Project Update: February 2008

1. PROJECT BACKGROUND AND OBJECTIVES

About 70 percent of Tanzanians, Morogoro region included, live in rural areas and depend on subsistence agriculture; approximately 39% of them live below poverty line (URT, 2006). Morogoro region covers the forests of Uluguru Mountains, which form a part of Eastern Arc Mountains (biodiversity hotspot) and are famous for their high species diversity and endemism. The Uluguru Mountains are ranked sixth in mainland Africa for their vertebrates (Burgess et al, 1998). The Mountains have outstandingly various forests and landscapes forms that provide numerous habitats for primates. The forests are in five patches, with 65% of their original forest cover lost due to seasonal fire, agriculture and logging, charcoal making and human settlements (Lulandala, 1998).

Forests fragmentation has negative impacts on wildlife, for example most primates like monkeys cannot cross the gap between forests, without passing in human residents or agricultural fields. Albeit, monkeys are forest specialists, which are less tolerant to disturbed forests (Burgess et al, 1998; Newmark, 1998). Monkeys in western slopes of lower Uluguru Mountains are confined in small shrub patches with exotic tree species, and those, which are luck to be in closed forest reserves are blocked in there.

Monkeys found in Uluguru Mountains forests are *Galago crassicaudatus crassicaudatus* (Greater Galago), *G. zanzibaricuson* (Uluguru Bushbaby), in the IUCN red list, *Cercopithecus mitis kibonotensis* (Blue Monkey) and (*polycomo*s) *angolensis palliates* (Black and White Colobus). Unfortunately, Monkeys especially blue monkeys are been harassed and killed by using wire snares, poison bait and man traps, because they are regarded as pests/vermin. Local extinction of monkeys is likely unless such actions and attitude are dealt accordingly.

The aim of the first phase of this project was to develop a monkeys management techniques to reduce human-monkeys conflict on farm-forests crossing point, and improve animal welfare through encouraging use of ecological integrated monkeys control techniques instead of lethal ones that were and are commonly used. Specific objectives were (i) Participatory assessment of the effectiveness of existing traditional crop protection techniques (ii) Develops on farm ecological friendly techniques for monkeys' control against crop damage (iii) Organise training workshops to local farmers to demonstrate improved crop protection techniques.

2. METHODS

Location

This study was carried out on the Uluguru Mountains in four pilot villages namely; Bagiro, Tandai, Magadu and Kilakala. Uluguru Mountains are located in Morogoro region, the mountains are about 46km long and rise out of the coastal plain at approximately 300m above sea level to a peak of 2638m (Bhatia and Ringia, 1996). The Mountains are at 07°00' South and 37°40' east (Lovett and Wasser, 1993). On the main Uluguru range, 50 villages touch the forest boundary and over 151,000 people are found within the mountain area.

The climate of the Ulugurus is very much influenced by the Indian Ocean from where wind laden with moisture arrives on the eastern slopes. In general, these slopes receive 2000-4000mm per year, with a decrease from East to West. The amount of rainfall increases and becomes more predictable with altitude (Lovett *et al.,* 1995). Rainfall is bimodal with dry season between May to late October, a short rainy season between October to the end of December and a long rainy season between March and May. Temperature also changes with altitude, ranging from below 0^{o}C to 26°C at the higher and lower altitudes, respectively. In Morogoro town the average air temperature is 24°C with the coolest month being July (21°C) and the warmest being December with 26°C (Masawe, 1992).

The vegetation of the Uluguru main ridge and the outlying blocks is extremely variable. It ranges from dry lowland coastal forest habitats, to transitional rainforests, to sub-montane, montane and upper montane forest types. It also includes an area of afromontane grasslands on the Lukwangule plateau. All these habitats are rich in endemic species and are all of high conservation priority. The forests of the main ridge are quite well known biologically, although each new survey continues to find additional species. The outlying blocks are poorly known, with some having almost no biological investigation.

The Ulugurus have very high species richness like other Eastern Arc Mountains and their share of endemic species include; six globally threatened birds including the Uluguru Bush Shrike, two globally near- threatened birds including Love ridge's Sunbird and six other forest birds of extremely restricted range (Bhatia and Ringia, 1996). Two shrew species, three mammal species all in 1994 IUCN Red list of threatened animals (Lyamuya *et al.,* 1994). Of the 22 reptile species known to occur in the Ulugurus, six species are endemic. Levels of endemism are also high in plants (Lyamuya *et al.,* 1994).

The farming system in the surrounding villages is a peasantry, producing crops for food and sale. Main crops are banana, maize, cassava, rice, cocoyam, oranges and pineapples, Farming methods commonly practised are mixed cropping, as well as intercropping. Mixed cropping and intercropping are preferred as they save time, and more efficient land utilization. Intercropping also helps in reducing heavy runoff caused by heavy rainfall and the steep slopes (Hymas, 2000). More agricultural land is required every year, because of continued population growth since the Luguru people arrived in the area about 200 years ago. Population density on the slopes of the Uluguru is as high as 150persons/km2, with over 3.0 rate of a population increasing. The high density is mostly a result of favourable microclimate of the mountains, which favours agriculture, since relative low temperatures, reduced water loss, and lack of pronounced dry season, lower the risks of crop failure.

Project design

The project is being designed for two phases, including one-year extended periods of conservation initiatives. The first phase of this project has been completed and concentrated on:

- Participatory assessment and establishing the existing situation
- Developing, implementing, and monitoring prevention techniques, and collection of mitigation data.
- Conducting workshops and disseminating outcomes to farmers.

The first fieldworks of the project have involved introducing the project in organised village meeting, interviews with farmers to acquire background information as well as systematic observations of farm-based and forest-edge activities to assess patterns of crop-raiding across farms, and the effectiveness of farmers-initiated mitigation techniques (traditional).

Experimental treatments designs, establishment and management

Participatory and demand focused experiments that were researcher-farmers designed and farmers-managed were set on 2nd to 6th of March 2007. Four techniques were developed and tried:

1st technique: Use of dogs to control monkeys

20 Experimental Pilot Farms (EPF) and 20 Experimental Control Farms (ECF) were selected. The EPF and ECF farms had relatively similar characteristics in terms of location from the forests, vegetation cover, farming system and crop grown. Dogs were used to guard farms of defined shapes and size. One dog was assumed able to detect monkeys in an area of about 50m ^{2}. On the first day, a team of farmers using dogs drove monkeys away from their farms into the forests and thereafter tied dogs on forest- farm interfaces. Expectation was that dogs would bark to monkeys crossing the border to the farms and alert the farmers, whom in turn release dogs and scare the monkeys back to the forests.

Farmers recorded the incidences of monkeys trying to cross the farm-forests border or raiding crops. In case of crop raiding farmers would record the nature of crop destruction and crop variety. Farmers were advised to record other wild animals raiding crops in similar way to monkeys. Regular and informally, short discussions with farmers during visits to farms and villages, and after harvest workshops, provided opportunities to monitor activities and acquire feedback. Data collection was done from morning (7.00hours) to evening (18.30 hours) all days of the week as the traditional guarding of farm against monkeys were normally done. Trained field assistants monitored ECF and recorded the crop raiding incidences by wildlife species to avoid farmers' biasness.

2nd Technique: Use of wire nets

Five farms of bananas and five pineapple gardens were selected to study the effectiveness of wire nets in monkey control. Generally, farmers reported that monkeys feed on ripe banana fruits or tender young ones whereas in pineapple gardens, monkeys normally eat mature ripe pineapple. Hence, we decided to enclose young and mature bananas and mature pineapples with wire nets. Farmers monitored the monkeys' behaviour in those farms.

3rd Technique: Use of non-attractive crops as buffer zone

Most farmers in Uluguru own small piece of land (an average of 0.5 to 1.0 hectare). The land is privately owned, and each household produce independently. The land tenure system therefore does not support creation of buffer zone with non-attractive crops. Consequently, it was suggested to test this technique at SUA horticulture unit which has the citrus fruits. Maize and beans were planted in a manner of taking advantage of the horticulture garden as the buffer zone.

4th Technique: Demarcating monkeys' forests corridor and use of non-attractive crops and dogs

Ten farms were selected in Kididimo-Magadu; the farms were separated by one strip of stunted forest. The forest was about 8km long and 100m width connecting forest patches. That forest strip acted as a corridor for monkeys to migrate between forest patches. Along the forest strip borders dogs were set to guard crops as design in technique one above. Farmers recorded the trends of crop raiding incidences.

Collected data were coded and analysed. The results were shared during mid and post experimental workshop.

3. PRELIMINARY RESULTS AND DISCUSSION

Use of dogs to control monkeys

The sum of twenty-eight (28) monthly mean incidences, of monkeys trying to cross the forest-farm interface were recorded, among which three (3) incidences monkeys succeeded to raid crops. However, a total of 218 crop raiding incidences involving 9 wildlife species were observed over 10 months in 20 EPF. Table 1 summaries observed crop-raiding incidences for the first month (March) of the experiment in the four sampled villages. Magadu village which has high level of forest degradation has high number (8) of crop raiding incidences, followed by Kilakala (6), Tandai (5) and Bagiro (2). Table 2 summarises the mean observed crop-raiding incidences by month for group of wild animals in EPF.

Table 1: Observed crop-raiding incidences in March 2007

Village	Observed crop-raiding incidences: March 2007				
	1st Week	2nd Week	3rd Week	4th Week	Total
Tandai	1	2	1	1	5
Bagiro		1	1		2
Magadu	2	2	1	3	8
Kilakala	1	2	2	1	6
Total	4	7	5	5	21

Table 2: The mean of observed crop-raiding incidences by wild animals and month in EPF

Species	Mean observed crop-raiding incidences: March to December 2007										
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monkeys	5	2	3	3	1	4	2	4	3	1	28
Birds	4	6	8	7	19	13	5	3	4	3	72
Baboon	1	1	2	3	4	2	3	1	2		19
Wild rats	4	5	20	17	9	5	7	11	1	6	85
Bush pigs	2*				1*						3
Dik dik	1				1					2	4
Cane rat					1		1				2
Mongoos					1	1					2
Squirrel							1	2			3
Total	17	14	33	30	37	25	19	21	10	12	218

* Crop raiding was done tonight

Contrary, to EPF in ECF monkeys involved in 141 crop raiding incidences out of 423 total crop raiding incidences involving 9 groups of wild animals per ten months.

Table 3 summarises the mean observed crop-raiding incidence by month for each group of wild animals in ECF.

Table 3: The mean of observed crop-raiding incidences by monkeys and other wild animals

Species	Mean observed crop-raiding incidence: March to December 2007										
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monkeys	24	17	11	15	9	21	11	20	9	4	141
Birds	5	8	10	9	23	16	6	4	5	3	89
Baboon	4	7	5	12	15	13	12	6	8	7	89
Wild rats	4	6	23	16	8	6	8	7	2	7	87
Bush pigs				1							1
Dik dik								1	3	2	6
Cane rat						1					1
Mongoos			1		1	1	2				5
Squirrel			2						2		4
Total	37	38	52	53	56	58	39	38	29	23	423

The comparison of monkeys means crop raiding incidence observed in EPF and ECF shows that dogs are more efficient on farm guarding that other traditional means employed in Uluguru Mountains. Dogs reduced monkeys involved crop raiding incidences from 33.3% percent in ECF to 12.8% percent in EPF. Interestingly, in EPF the crop damage was estimated to be 1.4 % percent compared to 22.1% percent in ECF. Farmers aforementioned crop raiding incidences by monkeys to be 37.8% percent and estimated crop damage up to 41.1% percent.

The evident from ECF shows that when monkeys left alone, they are likely to come into the farms every day, because with all farmer efforts of guarding their farms and using scaring postures still monkeys raided crops at least once every two days. However, use of dogs reduced monkeys' crop raiding incidences to one per week. Observed crop-raiding incidence were distributed relatively equally across ten months, with the exception of December. The rise and fall of raiding frequencies may partly be attributed to increased human presence in and around farms and the intensity of farms guarding.

Figure 2 presents the distribution of crop raiding incidences between March and December 2007 and the raiding differences in ECF and EPF.

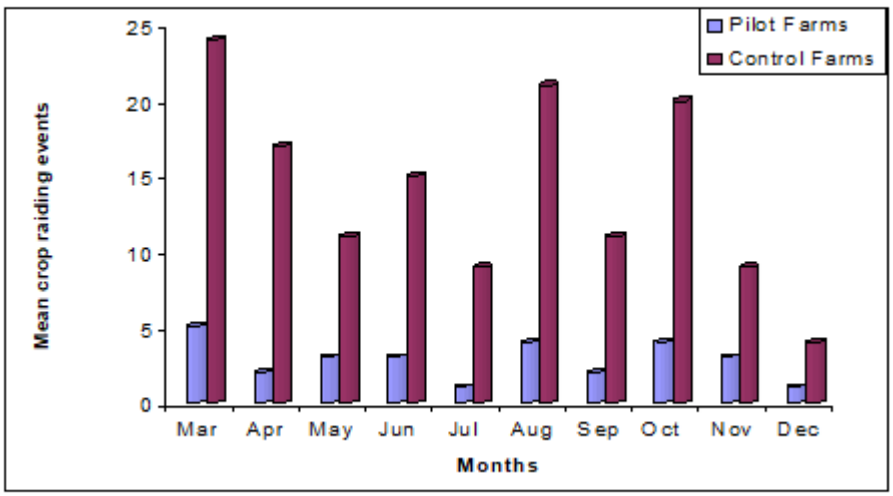

Figure 2: Mean crop raiding and distribution incidence in ECF and EPF by monkeys

Furthermore, it was observed that monkeys' peak hours for crop raiding was morning at 8 hours to 10 hours and later evening 15 hour to sunset 18 hours. The monkeys' number per troop ranges from 20 to 80, and composed of adults, juvenile and young. The weather conditions and crop seasons seem not to be associated with monkeys' crop raiding behaviour in Uluguru Mountains.

Monkeys control was the focus of this project. However, the collected data shows that the incidences of crop raiding by baboons were also reduced significantly in EPF. Nevertheless, technique has relative no impact on other group of animals like birds, rats, bush pigs, mongooses and squirrels (Figure 3). This may be due to size of animals and time of raiding.

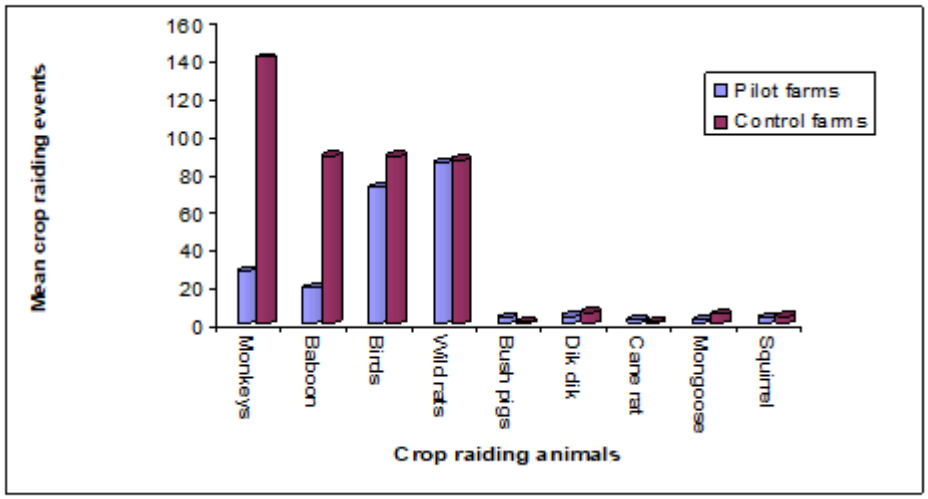

Figure 3: Mean crop raiding and distribution incidence in ECF and EPF by different group of wild animals

Use of wire nets

The wire nets proved to be effective during first two weeks. On the third week monkeys started to feed on green bananas, which farmers previously reported to be unattractive to monkeys. Similarly, on the fourth week monkeys were seen raiding whatever pineapple accessible (even immature ones). Since the sampled farms of banana and pineapple garden were not for pure scientific study, farmers opted to use traditional ways of guarding their crops. However, in future a scientific study (where farmers shall be compensated for their losses) is required to understand the feeding patterns of monkeys and survive mechanism in incidence of food scarcity in and around Uluguru Mountains.

Furthermore, the use of wire nets is difficult in Uluguru Mountains because of preferred farming systems i.e. mixed cropping and intercropping. The cost of application of this technique is even higher than fencing the whole farm, thus far, poor farmers in Uluguru Mountains cannot be afford.

Testing the use of non-attractive crops as buffer zone

The experiment finding showed that the size of the buffer zone significantly affects the crop raiding incidence. In this project two designs were developed, firstly, citrus garden was followed by nine acres of millet farms, and then maize farm. Finding: no crop raiding

incidences related to monkeys was recorded. Second design, citrus garden was followed by maize farms, no millet. Observation: monkeys managed to raid crop at least once per week. Furthermore, it was observed that monkeys eat oranges and lemon contrary to what farmers believed from their experience. The immediate explanation of monkeys feeding on crops thought to be non attractive is the survival mechanism i.e. monkeys has food preference but can switch to non-preferred during food shortage periods.

Demarcating monkeys -forest corridor and use dogs

There is no significant different to the findings from first technique (use of dogs). The results of this technique suggest having corridors for monkey's movements between the forests without high interactions with human being.

Results dissemination

- Workshop with farmers –done
- Two full papers have been submitted and accepted for presentation on international conference on biodiversity conservation to be held in Nairobi in February 2008.
- One paper to be submitted in the Journal of Environmental Management is on preparation,
- Final Report to be submitted to RSG for nature conservation

What remains to be done?

- Final evaluation
- Final report writing and publications
- Project scaling-up

4. FURTHER RESEARCH AND PROJECT ACTIVITIES

The first phase of the project has been completed, justifying that:

(i) Use of Dogs is cost-effective technique to reduce human-wildlife conflicts along forest-farm interfaces and can easily be adopted.
(ii) The forests corridor is necessary to enable monkeys to cross from one forest patches to another without passing in human residents or farms.
(iii) Project scaling up and communicating results to users is very important

The second phase of the project (May 2008 to April 2009- subjective to funds availability) will focus on dissemination of results to other 46 villagers bordering the forests of Uluguru mountains, and workshops with stakeholders to implement ongoing strategies aimed at reducing or eliminating crop-raiding conflict and creating the value of primates in the mountains.

The methods to be used in phase two shall include the use of local TV, designed brochure and workshop to scale up the efforts and impressive findings of the project first phase. In the process of encouraging the use of trained dogs to control monkeys, the project second phase plans to promote primate viewing tourism. We intend to organise workshop for local people and tourism companies. That workshop will provide a forum for the two parties to

develop the memorandum, as initiatives to enable local people benefits from their village forests and forests reserves, which have a viable number of viewable primates. The MO developed shall be the catalyst of local people participation in conservation of monkeys on gaining economic returns and changing the negative attitude.

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