Project Update: July 2022

1. Monitoring the artificial nests made for the Indian spotted eagle

Different anthropogenic activities as well as natural calamities (flood, landslide, forest fire, hailstorm, heavy rain and winds) may cause a decline in the species population if conservation initiatives are not adopted. Careful planning, monitoring and evaluation of the time, money and effort applied are the important aspects of conservation (Sutherland et al. 2004, Groom et al. 2006). Such assessments often provide great opportunities for a revision of conservation practices and redirection of limited resources (Katzner et al 2005).

The destruction of raptor nests are about 40% (Ivanovski 1985). Construction of artificial nests is widely used as a conservation practice to provide nest sites for the raptors (Ivanovski 2000, Charter et al. 2010, Honkala et al. 2011). Artificial nests can be beneficial in several ways. First, they provide nesting sites to the breeding raptors and reduce the intra- and inter-specific competition for nests. Second, choosing the artificial nests can save time as well as energy to build the nests. Thirdly, artificial nests can withstand harsher weather than natural nests. Artificial nest building has been practised globally mainly for eagles (Grubb 1995, Randla and Tammur 1996, Ivanoski 2000), Ospre y (Wahl and Barbraud 2005, Saurola 2011), hawks (Bohm 1977, Steenhof et al. 1993).

We monitored 13 artificially built nests in three different breeding territories (Lumbini, Dhanusa and Koshi) of Indian spotted eagle. Lockdown lifted in last week of June 2020. Meanwhile, restrictions from one province to another was lifted by first week of July 2020. Additionally, floods and landslides occurred in different parts of the country that restricted our movements. Thus, we could not monitor nests on time. We found that one of the nests was used by the white-eyed buzzard. Although we did not see with our own eyes, we found evidence that proved that an artificial nest has been used. First, the presence of leafy branches in the rim of the nest which we had not used while building the nests (we only used non leafy twigs). Second, there were lots of leaves than we have used in the bed of the nests. Third, we found the poo in the leaves lying under the nesting branches and few bones in the nests. Fourthly, we found the feathers of white-eyed buzzard in the nest and, last but not the least, we saw two newly fledged juveniles white-eyed buzzard in the periphery of the nesting tree.

2. Study of breeding biology using a camera trap

In first week of April 2020, we did not find any Indian spotted eagle incubating in the nests, so no camera traps were installed. In the last week of April 2020, the nation went for a lockdown stage due to Covid-19 pandemic hence our work was halted. Lockdown lifted in July 2020, while movement of one province to another was allowed in mid-July 2020. In addition to this, natural calamities halted our work. Hence, camera trap installation in the nests was done in August 2020, by the time chicks were already 5-6 weeks older. We monitored seven nesting sites (three - Lumbini, one – Bardia, one - Chitwan, one – Dhanusa, one - Koshi) of Indian spotted eagle. Out of three pairs of Lumbini, one of the pairs did not breed (reason unknown). Breeding failure took place in Dhanusa, Chitwan, Bardia and Koshi. However, we found one more nesting pair inside Koshi Tappu Wildlife Reserve. We used a jumar technique to climb the tree and

install the camera trap in the nest (Photo 2). We deployed the camera trap 1m from the edges of the nests.

Photo 1: Artificial nests used by raptors on the left (white circle – leafy branches, red circle – poo, yellow circle – feathers of chick of White-eyed Buzzards) and researcher Dheeraj Chaudhary inspecting the artificial nests (right)

We deactivated motion function and used time lapse mode from 6 am till to 6 p.m. It was programmed to take single picture in every 3 minutes. We also used another camera trap in the same nest to study the predators of eaglet. Motion sensor programmed was made from 7 p.m. to 4:30 a.m. The camera was programmed to take a single picture. Both cameras were deployed at the same time. The camera trap installed near to its nest did not change the behaviour of the adults and juvenile. Two eaglets successfully fledged from the nests (Lumbini- one, Koshi- one). Because of Covid-19 lockdown (because we could not regularly monitor them) we could not determine in which stage the breeding failed.

In total, we captured 14,595 photos during our monitoring period of two breeding pairs by time lapse programmed mode and 21,137 photos from the motion sensor mode camera traps. We recorded 61 prey items from the camera traps time lapse camera. The main dietary of Indian spotted eagle was found to be frogs (68.5%) followed by birds (16.39%), rodents and shrews (11.48%), small mammals other than rodents and shrews(1.64%) and 1.64% as unidentified items (Table 1). The average prey deliverance per day was found to be 1.76 ± 0.66 SD/day (range= 1-3/day) for the Lumbini nests and 1.47±0.60 SD/day (range= 1-2/day).

Table 1: Prey items of Indian Spotted Eagle

S. No	Common Name	Scientific name	Family	No.
Amphibians				
1	Jerdon's bull Frog	*Hoplobatrachus crassus*	Ranidae	11
2	Skittering frog	*Euphlyctis cyanophlytics*	Ranidae	6
3	Sri Lanka bull frog	*Kaloula taprobanica*	Microhylidae	1
4	Tiger frog	*Hoplobatrachus tigerinus*	Ranidae	19

5	Unidentified Ranidae		Ranidae	2
6	Unidentified frog			4
Bird				
7	Red-wattled lapwing	*Vanellus indicus*	Charadriidae	3
8	Black francolin	*Francolinus*	Phasianidae	1
9	Bronze-winged jacana	*Metopidius indicus*	Jacanidae	1
10	Cattle egret chick	*Bubulcus ibis*	Ardeidae	1
11	Indian pond heron	*Ardeola grayii*	Ardeidae	2
12	Unidentified bird			2
Rodent and Shrews				
13	Asian house shrew	*Sunchus murinus*	Soricidae	2
14	Eastern house mouse	*Mus musculus*	Muridae	1
15	Greater bandicot	*Banicota indica*	Muridae	1
16	Indian bush rat	*Golunda ellioti*	Muridae	1
		Niviventer spps	Muridae	2
Other				
17	Northern palm squirrel	*Funambulus pennanti*	Sciuridae	1

The deliverance of prey items peaked between 14:00 – 15:00 hrs., 16:00 – 17:00 hrs. followed by 10:00 – 11:00 hrs., 11:00 – 12:00 hrs. (Fig 1).

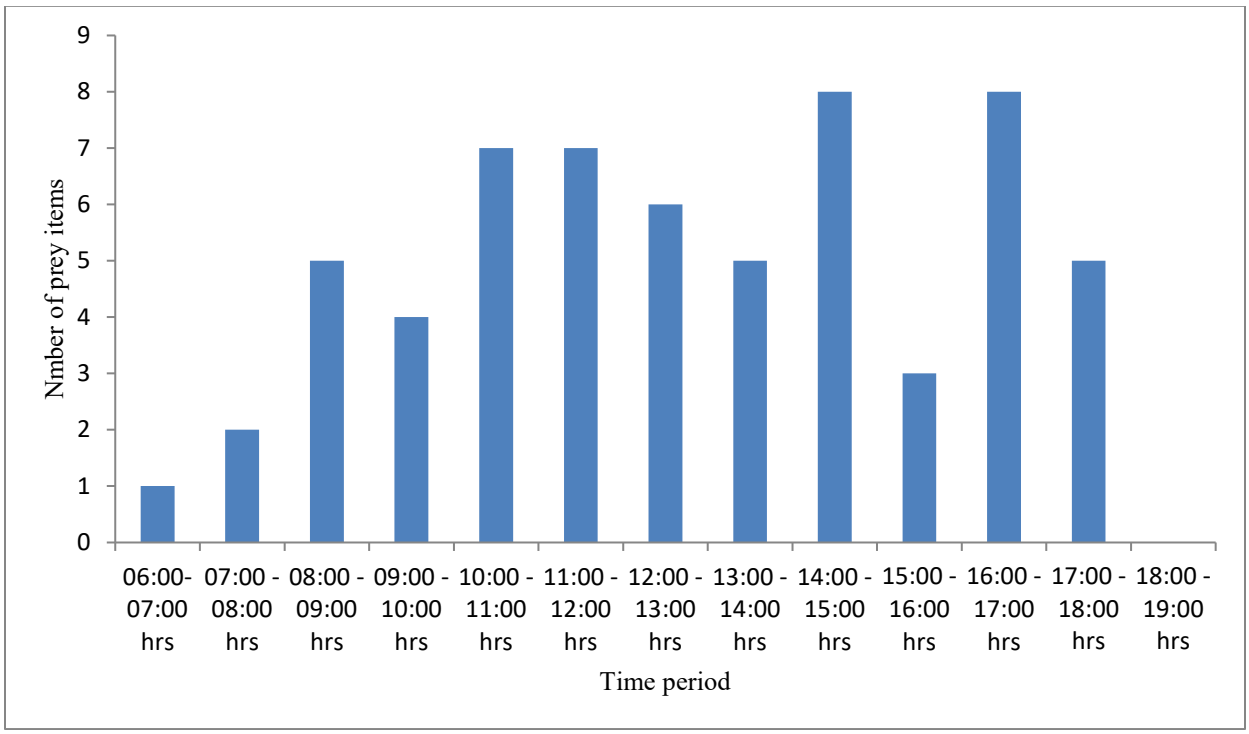

Fig 1: Number of prey items vs time period

Throughout the study period, we recorded Indian spotted eagle maintained their nest 18 times. Indian spotted eagles were found to maintain/repair their nest mostly in the

early morning compared to noon and evening (Fig 2). They mostly brought small branches with green leaves for a bedding purpose (Photo 3).

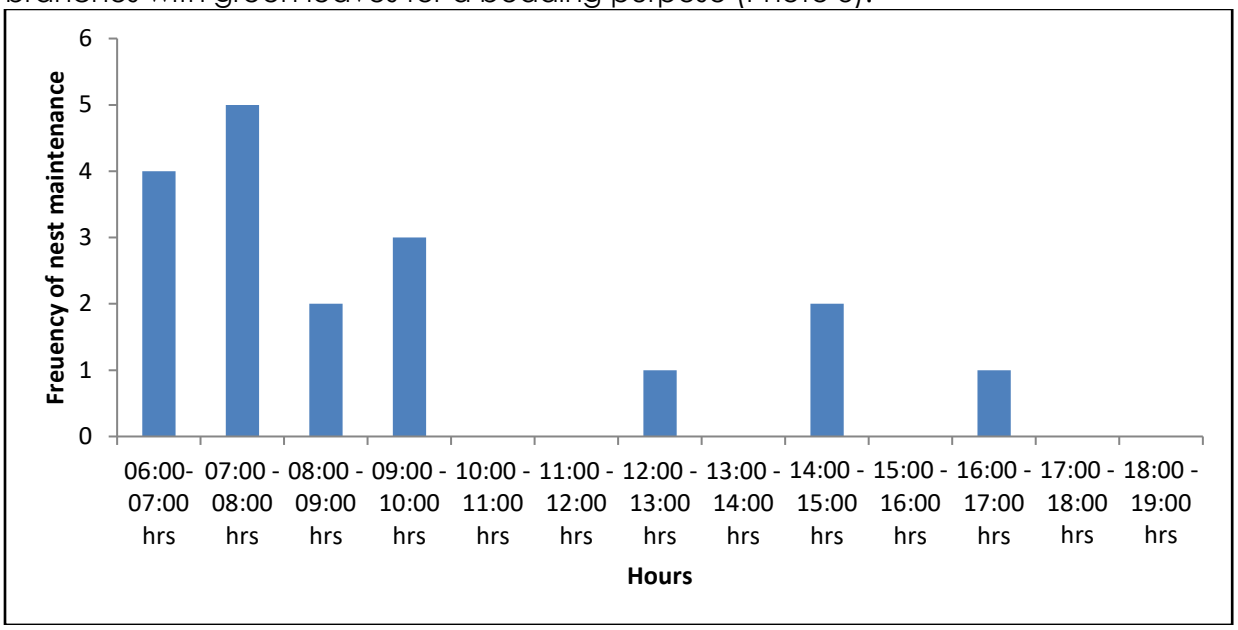

Fig 2: Frequency of nest maintenance Vs time period

Photo 2: Rappelling down after collecting the camera traps from the nest (left), Jumaring to reach the nest to collect the camera trap (right)

Photo 3: Red-wattled Lapwing (left) and Tiger Frog (right) recorded in the camera trap

Photo 3: Tiger Frog (left) and Asian House Shrew (right) as a diet of Indian Spotted Eagle

Photo 3: Fresh leaves of *Dalbergia sissau* placed in the nest for a bedding purpose

3. Evaluation of previously conducted farmer training programme

Involvement of local community as a stakeholder is a central feature of conserving and managing biodiversity globally. Active participation of local community for the conservation has been found to be advantageous and has resulted success of the biodiversity conservation project at different places (Reeds 2008, Brooks et al 2013, Sterling et al 2016). Active participation of local people can possibility increased diversity in decision-making bodies and may lead to higher quality decisions better adapted to the local social-cultural and environmental contexts, development of trust, feeling of ownership resulting successful implementation and reduction in the implementation cost (Richards et al., 2004, National Audubon Society, 2011). Community based conservation usually follow socio-economic incentives for

conservation and handing ownership of natural resources strategy to local community (Brooks et al 2012). Such programmes have succeeded in favourably changing individual and community behaviours eventually leading to success in the projects (Bajracharya et al., 2005, Cranford and Mourato, 2011). Thus, we conducted the 1-day farmer training programme within the breeding territories of Indian spotted eagle in 2018 – 2019 to discourage the use of pesticides and encourage organic farming. However, we could not evaluate the success of the programme.

In order to analyse the impact of programme conducted in 2019, we conducted the structured questionnaire survey with the previous participants. In each area (Koshi, Dhanusa and Lumbini), we made an approach to 20 farmers. We briefly explained that the aim of the programme was to understand impact of previously conducted programme. Among the 60 respondents, 80% were male and 73.91% were over 45 years old. Moreover, 51.7% were Madhesis, 21.7% were Aryan, 18.3% were Mongolian and 8.3% were Dalit respectively. 43.8% of farmers said that they have significantly decreased the amount of use of chemical fertilisers, 26.09% moderately decreased the amount, 4.35% did not know the amount of use of chemical fertilisers in their farm while 26.09% of farmers have increased the number of chemical fertilisers in their farmland. Out of 60, 28 respondents said that the number of chemical pesticides used in farmland has decreased moderately, 16 reported to have decreased significantly while 16 answered that the number of chemical pesticides in farmland has moderately increased (Fig 1).

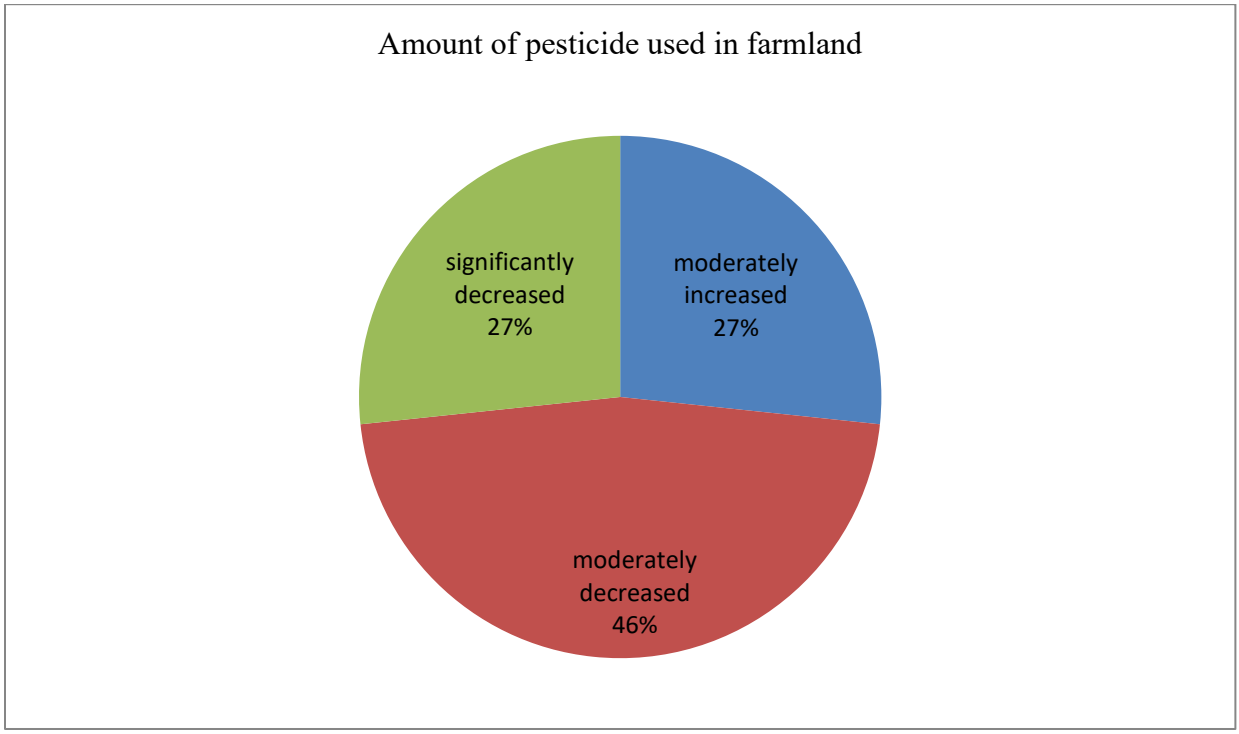

Fig 1: Number of pesticides used in the farmland by farmers after the training program

Surprisingly, it was found that the utilization of chemical pesticides in the vegetable garden has significantly decreased as per respondents (Fig 2).

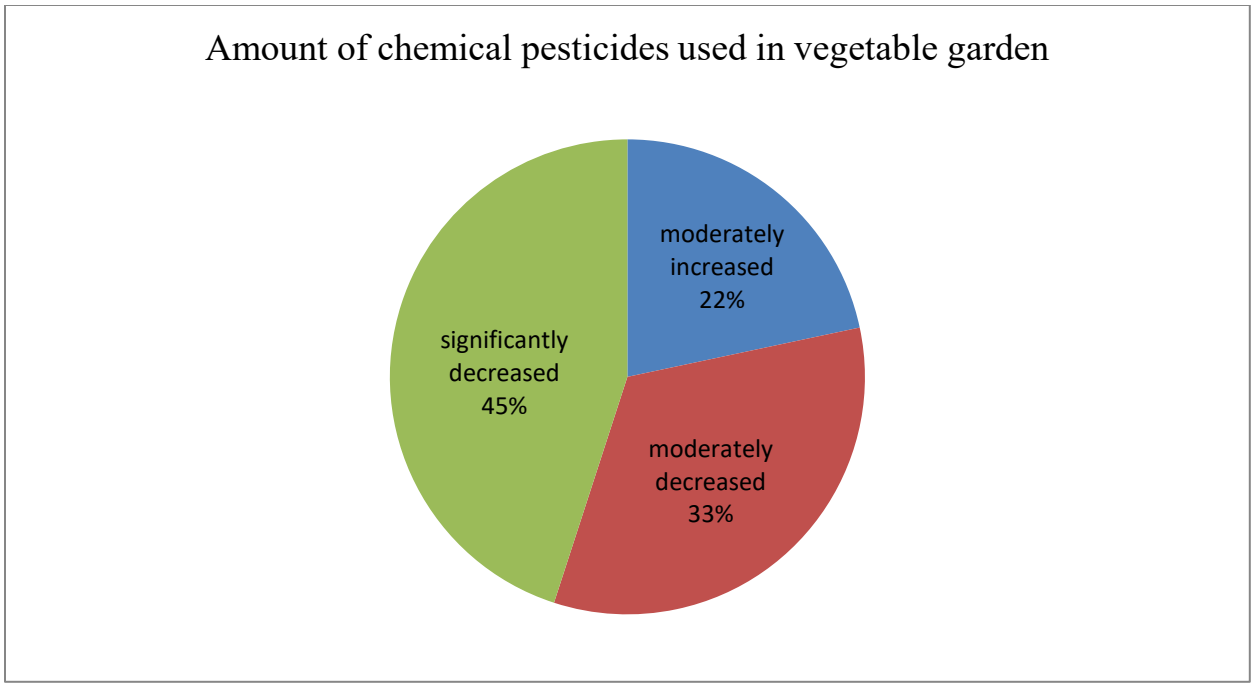

Fig 2: Chemical pesticides used in the vegetable garden as per respondents after the training program

The average chemical fertilisers applied in the farmland was found to be 1.43 ± 0.72 SD (0 – 3 Range) times in a year. The average amount of chemical fertilisers used in the farmland was 2.33 + 2.15 S. D (0 – 10 Range) kilogram in a year. This result when compared to prior farmer's training programme (3.1 times per year, 3 kg per 338.63 m^2) was found to be lower. Similarly, the average numbers of times the pesticides used in the farm was found to be 1.5 ± 0.68 times (0- 4 Range) and the average amount of pesticides used was 174.35 ± 222.46 (0 – 1000 ml Range)for each crop including pre and post harvesting time, which is less compared to the prior farmer's training programme (3.91 times for each crop) while one respondent did not have idea about the amount of pesticides used in their farmland (it is because they buy it in packet and do not have idea of its weight). In addition to this, 8.33% (five respondents) of the farmers did not use any pesticides. Questionnaire revealed that 60% (n=36) of farmers did not used chemical pesticides in their vegetable gardens. Out of 24 respondents, 75% of the farmers were found using the green labeled pesticides i.e., ecofriendly/least toxic pesticides, 12.50% used yellow labeled (more toxic than green), 8.33% blue labeled (more toxic than yellow) and 4.17% used highly toxic pesticides (red labeled). After the training programme, we found that 76.27% (n=59) wore a safety equipment while using a pesticide. We also asked the respondents to arrange the toxicity of chemical pesticides according to its color labeled in the pesticides packets (increasing orders), 20 respondents were able arrange the toxicity of the chemical pesticides based on its colour (increasing order i.e. green>yellow>blue>red), 40 respondents were able to differentiate the least and highly toxic chemical based on its colour (i.e. green-least, red-highly toxic) while 20 respondents could not arrange the chemical pesticides in proper orders. Thirty percent of respondents also use alternatives of pesticides such as yellow trap, mechanical trap and locally made ecofriendly pesticides using local

resources. Out of 60 respondents, 63.33% of the farmers (n=38) were able to prepare pesticides using a local resource.

We also monitored the farmlands and home of the participants during the study period. We found several protective gear (facemasks, gloves, sprayers, etc.) as well as several alternatives of chemical pesticides (yellow traps, homemade ecofriendly pesticides, etc.). Monitoring of the farmland was conducted in August – October 2020.

Photo 3: Questionnaire with the respondents to analyze the impact of farmer's training program

Photo 4: Questionnaire survey with the farmer's training participants (left), monitoring used to reduce the health hazard and the ecofriendly pesticides (right)

Photo 5: Yellow Sticky Trap used in the vegetable garden of the farmer's house (left) and yellow labeled pesticides used by the farmer's (right)