Title: Integrated community conservation of biodiversity in agro-ecosystems adjacent to the eastern side of Mount Kenya Forest.

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INTRODUCTION

One third of the world's land area is used for food production and agricultural-ecosystems can be found in almost every part of the world. As such, Agricultural ecosystems harbor a large portion of biodiversity. However, conservation of biodiversity in the world as prioritized other ecosystems such as forests relegating agro-ecosystems to the bottom. Nonetheless, it is widely known that agro-ecosystems plays a crucial role in biodiversity conservation since they offer food, shelter and are key stepping stones for migrating species thus linking fragmented landscapes. Therefore, there are huge benefits from conserving biodiversity thriving in agro-ecosystems.

In Kenya numerous biodiversity studies have been carried out in the forests, lakes and national parks but very few have been carried out within agro-ecosystems although it is an established fact that biodiversity plays a crucial role in agricultural production. Among the key biodiversity services for agriculture are pollination and seed dispersal. Pollination is especially crucial for leguminous plants whereas seed dispersal is important for regeneration of woodlands within agro-ecosystems. Thus conservation of agro-ecosystems biodiversity is extremely important. However, conservation of biodiversity in agro-ecosystem is impossible without involving all the stakeholders. Thus it is imperative to mobilize and build the capacity of local communities in order to achieve this goal. Ultimately this would have a wide spread impact such as on conservation of biodiversity on its own right, tourism, environmental conservation and rural livelihoods improvement.

Rationale

The agricultural landscapes adjacent to Eastern Mt. Kenya Forest have steep slopes, numerous river valleys and streams. Tea, coffee and food crops have been grown up to the riverbanks leading to clear-cutting of natural vegetation resulting in drying up of some streams, soil erosion and massive landslides (Fig. 1). The fate of aquatic life, insects, birds and other species whose natural habitats have been destroyed is unknown, yet some of these species are important pollinators and dispersers. This has also increased pressure on Mount Kenya forest for fuel-wood

and other forest resources. Tree planting even next to water sources is dominated by a single exotic tree-the Eucalyptus. Thus this project set out to establish the status of biodiversity using key indicators and to build community consciousness to conservation of biodiversity.

Objectives

The main objective of this project was to improve livelihoods by promoting community conservation of agro-biodiversity to restore ecosystem processes and functions.

Specific objectives

i. To document key indicator species in the region
ii. To educate the community about environmental conservation
iii. To carry out a survey on community bee keeping
iv. To initiate tree nurseries for tree planting purposes

Figure 1: Bare road sides, clear-cut woodlands and diminishing rivers

KEY ACTIVITIES UNDERTAKEN

Documentation of key indicator species

Conservation of biodiversity is normally easier if the species to be conserved and the role they play in an ecosystem is known. However, it has long been realized that there are certain key species the so called "indicator species" that if found in good numbers in an area then it can be inferred that that habitat is in a good state. Such species include pollinators and seed dispersal agents. Thus, we sampled bees, butterflies and birds to infer on the status of biodiversity in our project area. Vegetation surveys were carried out and common trees species were identified and classified according to abundance. Apart from coffee and tea, the dominant tree species in all the three habitats were *Grevillea robusta* and *Eucalyptus* sp. From the results the project area was grouped into three sites depending on the dominant vegetation and altitude. Description of the three sites is as follows;

1. Tea dominated – this lies next to Mt Kenya Forest boundary and the main cash crops here is tea. Common trees starting with most abundant include; *Grevillea robusta, Eucalyptus* sp., banana species, *Mangifera indica, Vitex keniensis* and wattle trees (Fig. 2).

2. Tea and coffee dominated- this lies between the tea and coffee zone and as the name suggests tea and coffee co-dominate. Common trees starting with most abundant include; *Grevillea robusta*, banana species, *Eucalyptus* sp., *Cordia africana*, avocado species, *Bridelia micrantha*, *Harungana madagascarensis*, macadamia species, and *Guajva japonicum* (Fig 2).

3. Coffee dominated – this is the lowest point and lies furthest from the forest edge and is dominated by coffee as a cash crop. Some of the common trees starting with most abundant include*; Grevillea robusta, mangifera indica, Sapium allipticum, Eucalyptus* sp., *Guajava japonicum*, *Spathodea campanulata, Prunus africana* and *Cordia africana* (Figure 2).

Figure 2: sites 1, 2 and 3 respectively

Pollinators

Sampling Pollinators

To establish species present and abundance in the project area transect counts were adopted and sweep nets were use to capture bee and butterfly species in the three different habitats. Transects measured 1km in length and bees were captured 2 meters on either side of the transect using sweep nets. Species were identified in the field and released, however, those hard to identify were collected in killing jars for later identification by bee taxonomists. Flowering plants that pollinators were foraging on were noted and this comprised notes for community training on bee-keeping. Sites site 1 and 3 harbored only honey bees (*Apis mellifera*) and in low numbers, whereas site 2 had the highest number of species and density. In site 2 we captured honey bees, carpenter bees and solitary bees. The same trend was established for butterflies with site 2 harboring the following genera; *Junonia*, *Bicyclus* and *Acraea*, whereas only genus *Junonia* was found in site 1 and genus *Acraea* in site 3. Apart from *Apis mellifera* all the other species of bees and butterflies are currently undergoing identification to establish the species. No stingless bees were found during sampling; however, incidences of stingless bees being found by traditional beekeepers from the region before were reported. The decimation of large trees from the area could have lead to the loss of stingless bees. Nevertheless, more sampling effort is required before drawing any conclusions.

Figure 3: Trainees sampling pollinators and examples of food sources for pollinators

Birds

Just like for the pollinators, birds too were counted on the same transects using a pair of 10x50 binoculars. Birds were counted 30metres on either side of the transect. Later the area sampled was calculated and converted to hectares and the findings are hereby reported as birds per hectare (Fig. 4). The highest species were found in site 2 (appendix 1) which harbored both tea and coffee, this area is an intermediate between the two other sites and has a higher occurrence of plant species than the other two sites and this is the main reason for the higher density. Nevertheless, larger birds such as birds of prey that were common in the region in the past were not found. Some of the key birds that were common in the area from anecdotal reports and are now missing include the long crested eagle *Lophaetus occipitalis* and the Crowned eagle *Stephanoaetus coronatus*. Other birds that were missing and were common before include Hartlaub's turaco *Turaco hartlaubii*.

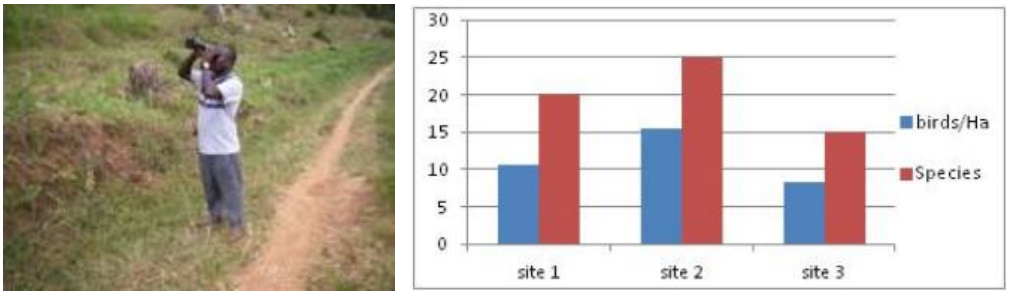

Figure 4: Sampling birds and a graph of bird species and density recorded in the three sites

Community Education

Community education took a rather unique way with a lot of training taking place at household level. We visited 120 families and took each family through a discussion centered on why the environment is changing and why human beings are the cause of the changes we are experiencing. We also took a tour of each household's farm and advised them on where to plant

Figure 5: A community Training in progress

-trees, which tree species to plant and what activities they were engaged on that could be a threat to the environment such as planting of eucalyptus trees next to water sources.

Training for larger groups was done during events such as tree planting and also at the nursery level. At the nursery level community members were trained on proper nursery management, tree species selection and the reasons why indigenous tree species are better that the exotic ones. During tree planting events the members were trained on when to plant trees the right depth for planting and how to ensure polythene tubes are removed for recycling purposes.

Community bee keeping

Conservation of biodiversity is successful if the communities realize economic benefits from the same. Thus it was imperative to introduce bee keeping as a way of ensuring community benefits from their conservation efforts. However, before the introduction we set out to know the proportion of people already carrying out bee farming and the form of bee keeping they were practicing. We also sort to know from those who were not currently farming bees what was the limiting factors. We did this through semi-structured interviews (see appendix for the array of questions guiding the interview).

From interviews carried out from 90 families visited, it is clear that beekeeping is restricted to the older generation of men (45 years and above) and is on an inheritance basis. There is also deep understanding of bees by those who keep them and very little knowledge from those who do not. All the beekeepers rear bees in the traditional log hive and each owned from one hive to a maximum of 46 hives. This was indeed one reason for the increased loss of trees. Trees that were mainly targeted for making the log hives included; *cordia africana*, *prunus africana and vitex keniensis*, all high value indigenous species. In fact this has highly decimated the population of *Cordia africana* which seems to be the best tree for all bee keepers in this region. To counter this and reduce the toll on indigenous tree species we have introduced hybrid beehives that use plastic soda or bread carrying crates/boxes. Wood is only used to make the top bars and plywood to line the inside of the hive, therefore, an indigenous tree does not need to be cut. Use of log hives also means that harvesting of honey is not well managed since there is no clear separation

of the honeycombs from the brood combs. Thus the introduction of modern bee hives in the area will ultimately solve this problem since modern bee hives are easier to manage and harvest

From a total of 160 people interviewed during family visits half were interested in beekeeping, a quarter wanted to wait first and see how it works out, while the last quarter were not interested at all (some especially women cited restrictive traditions while others phobia for bees). The former was clear from the interviews since majority of women (30 out of 40) interviewed said that they were not allowed to rear bees due to outdated traditions. However, many women interviewed were willing to venture into beekeeping using the modern bee hives since the traditions are slowly easing off.

Figure 6: Hands on training on hive construction and best sites to place the hive

We later set up an apiary with three modern hives for training purposes. The topics included how to construct a bee hive, how to treat it so that bees will find it attractive, where to set it, best plants for bees, when and how to harvest honey. Currently we have four more hives to be added to the apiary once bees are captured. We established that swarming of bees in this region takes place from August to February and this is the time when newly constructed hives such as the ones below (Fig. 7) will be strategically placed to capture bees for placing in the apiary later.

Figure 7: Hive in apiary, comb of honey harvested and new hives waiting to be hang on trees

Tree planting

Tree Nurseries

Two tree nurseries were established with a total of 5000 seedlings. All the trees in the nurseries were indigenous species. Community members used to visit the nurseries whenever they were free and the nursery attendants who had been trained on all aspects of this project including nursery management were there to guide them.

Figure 8: Seedlings in nursery ready for transplanting

Actual Tree Planting

The rains came towards the end of March, and in April 2009 the soils were well soaked. We therefore mobilized members of Weru Self-help Group to plant trees along one of the main road reserves traversing the villages. We ensured that all trees planted were one foot and above in order to ensure maximum survival. In addition the owners of the land bordering the road where the trees were being planted were given the mandate to ensure that the trees survive since eventually it is they who would benefit directly from the trees.

Figure 9: Community members selecting and transplanting seedlings to planting sites

Before planting, members were introduced to the procedure followed on how to plant trees, a topic which I personally delivered. I also demonstrated on how seedlings could be removed from potting bags for recycling in future.

Figure 10: Project leader demonstrating how best to plant trees

Figure 11: After the demo community members joined in planting trees

During planting it was essential to water the young seedlings to ensure that all had a high chance of survival

Figure 12: Community members watering young seedlings

A total of 3200 trees were planted on a 5km stretch of the road. Some of the main trees planted included *Markhamia lutea*, *Cordia africana*, *Harungana madagascarensis*, *Prunus africana*, *Croton macrostachyus*, *Milletia dura*, *Bridelia micrantha*, *Ehretia cymosa* and *Sapium ellipticum*. The above trees are extremely important since all are indigenous and the majority bears flowers pollinated by bees. In addition, their fruits are fed on by a diverse array of animals including birds and mammals. These trees also offer good firewood and timber. Members were later encouraged to each plant at least 10 trees in their private farms. About 1000 immature

seedlings were left in the nursery and these will be planted once they reach the right height. Plans are also underway to increase the number of seedlings in the nurseries for future planting.

Weru self-help group revived

March 2009 marked a milestone for this project since the defunct Weru Self-help Group, which was very active in the area in the early 1990s, was revived. This revival was seen as the best option as compared to forming a new outfit since the older generation that we held discussions with were comfortable associating themselves with the organizations it also meant that conservation matters would move faster. This is the group which will take over this project and steer it to the next level. We have registered 117 members and put in place and interim officers (Chairperson, Secretary and Treasurer) pending elections.

OUTCOMES

Through this project we have come up with the baseline data on key biodiversity indicators in an agro-ecosystem adjacent to a world heritage site (Mt Kenya Forest). This data is important for future comparisons. We have also shown that the community is willing to engage into conservation of their environment once they understand the benefits of a good environment and the consequences of not conserving the environment. We have also shown that traditional beekeepers have immense knowledge on bees which is normally inherited. In addition we have shown that tree planting is a noble task and the community in the project area has fully grasped the relation between trees and the weather and ultimately their livelihoods. If the momentum is maintained all the above will contribute to restoration of the environment and better livelihoods in the region.

CHALLENGES AND LESSONS LEARNT

During planning of this project the ambitions were so high and the target was to sample as many of the biota as possible which we later had to trim down partly due to the cost that could be incurred, the expertise required and the time required especially for the project leader to coordinate. However, the coordination bit was easier later after training four community members one who doubled up as a research assistant and the rest as volunteers.

During the wet season some of the areas were inaccessible by car and one had to trek several kilometers to reach the sampling points. It is also worth noting that growing of indigenous trees from seeds for planting is not possible in projects running for only one year since they need over one year in the nursery to reach the right stage for transplanting a factor that was not obvious during proposal writing. However, a few indigenous species especially the so called “pioneer species” can be ready for transplanting in one year.

CONCLUSION

In spite of the challenges outlined above this project was able to achieve all the objectives set. However, much of the conservation from the community members depends on the sustainability

of tempo currently set. In order to maintain this tempo it is necessary that the community realize direct and tangible benefits from their efforts in conserving the environment that is why the introduction of bee-keeping should be up-scaled from the training to actual beekeeping. One way of doing this is co-financing as opposed to giving them a full hive one could order hives and sell them at a reduced price. This will ensure the members take good care of the hives and only those who are really interested in beekeeping benefit.

FUTURE PLANS

For continued conservation of environment in this region it is prudent to upscale the effort so as to impact on a wider area. Beekeeping offers one way of convincing the community that conservation of the environment is important due to the quick turnover. Thus we have plans to supply hives to those interested at subsidized prices which can be done through co-financing. We plan also to continue planting trees and train the community on climate change adaptation and mitigation. One way of doing this is by building capacity especially as regards to diversifying crops so that the community shifts to growing drought resistant crops (Especially perennial ones). Other ways of climate adaptation strategies that the community badly need is on the realms of water harvesting and conservation once this is done then the community can use this water not only for domestic consumption but also for irrigation especially during the dry seasons or when the rains are not enough as is the case these days. To cater for those members with a phobia for honey bee, we are constantly searching for a stingless bee species that could be domesticated. There is need also to carryout research on stingless bees found in other regions with a view to domesticating for honey production. There is a need to also establish a market chain for honey produced since this is currently unheard of in the region.

ACKNOWLEDGEMENTS

This project would not have been successful without inputs from the following; Dr. Namu for her effort in sampling pollinators and identifying them, Mr Mugendi and Mr Gitonga for tirelessly assisting in the field, attending to the nursery and teaching the community, Mr. Murungi and Mr. Kaburu for availing land to set up the nurseries and many more who assisted in one way or the other. We are also indebted to the community members who participated in tree planting free of

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FINANCIAL REPORT

Item	Quantity	Unit cost	Total (£)
Research materials and supplies			
Global positioning system (GPS), hire days	10	1.6	16
Binocular	1	64	64
Sweep nets	2	8	16
Hand magnifying glass	1	3	3
Entomological forceps	2	1.6	3.2
Insect envelopes, packets	4	4	16
Killing jar	2	1.6	3.2
Plastic specimen tubes, a box	1	21	21
Alcohol	1	16	16
Insect storage boxes	2	9.6	19.2
Insect pins, packets	3	4	12
Miscellaneous (Phone calls, email, notebooks, pens, flashlights etc)	1	160	160
Personnel expenses			
Field assistance, person days	220	3	660
Travel and living expenses			
Automobile hire once in field, days	45	32	1440
Fuel cost	1	1152	1152
Transport from Nairobi to field and back	15	12	180
Living expenses			
P1 subsistence, days	20	20	400
Lodging costs in the field	45	9.6	432
Beekeeping			0
Hives construction	7	20	140
Tree Nurseries			
Polythene tubes (5000 pieces)	1	32	32
Supporting poles, Nails etc	1	40	40
Watering cans	2	6	12
Labor	1	120	120
Seeds	1	16	16
Grand Total			**4973.6**

APPENDIXES

Appendix 1: Bird species recorded in the three sites

Site 1 (Tea dominated and closest to the forest)

Common name	**Species name**
African Citril	*Serinus citrinelloides*
African Paradise Flycatcher	*Terpsiphone viridis*
Baglafecht weaver	*Ploceus baglafecht*
Black saw-wing	*Psalidoprocne a. Albiceps*
Black-and-white Mannikin	*Lonchura bicolor*
Bronze Sunbird	*Nectarinia k. Kilimensis*
Collared Sunbird	*Anthreptes collaris garguensis*
Common Bulbul	*Pycnonotus barbatus*
Grey-backed camaroptera	*Camaroptera brachyura*
Grey-headed sparrow	*Passer griseus*
Montane White-eye	*Zosterops poliogaster*
Pin-Tailed Whydah	*Vidua macroura*
Red-Billed Firefinch	*Lagonosticta rufopicta*
Red-Chested Cuckoo	*Cuculus s. Solitarius*
Red-Eyed Dove	*Streptopelia semitorquata*
Speckled Mousebird	*Colius striatus kikuyuensis*
Streaky seedeater	*Serinus s. Striolatus*
Tawny-Flanked Prinia	*Prinia subflava melanorhyncha*
White-Eyed Slaty Flycatcher	*Melaenornis fischeri*
Yellow-rumped tinkerbird	*Pogoniulus bilineatus*

Site 2 (Both tea and coffee dominated)

Common name	**Species name**
African Citril	*Serinus citrinelloides*
African Dusky Flycatcher	*Bradormis adusta interposita*
African Paradise Flycatcher	*Terpsiphone viridis*
Amethyst Sunbird	*Nectarinia amethystina kalckreuthi*
Baglafecht weaver	*Ploceus baglafecht*
Black-and-white Mannikin	*Lonchura bicolor*
Bronze Sunbird	*Nectarinia k. Kilimensis*
Collared Sunbird	*Anthreptes collaris garguensis*
Common Bulbul	*Pycnonotus barbatus*
Common Drongo	*Dicrurus a. Adsimilis*
Grey-backed camaroptera	*Camaroptera brachyura*
Montane White-eye	*Zosterops poliogaster*
Olive Thrush	*Turdus olivaceus abyssinicus*
Red-Billed Firefinch	*Lagonosticta rufopicta*
Ruppel's Robin-Chat	*Cossypha semirufa intercedens*
Speckled Mousebird	*Colius striatus kikuyuensis*
Streaky seedeater	*Serinus s. Striolatus*
Tawny-Flanked Prinia	*Prinia subflava melanorhyncha*
Variable Sunbird	*Nectarinia venusta*
White-Eyed Slaty Flycatcher	*Melaenornis fischeri*
White-Bellied Tit	*Parus albiventris*
African Pied Wagtail	*Motacilla aguimp vidua*
Cinnamon-Chested Bee-Eater	*Merops aerobates*
Common Waxbill	*Estrilda astrild*

African Goshawk	*Accipter tachiro sparsimfasciatus*

Site 3 (Coffee dominated)

Common name	**Species name**
Baglafecht weaver	*Ploceus baglafecht*
Black-and-white Mannikin	*Lonchura bicolor*
Common Bulbul	*Pycnonotus barbatus*
Grey-backed camaroptera	*Camaroptera brachyura*
Red-Eyed Dove	*Streptopelia semitorquata*
Speckled Mousebird	*Colius striatus kikuyuensis*
Streaky seedeater	*Serinus s. Striolatus*
Tawny-Flanked Prinia	*Prinia subflava melanorhyncha*
White-Eyed Slaty Flycatcher	*Melaenornis fischeri*
Common Drongo	*Dicrurus a. Adsimilis*
Olive Thrush	*Turdus olivaceus abyssinicus*
Common Waxbill	*Estrilda astrild*
Hamerkop	*Scopus u. Umbretta*
Variable Sunbird	*Nectarinia venusta*
Silvery-Cheeked Hornbill	*Bycanistes brevis*

Appendix 2: Bee keeping questionnaire

Questionnaire on beekeeping practices among the Meru people of Abogeta Division, Meru District, and factors that affect bee keepers that may influence conservation of biodiversity in agro- ecosystems adjacent to the eastern side of Mount Kenya forest.

Bee keeper data

1. Location……
2. Name of Interviewer……Date:…….
3. Name of farmer (owner of the hives)……...……
4. Gender: Male [ ] Female [ ]……...
5. Age (years): ……..……
6. Marital status: Married [ ] Single [ ]…….…….
7. Level of education (Please tick which applicable)

i. Below standard 4 [ ]
ii. O-level [ ] A-level [ ]
iii. Tertiary [ ]
iv. Other

Bee keeping industry

1. Do you keep bees? Yes [ ] No [ ]

If yes, which ones?

2. How many hives?
3. What type of hives do you use?

i.Traditional log type [ ]

ii. Kenya Top Bar Hive [ ]

iii. Langstroth [ ]

iv. All [ ]

4. Where do you keep the hives?

i. Own land/ private

ii. Lease

iii. Government land

iv. Given free by neighbours

5. Bee behaviour

i. Are there migrations? Seasonal? Yes [ ] No [ ]

If yes, do they know the reason?

ii. Is there absconding (Bees suddenly leave the hive. They leave the brood behind too. Yes [ ] No [ ]

If yes, do they know the reason?

6. Management of bee colonies

i. Do you manage your bee colonies? Yes [ ] No [ ]

ii. Do you do anything to the hive before the bees enters? Yes [ ] No [ ]

If yes list……

iii. Once the bee enters the hive do you do anything else Yes [ ] No [ ]

If yes list……...

iv. How many times do you visit your hive before you harvest honey…….

7. How many years have you been keeping bees?

8. Bee keepers' knowledge about bees

i. Which type of bees do you keep? (they describe the bees they keep)

ii. Do you know the role of bees in a colony? (do they know there are workers, drones and queen and what they do in the hive?)

iii. Do you know other bees apart from the one you keep?

Yes [ ] No [ ]

If yes list.

If No, interviewer explain about stingless bees and solitary bees

9. Where do you get information from about bee keeping (tick all applicable)
    i. Agricultural extension services [ ]
    ii. Farmer field schools [ ]
    iii. Farmer groups [ ]
    iv. Farmer cooperatives [ ]
    v. Non-governmental organizations (NGOs) [ ]
    vi. Community based organizations [ ]
    vii. Provincial administration [ ]
    viii. Other

10. Harvesting and processing procedures
    i. When do you harvest honey?
    ii. How do you know the right time to harvest honey?
    iii. How do you do the harvesting? At what time do you do honey harvesting?
    iv. Which equipment do they use in harvesting honey?
    v. How do you process the honey after harvesting?
    vi. How do you store and package honey?

11. Which other bee products do you produce?
    i. Wax
    ii. Propolis
    iii. Royal jelly

12. How do you sell the bee products (tick all applicable)
    i. Farm gate selling
    ii. To the nearby market center
    iii. Regional market center

iv. Other regional centers

v. National market center

13. What constraints do you face when selling bee products?

14. Record Routine task in Bee Keeping

Bee keeping and conservation in agro-ecosystems

1. Do you know what the bees use to make honey?

Yes [ ] No [ ]

If yes, list

Do you know where the bees get it from? In other words: Do you know plants on which bee keeping depends? List if yes

2. Do you know whether bees have other importance apart from making honey?

Yes [ ] No [ ]

If yes, list please:

3. Do you know where the bees live naturally, before you rear them in the hives?

Yes [ ] No [ ]

4. Do you know where we can find these natural homes for bees?

Yes [ ] No [ ]

If yes, list

5. Do you think these natural bee homes have remained the same over the past years and if they will remain the same in future?

Yes [ ] No [ ]

Why?

6. Do you know whether the bees require water?

Yes [ ] No [ ]

If yes, where do they get if from?

7. Is your land neighbored by a river/stream?

Yes [ ] No [ ]

If yes, has there been any decline in water volumes?

Do you know why?

8. What is the color of the water? Clear [ ] Muddy [ ]

Do you know why the color is like that?

9. What kind of farming do you practice? Commercial [ ] semi-commercial [ ]

Subsistence [ ]

10. Do you leave some parts of your land uncultivated/ furrow?

Yes [ ] No [ ]

If yes, for how long?

11. How many non food crop trees do you have in your farm?

12. What do you use them for?

13. What kind of fencing do you use around your field/homestead? Live

i. Dead fence
ii. Wire
iii. Live
iv. Other

14. If live, what are the plant species in its composition? List:

15. What are the reasons for the species maintained on the fence?

i. Medicinal
ii. Animal fodder
iii. Intertwining, hence good fence
iv. Spines, hence security
v. Other reasons

16. How do you manage the fence?

i. Trimming

ii. Watering
iii. No management
iv. Other

17. Do the plant species (in the fence composition) flower? Yes [ ] No [ ]
18. Is your live fence around whole farm? Yes [ ] No [ ]
19. Does it merge with neighbors' fence? Yes [ ] No [ ]
20. Do you harvest fuel wood from the fence? Yes [ ] No [ ]
21. What do you think you could do to conserve bees?
20. Bee keepers' knowledge about biology of local bees
    i. Plant on which bee keeping depends
    ii. Bee colony management practices/approach adopted for apiary management
    iii. Honey harvesting and processing procedures followed

Problems faced in bee keeping in Abogeta

22. Generally what problems do you face during bee keeping? (Interviewer discusses with the farmers on all the problems they face in bee keeping and list them down