internet education to farmers, development of internet lines all over the country, awareness and easiness in the process of online payment system would be the important strategies for E-Commerce development & implementation in agriculture sector of Nepal.

P-EN-1-734

# Seasonal Variation and Transport Pathways of Black Carbon in Dhunche, Nepal

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Black carbon (BC) is an atmospheric aerosol mainly produced from incomplete combustion of fossilfuel, which is largely emitted from residential, transportation, agriculture and industrial

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sources. BC has been shown to have local, regional and global climate effects. BC, being a good- light absorbing species, is one of the cause behind the alteration of radiation system leading to imbalance in local, regional and global temperature. Atmospheric heating by BC causes a strong positive radiative forcing at the top of the global atmosphere, offsetting a large fraction of the cooling by other aerosol components causing problem in earth's climate and hydrological cycles. In short BC absorbs heat from sun and warms everything around it and differ temperature around it, causing serious environmental problem alongwith fatal health problems. The most important effect of BC found in Himalayas is albedo effect, where BC deposited on snow and ice changes the overall reflectivity of the surfaces and accelerates melting of snow and ice. Evaluation of BC concentration and assessment of their pathways and location of emission source can be useful for the BC regulation and mitigation strategies. In this study Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model driven by Weather Research & Forecasting (WRF ARW) model was used to identify location of possible emission sources and their transport pathways. Meteorological fields were simulated using WRF with two nested domains of 27and 9 km horizontal resolution and 40 verticals levels and were validated with Nepal Department of Hydrology and Meteorology (DHM) data obtained from AWS station. The HYSPLIT model was integrated with meteorological fields derived from the WRF model to identify the possible source locations using backward trajectory calculation. The backward trajectories for a 168-h period were plotted at 6-h intervals starting from single observation locations (Dhunche) to identify possible sources. Back trajectories were clustered and analyzed seasonally. The back trajectories distinctly indicated thesources to be mostly from India and others from Pakistan and Bangladesh. Transport pathways were found to be influenced by SAM (South Asian Monsoon) during monsoon and westerlies throughout the year. The observed annual average value of BC concentration at Dhunche during the period April/2013-March/2014 was 2.44 µg/m<sup>3</sup>. BC concentration was found to be the highest during pre-monsoon (March, April, and May) at Dhunche and was followed by winter (December, January, and February.)

P-EN-1-75

### Modification of Jatropha Pressure Jet Stove and Local Level Trans-Esterification Mechanism Using Methanol and Sodium Hydroxide

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The main aim of the performed research is to provide experimentally the performance analysis of jatropha oil, both crude and transesterified, in the pressure jet stove, and its evaluation on the basis of its efficiency, emissions and safety, and compatibility with the users. The fuel properties of transesterified jatropha, such as kinematic viscosity and calorific value, were found. The results of tests on modified kerosene stove shows improvement in efficiency from 30.6% to 33.1%. There are also slight improvements in terms of emission, with PM concentration decreasing from 675 to 672 (ug/m3) and average PM concentration falling from 227 to 224 (ug/m3). The water boiling tests on normal kerosene stove showed an efficiency of 38.4% while use of transesterified jatropha in the same stove resulted in efficiency of 30.6%.

P-EN-1-779

# Isolation and Characterization of Myxobacteria from Different Biological Samples

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Myxobacteria are gram negative slime bacteria found on top soil. They produce variety of bioactive compounds including antibiotics. Myxobacteria, that are also cellulose degraders,

were isolated from the bark of trees, dung pellets and soil. The collected samples were soaked in distilled water containing cyclohexamide (upto 0.08 mg/ml) for few hours to suppress the growth of fungi. An appropriate amount of water was added during cultivation. Dung baiting and bacterial bating techniques were used for the isolation. Identification of Myxobacteria was performed based on swarms, fruiting bodies and direct plating techniques. Rabbit dung was found to be good source for Myxobacterial cultivation. Myxobacteria with cellulase activity were purified on ST21 medium with 50µg/ml cyclohexamide and 10 µg/ml kanamycin. All isolates were resistant to Kanamycin, Neomycin and Gentamycin. 16s rDNA amplification resulted in 1.5kb amplicon which was cloned to pGEM T-Easy vector to generate pDNA pGEM-NR. The insert will be sequenced using SP6 and T7 primers. Identification based on sequence data is ongoing. Morphological and sequence based identification can be done to identify Myxobacteria in Nepal.

P-EN-1-822

#### Characterization of Actinomycetes towards the Development of Antibiotics

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Actinomycetes are gram positive filamentous bacteria with high G+C content. They are microbial interest due to metabolites production, biodegradation and globalization. Maximum global human death is attributed to infectious diseases, accounting billions of dollars and such infections causing agents are becoming more and more resistance to common drugs at a rate faster than the discovery of new drugs. History shows that natural products and their derivatives are main source of human drugs that includes microbial metabolites. Among microbes, actinomycetes occupy more than 45% of such drugs which lead to the screening of novel strains and their active bio-compounds. In this study, 48 actinomycetes strains were isolated from eleven soil and three water samples of Muktinath, Kalikot, Chitwan, Rajbiraj, Darchula, Sindhupalchwok and Lalitpur and identified by morphological characters. Their antimicrobial bioassay was done against multi drugs (MDR) resistance pathogens like, Staphylocooccus aureus, Enterococcus, Acinatobacter, Klebsiella pneumonie, Salmonella typhi etc. by agar well diffusion and agar co-cultivation method. From this assay, seven strains showing better inhibition were selected; genomic DNA of each was isolated and amplified their 16S rDNA region (1.5 kb). Then amplified product was ligated to pGEM T-Easy vector (3 kb), transformed into E. coli DH5a by electroporation and thus prepared recombinant plasmid (4.5 kb) were sent for sequencing after confirmation by EcoRI digestion. The data obtained from sequencing will be used for phylogenetic analysis to identify and characterization of antimicrobial compounds. These strains would be useful in pharmaceutical biotechnology research towards the development of new or hybrid antibiotics.

P-EN-1-86

### Future Energy Scenarios of Nepal: RET Policy Options in Commercial Sector

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Energy is a vital input for social and economic development of any nation. Energy use and per capita GDP, a development indicator, are highly correlated over time and space. This correlation has lent support to the claim of "resource economics" that energy is an essential input in the economy, but can also be explained by mainstream arguments that posit energy use is the result of higher income and high income elasticity on energy intensive products and

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services. Hence, energy consumption is highly correlated to the economic excellence of the country. In the base year 2015, a total of 475 PJ of energy is estimated to be consumed. In the reference case i.e. at the GDP growth rate of 6% per annum, the total energy consumption is estimated to increase at an average annual growth rate of 2.6%. Similarly at GDP the growth rate of 4.42%, 7.5% and 9.2%, the energy consumption annual growth rate is estimated to be 2.06%, 3.22% and 4.8% respectively. Despite commercial sector being less energy intensive sector, its contribution to GDP is high. Hence an approach for strengthening the country's economy can be securing the energy supply to the commercial sector. In order to do so, the sustainable energy, renewable energy technology, approach for the energy security of the commercial sector is studied. Different energy scenarios in the commercial sector can secure the energy, nurture the environment and boost the nation's economy. For the combined renewable energy technology policy to be implemented, the government, finance institution and the people involved directly or indirectly in commercial sector should work hand in hand.

P-EN-1-9

#### Solid Waste Management by Natural Ways

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Nowadays in the context of our country, the project seems to be very effective one for the energy generation and solid waste management technique for entrepreneurship also. In this project, moreover natural ways are taken into consideration. The weapon animals like cows, buffalo, chickens, duck, earthworm etc are used. Mostly 70-80% of the daily waste in our community is organic and degradable one .This huge amount of waste is used directly fed to the cattle(infertile one mostly in the case of cattle) and the remaining and animal wastes are directly used for the generation of BIOGAS. Other animals work together for the waste settlement for ex: duck (fish waste), hen(rotted product),earthworm(for Fermi composting of the slurry of biogas product)etc. The project not only safely settles the waste but also helps for the income generation and employment which can help to prevent the youth of Nepal for migrating to foreign land too. The heavy, pollution creating and expensive equipments for waste management can be easily replaced by this sort of technique. The basic idea to this project is collection of waste separately for different eco friendly uses. The system can be accessed and monitored with the help of different application softwares (mobiles, tablets) too. The timing of waste collection vehicles can be easily monitored with the help of these techniques. The method seems to be environment friendly and easily handled. The method can be practiced in the south Asian countries too. This simple project can be easily implemented and fruitful end results can be surely observed.

P-EN-1-918

# Green Synthesis of Silver Nanoparticlesin Presence of Ascorbic Acid and Gelatin and Study of their Antimicrobial, Antioxidant Properties

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In contrast to the prevalent physical and chemical methods for preparation of metal nanoparticles that result in toxic byproducts and are generally costly, biosynthetic

preparations are eco-friendly and inexpensive.Present study unveils green synthesis of silver nanoparticles (AgNPs) using ascorbic acid as a reducing agent.Regarded as a simple and cost-effective method for preparation of AgNPs, it utilizes silver nitrate (AgNO<sub>3</sub>) as a metal precursor and gelatin as a natural stabilizer. The synthesized AgNPs were characterized by Ultraviolet-visible (UV-vis) spectroscopy, powder X-ray Diffraction(XRD) and Fourier transform infrared (FT-IR) spectroscopy. Further, the antibacterial activity of AgNPs against Gram-positive and Gram-negative bacteria was studied by Kirby-Bauer method. The study of antimicrobial properties of AgNPs carries a promising potential, especially in the context of growing microbial resistance to widely used antibiotics. The antioxidant activity of the AgNPs was also studied by DPPH assay which emphasizes on the possibilities of application of AgNPs to target free radical scavenging *in vitro*.