# Darwin Initiative – Final Report

*it is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)*

### Darwin project information

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| Project Reference | 14-009 |
| Project Title | Biodiversity Monitoring in Forest Ecosystems in Bale Mountains National Park, Ethiopia |
| Host country(ies) | Ethiopia |
| UK Contract Holder Institution | University of Aberdeen |
| UK Partner Institution(s) | |
| Host Country Partner Institution(s) | Bale Mountains National Park (Oromia Bureau of Agriculture and Rural Department, OBARD) |
| Darwin Grant Value | £155,730 |
| Start/End dates of Project | 1 September 2005 / 31 August 2008 |
| Project Leader Name | M Pinard |
| Project Website | www.abdn.ac.uk/bale |
| Report Author(s) and date | Pinard, Burslem, Asefa, February 2010 |
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## 1 Project Background

Bale Mountains National Park is one of the most important centres of biodiversity and endemism in Africa. Harenna Forest is the most diverse ecosystem in the park yet is poorly known. The project's purpose was to conduct research and to strengthen the capacity of researchers, park managers, other government agents and local people to protect native forest flora and fauna. The project provided baseline information on the bale monkey, traditional resource management practices, as assessment of forest glades, along with support for provision of a substantial database and experience related to forest monitoring.

## 2 Project support to the Convention on Biological Diversity (CBD)

The project has mainly contributed to CBD objective 7 but has also contributed to objectives 6 and objective 10 (Appendix 3). Our activities, training and outputs were mainly directed at compiling baseline information about the Harenna forest ecosystem and evaluating this information to inform the development of a monitoring programme for the park and other stakeholders. While most of the work was conducted at the ecosystem or community level, one project was directed at compiling preliminary population data on an endemic primate that inhabits the montane and bamboo forest belt in the Harenna. The project contributed by documenting the threats to the park directly through its research on forest cover change, forest structure and composition, characterisation of forest glades and mineral springs and their uses and cultural values. The project generated a database with permanent plot data from the forest and with bird survey data. The project also supported partners to collect and compile data on settlements in the forest.

The General Management Plan for BMNP was developed in 2007 and although it targets a single park, because it was developed using participatory processes and because it incorporates the concept of sustainable resource management agreements, it represents an innovation for the country in regards to national strategies for conservation and sustainable use. Our project team was engaged with and contributed to the development of the plan and our partners continue to play an important role in national and regional discussions related to strategies for protected areas.

During the lifespan of this project, responsibility for management of the park shifted from the centre (national Ethiopian Wildlife Conservation Organization) to the region (Oromia Regional Agriculture Department) and then during the final months of the project, seemed likely to shift back to the centre (Ethiopian Wildlife Conservation Authority). Changes and uncertainty over the legal position of communities rights to resources in the park have meant that it was difficult to make progress in the integration of conservation and sustainable use on the ground, however, our research on local, traditional institutions in the Harenna provided information and insight into how community-based monitoring and management programmes could be developed. Indeed, this work is being continued through a Darwin Initiative project (1145 Building natural resource monitoring capacity in Ethiopia's key afro-montane ecosystems) and a SOS Farm Africa project in the southern belt of the Harenna.

# 3 Project Partnerships

Our main partner institution throughout the project was the Bale Mountains National Park, within the Oromia Bureau of Agriculture and Rural Development. This section within the regional government body is charged with implementation of park management. We decided upon project priorities together and defined training needs together. Due to staffing changes at BMNP, our main counterpart in the park changed several times during the project lifespan. These changes meant that progress was slow at times and field work was delayed to allow for re-negotiations of arrangements and for re-building trust. We established an MOU with OBARD and EWCO early in the project; later in the project we also established an MOU with our second main partner (FZS-BMCP).

Our second main partner institution was the Frankfurt Zoological Society's Bale Mountains Conservation Project. The FZS-BMCP is a long-term park support project in the BMNP focusing its activities on protected area planning, ecosystem monitoring, infrastructure strengthening, tourism development, and natural resource management. The partnership with FZS will be continued in a new DI project (1145).

Other institutions have worked with the project in various ways, for example, in the provision of training (Addis Ababa University, Wondo Genet College of Forestry), in the participation in training and planning events (WGCF), and in the research activities (EWCD).

A local project manager was employed to lead on the implementation of project activities. Unfortunately, during the final year of the project he experienced a number of personal problems that meant that he became unreliable, and his erratic behaviour fuelled conflict and undermined trust between partners. The PI managed this by meeting directly with partners.

# 4 Project Achievements

At the end of the project, an ecological monitoring programme was not yet fully functional in the Harenna, however, valuable experience with plot-based and plot-less sampling of forest structure and composition had been accumulated and was informing the work of our partners in the park. Valuable ecological data on the bird communities in the forest and how they respond to disturbance had informed the development of guidelines for monitoring forest birds. The research efforts of project staff had provided new information about the evolving institutions that were operating amongst communities in the forest and the threats to valuable archaeological sites within the forest.

## 4.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

It is difficult to identify a direct impact on biodiversity that can be attributed to this project, however, the project's contribution to institutional capacity in the park to develop and implement an adaptive ecological monitoring programme has been enhanced. Also, the research outputs generated by project staff provide a foundation for further work in the forest. During the lifespan of the project the forest ecosystems of the park gained recognition and investment from park management. To the extent that this project enhanced the awareness and focus on the conservation value of the forest and the threats to it will be an important longer term impact on biodiversity.

In the short-term, the social impacts are limited to the few employment opportunities that were made available through the project. The project funded the employment of two para-ecologists that were trained and managed by FZS-BMCP to implement ecological monitoring. However, in the longer-term, the documentation of the traditional management institutions that governed the exploitation of forest resources and resolved conflicts may have positive impacts as there will be greater awareness of the potential for building on these institutions as NGOs build sustainable natural resource management agreements within the park and community-based management agreements outside the park.

## 4.2 Outcomes: achievement of the project purpose and outcomes

As above.

## 4.3 Outputs (and activities)

Output 1.

The first output, a monitoring programme established and functioning was not achieved although the activities and indicators in terms of training, development of protocols and testing of protocols were completed. We revised the logframe such that output one now states capacity-enhanced for the development of a monitoring programme for Harenna forest ecosystem in BMP and guidelines for protocols developed; this has been achieved. FZS has secured additional financial support through the EU to continue to develop the ecological monitoring programme in the park. The outputs from this project will inform the work in the forest ecosystems. As the reviewers of our Annual Reports indicated, it was ambitious to expect to have a monitoring programme implemented in the three years available. As detailed in section 4.5, protocols were developed and tested for monitoring birds and forest structure, composition and dynamics. At the end of the project, it was clear that the permanent plot system that was established was useful for providing baseline information but that it would not be useful for the long term monitoring programme. The plots were vandalised within 6 months of their establishment, with many of the tags removed from the trees and corner stakes removed from the plots. The protocol involving rapid assessment using transects is more feasible to implement until it is possible to ensure the security of permanent infrastructure in remote areas of the forest. The experience gained from the plots and transects was presented to project partners and other stakeholders in March 2009; the presentation made to that workshop and the working draft of recommendations for forest ecosystem monitoring is available on the project website.

Output 2.

All of the activities elaborated in the logframe have been completed and four of the component parts have been peer-reviewed and accepted for publication in a special issue of *Walia*, an Ethiopian wildlife journal. We are currently writing a synthesis document with our partners that brings together the recent research in the forest.

Output 3.

A preliminary report on this work is included as appendix EVOLVING INSTITUTIONS. The research on local institutions will continue to be developed as part of the doctoral research of Mr Dereje Tadesse Wakjira over the next four years. Because of the uncertainty over the acceptance of the GMP by the EWCA, it has not been possible for our partners to move forward with Sustainable Natural Resource Agreements within the park. However, FZS is working with communities to the north of the park and SOS Farm Africa is working with communities to the south of the park. Through these efforts, our findings are informing current activities.

Output 4.

The manuscripts that will be published in *Walia* later in 2010 address threats to the bale monkey, to the glades and mineral springs from over-grazing and trampling, to birds from habitat degradation and expansion of agriculture. The theses that were completed with project

support document threats from fire to the *Erica* shrubland and forest cover change. A synthesis paper is currently being prepared, with a target to submit it for publication by September 2010.

Output 5.

Two posters have been printed and disseminated within the park and to our partner organizations and four manuscripts will be published later this year. We have held off on preparing booklets with protocols because we haven't had a chance to plan these with our local project partners. The PI will be in Addis and Bale in April 2010 and plans to complete this work during that visit.

## 4.4 Project standard measures and publications

These are outlined in Annex 4 and 5. Three papers have been produced for a special issue of *Walia* that is due to be published in 2010. The project staff will continue to work on written project outputs throughout 2010.

## 4.5 Technical and Scientific achievements and co-operation

**Land Use and Land Cover Change in the Harenna Forest**

This was collaborative work between project staff and staff at Addis Ababa University (Prof Zerihun Woldu and Dr Dagnachew Legesse) and Mr Netsanet Deneke Morie, an MSc student in Environmental Sciences. Satellite images from 1973, 1986 and 2000 were examined to classify the area into land use types and then to determine changes over time. The main findings indicated that there had been broad changes in land use over the period covered by the images, with shrubland and glades increasing in extent and agricultural expansion outside the park. The work also suggested some changes in forest quality with a decline in dense forest and an increase in open forest, with montane forest patch size decreasing. The analyses of the images were of limited value in identifying change in forest structure across the range of conditions that appeared to be important in the forest. This was not a limitation of the research effort but rather a conclusion of the inadequacy of LANDSAT images from this period and for this steep and deeply dissected landscape. The thesis was subject to examination at AAU and the student was successful in gaining his qualification and was included in Annual Report 2.

**A Preliminary Assessment of the Bale Monkey (*Cercopithecus djamdjamensis*) in the Harenna Forest**

This was collaborative work between project staff and Mr Kumara Wakjira of the Ethiopian Wildlife Conservation Authority. Surveys were conducted in the dry and wet seasons to provide a preliminary estimate of population size and distribution of the bale monkey. A total of 163 km of transects were surveyed in three habitats, bamboo forest, bamboo-mixed forest and non-bamboo forest. A total of 204 monkeys were observed in 31 groups over an altitudinal range of 2200-3400 m asl. Group size ranged from 2-20 (median = 5) and was similar for the two survey periods. Monkeys were found only in bamboo and mixed-bamboo forest. A mean density of 9.6 (SE = 8.8) and overall abundance of 1437 (SE = 1315) were estimated. The high variability associated with these estimates is a consequence of small sample size and short sighting distance, a consequence of the terrain, the climate, and dark and closed conditions in the bamboo forest. Repeated sampling of the site with a team experienced with the terrain and species is needed to increase the reliability of the population estimates. This work has been peer-reviewed and accepted for publication in *Walia* and was included in Annual Report 3.

**Forest Bird Communities: Characterisation and Development of Monitoring Procotols**

This work was undertaken by Mr Anteneh Shimelis and Mr Addisu Asefa (BMNP) in 2006, 2007 and 2008. Resident bird populations were surveyed in the forest in December 2006 and February 2007 and habitat associations were determined. The work indicated that for several species of bird, mean abundance varied by habitat type and anthropogenic factors such as human settlement, grazing and agriculture. A total of 77 species of resident birds were encountered. The species list was used to supplement the existing bird list for the forest and

then used to classify species by morphological adaptation to feeding, documented feeding habits, habitat occupancy and taxonomic affiliation. Hierarchical cluster analysis suggested 9 communities. The pattern of species segregation by abundance into communities was evaluated and the significance of the determined structuring in the field was very high. Compositional changes as a function of habitat attributes were evaluated for communities with species specific data separately. The joint abundance/compositional response of each community to habitat attributes and human utilization factors were also highly significant. Aspects of this work have been peer reviewed and submitted to *Walia* but the bulk of it is yet to be written up into a publication. A report was included with Annual Report 3 and a second is included here (Appendix BIRDS).

**The Distribution, Properties and Uses of Mineral Springs in the Harenna Forest**
An investigation into the distribution, properties and uses of mineral springs in the Harenna was also completed during this year by Giovanni Chiodi (UA). In summary, the Oromo pastoralists that inhabit BMNP use the mineral springs in the forest extensively in relation to livestock husbandry. A survey was conducted in Nov-Dec 2007 to provide a preliminary account of the distribution, properties and use of mineral springs (horas) and hot-springs (tabalas) in the Harenna forest. A total of 47 horas and 3 tabalas were identified. Tabalas are used occasionally for healing skin and stomach illnesses and for thanksgiving celebrations. Six horas are currently important for their value for livestock. Horas are used as a salt supplement for livestock and, in combination with availability of grazing, are linked to the seasonal movement of people in the forest. The results of this survey indicate the importance of the historical dimension to current resource use patterns and the importance of engagement with local people to document and design relevant management initiatives. This work was peer-reviewed and has been accepted for publication in *Walia*. It was included in Annual Report 3.

**Evolving Local Institutions**

This work was initiated in 2006 by Mr Mohammednur Jemal, the Park Ecologist. He initiated some focus group discussions with people living in the forest but was unable to complete the work. In 2008-2009 the work was completed by Mr Dereje Tadesse Wakjira (FZS-BMCP) and Mr Addisu Asefa (BMNP) in collaboration with project staff. The general objective was to investigate and document the evolving local institutions (formal and informal) that govern resource management in Harenna forest and infer from this the institutional change that may be required to bring sustainable resource management in Harenna.

Data collection methods included structured interviews, key informant group interviews and trend analysis participatory learning and action (PLA) tools, observations and a review of relevant reports and documents (details can be found in Appendix EVOLVING INSTITUTIONS). The main findings indicate that a series of social-economic drivers have influenced the environmental sustainability of the Harenna. Past regimes preserved traditional land use rights that were overseen by an effective and transparent system of local governance. Traditional systems of restrictions, sanctions and punishments served to protect forest resources over generations. With each passing regime, the local populace returned to traditional systems of management. The current regime places unprecedented pressure on forest resources causing anthropogenic destruction within the Harenna. The combined socio-economic drivers are likely to increase the vulnerability of the Harenna forest ecosystem and reduce the ability of the system to support the local populations. Our results suggest that traditional resource governance has worked over time. Increasing demand within the local community to better define current forest resource uses suggests the vulnerability of forest resources is also an issue of concern for local communities.

**Characteristics and Origins of Glades in the Harenna Forest**

This work was undertaken by Mr Giovanni Chiodi, an undergraduate student in Environmental Studies at UA as part of the Twin Gardens Expedition. The aim of the study was to characterise the glades in terms of soil properties, vegetation and land use and to investigate their origns. Three glades and three adjacent forest sites were studied at each of three altitudes along a soil toposequence. Relative to adjacent forest soils, soils in glades were distinct with lower pH, total exchangeable bases and base saturation. Permanent grazing was associated with lower plant species richness and higher monocot biomass than seasonal

grazing; dicot species richness in glades increased with altitude. Leaching and water-logging are suggested as potentially important to the formation of the glades though some glades have characteristics consistent with an anthropogenic origin. The glades are important for both permanent and temporary settlers in the Harenna as grazing for livestock; their high social and conservation values could be compromised by intensive grazing and local expansion of agricultural land. This work has been peer-reviewed and accepted for publication in *Walia*. It was included in Annual Report 3.

**Traditional Beekeeping**

This was a project implemented by a UA undergraduate in Geography as part of the Twin Gardens Expedition. The aim of the study was to describe traditional honey gathering practices in the Rira area and to describe the attributes of the hives. The work was conducted through semi-structured interviews with honey collectors. The results suggest that bee-keepers follow traditional practice but with different levels of expertise. Trees were selected for hanging hives based on the defence offered against honey badgers more than for the species or presence of abundant floral resources. Tree species are selected for hive construction based on durability, ease of production, availability and attractiveness to bees. The density of hives varied by bee keeper and altitude. The report on the research was peer-reviewed and accepted for publication in *Walia*. It was included in Annual Report 3.

**Forest structure and composition**

This work was conducted by the project team in collaboration with FZS-BMCP and Charlene Watson, a PhD student from Imperial College working in BMNP on ecosystem services and valuation. A total of 81 permanent plots were established between 1400 and 3000 m asl between December 2007 and April 2008. The objective initially was to assess forest structure and composition but with a longer term objective of providing information on forest dynamics. Tree density, tree species richness and seedling and sapling density showed a non-linear response to altitude. Canopy height decreased with altitude whereas understorey vegetation height, herbaceous cover and thickness of the organic litter layer increased with altitude. Livestock management had no direct effect on seedling density, however, when other factors were included in the model, it had a significant effect. Seedling and sapling density was promoted by a dense canopy and limited by the height of the understorey vegetation. Chronological cluster analysis indicated that Harenna forest species composition and structure is more diverse at low elevations than at high elevations. The analyses summarized here were completed by an MSc student in Forestry at UA (Mr Jan Hrdlcka) and was examined as a thesis project; the thesis was sustained. (available on project website)

In addition to the permanent plot network, the project team with support from BMNP assessed variation in forest structure and quality using a rapid assessment method. Using restricted stratified random sampling, 100 transects (100 m in length) were located in the forest across an altitudinal range from 1420m to 3058 m. A number of structural variables were measured, as were measures of disturbance. Canopy continuity and incidence of disturbance varied with altitude, with percentage area in closed forest declining with altitude. Across all transects canopy cover averaged 24%. Evidence of grazing was found in 20% of the sample points and was more frequent at upper altitudes (2750-3200m) than at lower altitudes. Disturbance from fuel cutting was the most frequent (38%) in the lowest altitudinal belt and in the uppermost (17%). Coffee was found mostly in the lower two altitudinal belts, occurring in 77% of the sample points in the lowest belt. (report available on project website).

## 4.6 Capacity building

The project provided the financial support for the Park Warden, Mr Berhanu Jilcha, to complete an MSc in Conservation Biology at the University of Kent. Mr Jilcha conducted his research project on fire in the erica belt of the forest and continues to serve as the Warden and to contribute to the definitions of research priorities for the park.

The project also provided funds to our partners to train young local people to work as para-ecologists in the park. We funded a short course on plant identification for the para-ecologists

and also provided some hands-on training in the field during the period of data collection in the forest. The project provided training in bird community structure analysis for Mr Addisu Asefa by funding his collaborative work with Mr Anteneh Shimelis, an experienced ornithologist in the region.

Project staff also delivered a short course on monitoring for park rangers, and a short course on ecological monitoring methods to the park experts and participants from our partner institutions. The project supported two MSc project students and two undergraduate students through the provision of funding for field work, logistical support or access to data and mentoring.

The measurement and monitoring experience that was gained during the project has been helpful for informing the development of ecological monitoring programmes in other parks with afro-montane vegetation.

The presence of project staff at the camp site in the forest increased the general interest and awareness of conservation issues in the forest amongst park staff and contributed to positive relationship building with people living in Rira.

### 4.7 Sustainability and Legacy

The capacity building that was directed at the park experts, rangers and para-ecologists is likely to have continued impact as these staff remain working in protected area management in Ethiopia. The short training events will have supported the development of research planning and resource monitoring skills that will be relevant to the young staff as they pursue additional postgraduate training. Two of Ethiopian biologists that participated in project activities (i.e., bird monitoring, bale monkey assessment) are continuing their professional development in MSc programmes at institutions in Africa. Also, the relationships that were built between project staff and local people during field work in the forest provides a positive platform for further collaboration between the park and the people living in the remote parts of the park. One of the UA undergraduates that participated in the expedition to the forest is now pursuing a doctoral programme with his research directed at community-based resource management at a site in Ethiopia. The partners continue to work together on publications and through involvement in doctoral research programme of Mr Dereje Tadesse Wakjira who is completing his PhD through the University of Aberdeen.

The permanent plots in the forest are unlikely to endure, unfortunately, as discussed previously. However, the information that they generated has provided a solid baseline of information about forest structure and composition with relevance that will endure as the park staff and project partners continue to adapt and implement an ecological monitoring programme.

The field equipment that was purchased by the project has remained in the park and is being utilised by park staff. Two of the computers and the printer purchased by the project were still functioning and being used by park staff at the close of the project but the other two computers were no longer functional. The project vehicle was no longer functional at the end of the project. We attempted to repair the engine but it was not cost-effective given the overall age and condition of the vehicle. OBARD requested that the vehicle be delivered to them and the PI is working with BMNP staff to do this. The project funded some infrastructure development in Rira to support field work based in the forest.

## 5 Lessons learned, dissemination and communication

Information relating to project achievements have been disseminated locally, nationally and internationally. The lead researchers for the projects on forest cover change, the origins of the forest glades, traditional honey management and preliminary studies of bale monkey presented their work to academic audiences in both oral and written forms and presented their findings to the park through the presentation of theses. In addition, two posters were developed and disseminated nationally, one promoting the conservation of the bale monkey and one with information about the flora in the forest. The project achievements have also been presented to international audiences in Britain (the annual conference of the British Ecological Society), in Malaysia (as a lecture to staff and students at the International School of Forestry, University of Malaysia, Kota Kinabalu), and for project partners of another Darwin funded project in Sri

Lanka during the PIs visit. National awareness of the threats to the park were the focus of two public discussions in Addis, sponsored by the Forum for the Environment.

Lessons learned in relation to monitoring the forest were presented to a national audience in Addis in 2009 at a workshop on Afro-montane Ecological Monitoring.

Information about the research findings from the glades, mineral springs, bird communities and traditional institutions has been presented to people living in the forest informally through discussions and group meetings when project staff have returned to the forest.

Dissemination will continue after project completion. The special issue of Walia that includes a number of publication outputs from the project will be published later in 2010. The PI will be in Ethiopia and in Bale later this year and plans to coordinate with partners to define priorities for additional dissemination materials targeted at people living within the forest.

### 5.1 Darwin identity

The project carried a local identity associated with the Darwin Initiative logo. Our project vehicle displayed the logo, a sign at our field camp displayed the logo, and all communication within country was on letterhead that included the logo. During visits to Addis Ababa University and Wondo Genet College of Forestry the PI spoke with staff about funding opportunities and additional project development options during each visit. Staff at partner institutions were encouraged to apply for additional training through opportunities offered by the Darwin Initiative. Some project activities were lead by our project partners and Darwin funding was acknowledged but the Darwin identity was less dominant in these cases.

Because there have been a number of projects funded by the Darwin Initiative in Ethiopia over the past decade, many of the professionals working in conservation are familiar with the programme.

## 6 Monitoring and evaluation

Changes were made to the logframe in the first, second and third years of the project but no additional changes were made after our third annual report.

The project team formally reviewed progress against the logframe every six months. In retrospect, it would have been helpful to more critically evaluate their continued relevance as a team rather than use them primarily as a way of assessing progress. The changes in staffing in the park and the prolonged negotiation over the MOU with OBARD made it difficult in practical terms to practice inclusive and critical monitoring and evaluation.

Internal evaluation of the work was mainly done by the project team during the PIs visits to the park where the main partners were able to discuss project activities, issues and concerns, and explore ways to integrate between other ongoing efforts.

### 6.1 Actions taken in response to annual report reviews

The reviews of our first and second annual reports raised a number of issues but these have been addressed in subsequent annual reports. No outstanding issues were raised in the third annual report.

However, in the reviews of the second and third annual reports the reviewer raised a concern that we were being ambitious to expect that we could deliver a report on the status of the forest and the threats to the forest in the time allowed and suggested that we focus on the development of the monitoring strategy and capacity building. We have taken this advice and invested more in the analysis of our existing data to inform the monitoring strategy and less in the production of a complete report on the status of the forest. With this said, however, our work has provided some useful baseline information that captures forest status and threats.

# 7 Finance and administration

## 7.1 Project expenditure

**Table showing original budget by category and year, alongside spend.**

In 2005/2006 we were late in delivering some of our training programme and requested a carry-over of £6,600; this request was approved by the Secretariat on 28 March 2006 but at that time we only needed to carry-over £4,728. (*the original budget was 41,615 but added to this was the carry-over of 4,728 to give 46,343 for the year)

In 2006/2007 we developed our partnership with FZS-BMCP and increased our investment in field equipment for a team of para-ecologists who were to be trained to implement the monitoring protocols. We also shifted funds from the travel and subsistence budget into “other” to support field costs for an MSc student based at Addis Ababa University, working on forest cover change in the Harenna.

In 2007/2008 we requested and were granted two shifts in the budget allocations. The first was a shift of £5,000 from the travel and subsistence category into the other category to make up a shortfall in the allocation for a stipend for Mr Berhanu Jilcha during his MSc programme in Kent. Our original budget figure seriously underestimated the rise in tuition costs at Kent over three years. The second shift was for £1,000 from our communication budget and 500 from our other budget to capital items. Our project manager (RA) in Ethiopia was robbed in October of a laptop, a GPS unit, a pair of binoculars and other minor equipment. This shift allowed us to replace the computer. In the itemization of spend, the computer appears in the other category.

## 7.2 Additional funds or in-kind contributions secured

Additional funds were secured to support the PI's attendance at a national conference in the UK (British Ecological Society) and to support a group of six undergraduate students to spend three months in Ethiopia as part of the Twin Gardens Expedition. UA staff invested time in writing grant applications to secure additional funding for an Ecosystems Services and Poverty Alleviation Grant (NERC) but this was unsuccessful. UA funding was secured to pay tuition and stipend for a 3.5 y doctoral programme for Mr Dereje Tadesse Wakjira (2009-2012). FZS-BMCP secured funding from the British High Commission for a carbon analysis and this money supplemented our budget for permanent plot establishment in the forest. The permanent plot data are being shared with SOS Farm Africa for a new carbon mitigation project at the southern boundary of the park that will support the development of community-based forest management and monitoring, particularly relevant for the coffee zone in the forest.

## 7.3 Value of DI funding

At the initiation of the project, our partners were concentrating their outreach and ecological monitoring efforts in the northern part of the park and on the plateau. The DI funding enabled them to expand their efforts into the forest ecosystem earlier and more completely than would have otherwise been possible. Also, the DI funding allowed the warden to complete an MSc in Conservation Biology at the U Kent. This training enhanced his capacity to contribute to the implementation of the new GMP.

# Annex 1 Report of progress and achievements against final project logframe for the life of the project

| Project summary | Measurable Indicators | Progress and Achievements | Actions required/planned for next period |
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| **Goal**: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve<br>• The conservation of biological diversity,<br>• The sustainable use of its components, and<br>• The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources | | (report on any contribution towards positive impact on biodiversity or positive changes in the conditions of human communities associated with biodiversity eg steps towards sustainable use or equitable sharing of costs or benefits) | (do not fill not applicable) |
| Purpose<br>The purpose of the project is to conduct research and to strengthen the capacity of researchers, park managers and other government agents, and local people to protect native forest species of plants and animals in BMP. | Biodiversity monitoring programme for Harenna forest in place and functioning by yr 3.<br>New knowledge on biodiversity in Harenna forest ecosystem in BMP, particularly vascular plants and vertebrates and landscape structure and composition.<br>New knowledge on the threats to forest conservation.<br>Awareness of communities on the role of protected areas and threats to conservation strengthened. | About 80 permanent sample vegetation plots were established and 100 temporary sample transects, data were digitized and analyses completed. Guidelines for monitoring the forest were produced.<br>Two field trips were undertaken for sampling bird communities; guidelines for monitoring birds in the forest were produced.<br>Three manuscripts were submitted to a special issue of Walia. Two MSc and two BSc theses were completed. | Key Actions:<br>The monitoring programme continues to be developed by partners, supported by an EU grant to FZS and a Darwin Initiative grant to Macaulay Institute.<br>Characterisation of traditional management institutional structures and its relevance to the development of novel community-based management and monitoring programmes is being continued through doctoral research and partner institutions. |
| **Output 1. Capacity-enhanced for the development of a monitoring programme for Harenna forest ecosystem in BMP and guidelines for protocols developed** | Minimum of 15 staff from partner institutions trained by year 3 in sampling protocols, data analysis, and database maintenance.<br>Sampling protocols elaborated and tested by year 4. | Progress has been made in developing protocols for vegetation (forest and glades), birds and primates, testing them and training field staff to implement. Monitoring guidelines have been produced for forest birds and the forest ecosystem based on this experience and progress made in structuring and populating a database. The programme itself is not yet fully functional but our partner, FZS-BMCP, continues to support its development and implementation. | |
| Activity: Project planning workshop (relevant also to Outputs 2, 3, 4) | | This was completed in November of 2005. | |
| Activity: Field-based training (1) mammals; (2) birds; (3) plants followed by data management training; | | Completed and reported on in previous annual reports. During the final project phase, a plant ID course, including herbarium techniques was | |

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| | | delivered. |
| Activity: Training workshop on monitoring design and implementation | | Completed in year two. |
| Activity: Informal training in the field on implementation and data management. | | Completed. |
| Activity: Develop and implement protocols for sampling forest structure and composition, birds, forest glade biodiversity, and landscape structure and function; develop database structure. | | Plant data were collected from permanent plots and rapid transects, analyses conducted and data were passed to partners. Bird monitoring protocols were developed during 2007-2008. |
| Activity: Complete analysis of baseline data and revise monitoring plan and database as needed. | | This was completed during 2008-2009 and presented as preliminary recommendations to stakeholders and partners in an Ecological Monitoring Workshop in Addis in March 2009. A detailed report on the quality of the data in the database with recommendations for improvements was written and presented to project partners. |
| **Output 2.** Report on the Status of the Harenna Forest in BMP published and distributed | Report peer-reviewed and publication date established, distribution arrangements in place. 300 copies produced and distributed by y 3. | Several components of this report have been peer-reviewed and accepted for publication in a special issue of *Walia*. Delays have meant that they will be published later in 2010. We are currently drafting a synthesis paper that will bring together the various studies that have been conducted as part of the project and aim to have that submitted for publication later this year. |
| Activity: Collate historical data on forest cover in the park, including satellite data, conduct spatial and landscape analyses on forest cover and forest cover change. | | Completed in year two. |
| Activity: Complete baseline data collection, process material, digitise data and conduct preliminary analyses on vertebrate and plant diversity. | | Completed. |
| Activity: Report on spatial analysis of forest cover and landscape diversity. | | Completed. Two manuscripts have been prepared, one is a thesis from a student from Addis Ababa University, the second is for Walia by a collaborator associated with FZS-BMNP. |
| **Output 3.** Report on Traditional Management System | PRAs conducted and results discussed.<br>Focus group research on traditional management practices completed.<br>Report submitted and results discussed in relation to SNRU agreements. | The preliminary report is completed and the findings are informing our partners activities in the northern part of BMNP and the southern part, where community-based resource management agreements are being developed. This work will continue as doctoral research for Mr Dereje Tadesse Wakjira. |
| Activity: Conduct PRA in at least two settlement areas within the park to determine needs and priorities for community awareness programme. | | This activity was completed in March 2006. Further consultations and discussions were held between BMNP and communities within the Harenna in 2006 as part of the development of the GMP. |

| | | |
|---|---|---|
| Activity: Focus group research to describe traditional management practices and to assess local awareness of these | | This work was completed during the final phase of the project. |
| **Output 4.** Report on Threats to Forest Conservation | Report peer-reviewed and publication date established, distribution arrangements in place. 300 copies produced and distributed by y 4. | The manuscripts that will be published in *Walia* later in 2010 address threats to the bale monkey, to the glades from over-grazing, to birds from habitat degradation and expansion of agriculture. The theses that were completed with project support document threats from fire in the Erica shrubland and forest cover change. A synthesis paper is currently being prepared, with a target to submit it for publication by September 2010. |
| Activity: Conduct field research on threats to forest conservation. | | This is completed and was part of the work conducted using transects for forest quality. Some data from the bird monitoring also contributes to this dataset. |
| **Output 5.** Lessons learned and best practices disseminated | 1 Booklet on monitoring forest ecosystems produced<br>1 Booklet on threats to forest conservation produced<br>2 posters produced<br>2 papers submitted for publication in scientific journals | Three manuscripts have been submitted for publication to date. The booklets with protocols have not yet been finalized but this is scheduled to be completed on the PIs next visit to Ethiopia (April or May 2010). |
| Activity: Develop materials for communities about forest resources and threats to forest conservation. At least two posters produced. | | Two posters were produced and distributed, one on the bale monkey and one on trees of the Harenna. |
| Activity: Final workshop for dissemination | | Two discussions sponsored by the national network, Forum for the Environment, provided an opportunity for project staff to disseminate information about threats and opportunities for biodiversity protection. In addition project findings were presented to relevant stakeholders at an Afro-Montane Ecological Monitoring Workshop in Addis in March 2009. |

# Annex 2 Project's final logframe, including criteria and indicators

| Project summary | Measurable Indicators | Means of verification | Important Assumptions |
|---|---|---|---|
| Goal:<br>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve<br>the conservation of biological diversity,<br>the sustainable use of its components, and<br>the fair and equitable sharing of benefits arising out of the utilisation of genetic resources | | | |
| Purpose<br>The purpose of the project is to conduct research and to strengthen the capacity of researchers, park managers and other government agents, and local people to protect native forest species of plants and animals in BMP. | Biodiversity monitoring programme for Harenna forest in place and functioning by yr 4.<br>New knowledge on biodiversity in Harenna forest ecosystem in BMP, particularly vascular plants, **birds** and landscape structure and composition.<br>New knowledge on the threats to forest conservation.<br>Awareness of communities on the role of protected areas and threats to forest conservation strengthened. | Field survey reports and publications by partner organisations. | Government policies and programmes remain supportive of conservation work in BMNP;<br>OBARD, BMNP, FZS-BMCP remain viable and committed. |
| Outputs<br>**Capacity-enhanced for the development of a monitoring programme for Harenna forest ecosystem in BMP and guidelines for protocols developed** | Minimum of **15** staff from partner institutions trained by year 3 in sampling protocols, data analysis, and database maintenance.<br>Sampling protocols elaborated and tested by year 4. | Field reports<br>Database with biodiversity data with associated manual.<br>Participant attendance records. | Trained staff remain in institutions and in positions where they can use the skills provided and train others in the skills. |
| Report on the Status of the Harenna Forest in BMP published and distributed | Report peer-reviewed and publication date established, distribution arrangements in place.<br>300 copies produced and distributed by y 3. | Published reviews and feedback on report.<br>2 copies sent to Darwin Initiative | |
| Report on Traditional Management System | PRAs conducted and results discussed.<br>Focus group research on traditional management practices completed. | Local meeting reports.<br>Published materials.<br>Participant attendance records. | Users and relevant stakeholders are willing and able to participate in the process. |

| | | | |
|---|---|---|---|
| | Report submitted and results discussed in relation to SNRU agreements. | | |
| Report on threats to forest conservation. | Report peer-reviewed and publication date established, distribution arrangements in place.<br>300 copies produced and distributed by y 4. | Published reviews and feedback on report.<br>2 copies sent to Darwin Initiative | |
| Lessons learned and best practices disseminated | 1 Booklet on monitoring forest ecosystems produced<br>1 Booklet on threats to forest conservation produced<br>2 posters produced<br>2 papers submitted for publication in scientific journals | | Materials reach and positively influence intended stakeholders. |
| Activities | | Activity Milestones (Summary of Project Implementation Timetable) | |
| Workshops / Training Events | | Yr 1: Project planning workshop with project team to agree workplan, define training programme;<br>Yr 1: Field-based training (1) mammals; (2) birds; (3) plants followed by data management training;<br>Yr 2: Training workshop on (1) monitoring design and implementation;<br>Yr 2: Informal training in the field on implementation and data management;<br>Yr 3: Final workshop, for dissemination and work on publications | |
| Research | | Yr 1: Collate historical data on forest cover in the park, including satellite data, conduct spatial and landscape analyses on forest cover and forest cover change.<br>Yr 1, 2, 3: Develop and implement protocols for sampling forest structure and composition, birds, forest glade biodiversity, and landscape structure and function; develop database structure.<br>Yr 1: Conduct PRA in at least two settlement areas within the park to determine needs and priorities for community awareness programme.<br>Yr 2 and 3: Complete baseline data collection, process material, digitise data and conduct preliminary analyses on vertebrate and plant diversity.<br>Yr 3: Conduct field research on threats to forest conservation.<br>Yr 3 and 4: Complete analysis of baseline data and revise monitoring plan and database as needed | |

| | |
|---|---|
| Reports and publication development | Yr 1, 2, 3, 4: Develop materials for communities about forest resources, and threats to forest conservation. At least 2 Posters produced.<br>Yr 2, 3: Report on spatial analysis of forest cover and landscape diversity.<br>Yr 2, 3: Interim report on monitoring plan for the Harenna forest.<br>Yr 3: Booklet on monitoring forest ecosystems.<br>Yr 4: Final report presenting summary of findings from baseline sampling.<br>Yr 3, 4: Manual describing sampling protocols, database and guidelines for use and development.<br>Yr 3, 4: Papers submitted to scientific journals for peer-review. |

# Annex 3 Project contribution to Articles under the CBD

## Project Contribution to Articles under the Convention on Biological Diversity

| Article No./Title | Project % | Article Description |
|---|---|---|
| 6. General Measures for Conservation & Sustainable Use | 5 | Develop national strategies that integrate conservation and sustainable use. |
| 7. Identification and Monitoring | 90 | Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data. |
| 8. In-situ Conservation | | Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources. |
| 9. Ex-situ Conservation | | Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources. |
| 10. Sustainable Use of Components of Biological Diversity | 5 | Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector. |
| 11. Incentive Measures | | Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity. |
| 12. Research and Training | | Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations). |
| 13. Public Education and Awareness | | Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes. |
| 14. Impact Assessment and Minimizing Adverse Impacts | | Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage. |
| 15. Access to Genetic Resources | | Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits. |

| Article No./Title | Project % | Article Description |
|---|---|---|
| 16. Access to and Transfer of Technology | | Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies. |
| 17. Exchange of Information | | Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge |
| 19. Bio-safety Protocol | | Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research. |
| Other Contribution | | Smaller contributions (eg of 5%) or less should be summed and included here. |
| Total % | 100% | Check % = total 100 |

# Annex 4 Standard Measures

| Code | Description | Totals |
|---|---|---|
| **Training Measures** | | |
| 2 | Number of Masters qualifications obtained | 1 Ethiopian (Park Warden; U Kent, MSc Conservation Biology 2008) |
| 4a | Number of undergraduate students receiving training | 6 Europeans (UA expeditions) |
| 4b | Number of training weeks provided to undergraduate students | 30 Europeans (UA expeditions, data analysis) |
| 4c | Number of postgraduate students receiving training (not 1-3 above) | 1 Ethiopian, 1 European (through thesis projects) |
| 4d | Number of training weeks for postgraduate students | 14 weeks (field work, data analysis, writing) |
| 6a | Number of people receiving other forms of short-term education/training (ie not categories 1-5 above) | 24 Ethiopians (short courses) |
| 6b | Number of training weeks not leading to formal qualification | 6 weeks (short courses) |
| 7 | Number of types of training materials produced for use by host country(s) | 4 (plant ID and herbarium procedures; ranger training materials) |
| **Research Measures** | | |
| 8 | Number of weeks spent by UK project staff on project work in host country(s) | 32 weeks |
| 11a | Number of papers published or accepted for publication in peer reviewed journals | 3 (for special issue of Walia) |
| 12a | Number of computer-based databases established (containing species/generic information) and handed over to host country | 3 (permanent plots, transect data, bird data) |
| 13b | Number of species reference collections enhanced and handed over to host country(s) | 1 (plant) |
| **Dissemination Measures** | | |
| 14b | Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated. | 4 |
| **Physical Measures** | | |
| 20 | Estimated value (£s) of physical assets handed over to host country(s) | £2,000 (three computers, field equipment; project vehicle was worthless at end of project and was scraped) |
| 22 | Number of permanent field plots established | 80 |
| 23 | Value of additional resources raised for project | About £63,000 |

## Annex 5 Publications

Provide full details of all publications and material that can be publicly accessed, eg title, name of publisher, contact details, cost. Mark (*) all publications and other material that you have included with this report

| **Type *** (eg journals, manual, CDs) | **Detail** (title, author, year) | **Publishers** (name, city) | **Available from** (eg contact address, website) | **Cost** £ |
|---|---|---|---|---|
| Journal | Chiodi, G. & Pinard, M.A. (2010) The distribution, properties and uses of mineral springs in the Harenna Forest. *Walia* | Walia, special issue on Bale Mountains National Park (Wildlife and Natural History Society, Addis Ababa, Ethiopia) | Project website | Free |
| Journal | Chiodi, G. & Pinard, M.A. (2010) Characteristics and origins of glades in the Harenna forest, Ethiopia. *Walia* | Walia, special issue on Bale Mountains National Park (Wildlife and Natural History Society, Addis Ababa, Ethiopia) | Project website | Free |
| Journal | Lefevre, B. (2010) Traditional beekeeping and patterns of host tree use in the Harenna Forest, Bale Mountains National Park. *Walia* | Walia, special issue on Bale Mountains National Park (Wildlife and Natural History Society, Addis Ababa, Ethiopia) | Project website | Free |
| Journal | Wakjira, K., Gashaw, M. & Pinard, M.A. (2010) A Preliminary Assessment of the Bale Monkey (*Cercopithecus djamdjamensis*) in the Harenna Forest. *Walia* | Walia, special issue on Bale Mountains National Park (Wildlife and Natural History Society, Addis Ababa, Ethiopia) | Project website | Free |
| | | | | |

- This special issue is due to be published in July 2010.

# Annex 6 Darwin Contacts

| | |
|---|---|
| **Ref No** | 14-009 |
| **Project Title** | Biodiversity Monitoring in Forest Ecosystems in Bale Mountains National Park, Ethiopia |
| | |
| **UK Leader Details** | |
| Name | Dr Michelle A Pinard |
| Role within Darwin Project | PI |
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| Role within Darwin Project | |
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| Phone | |
| Fax | |
| Email | |
| **Partner 1** | |
| Name | Mr Adissu Asefa |
| Organisation | Bale Mountains National Park |
| Role within Darwin Project | Main project partner and implementing agency |
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| Email | |
| **Partner 2 (if relevant)** | |
| Name | Dr Anouska Kinahan |
| Organisation | Frankfurt Zoological Society -Bale Mountains Conservation Project (FZS-BMCP) |
| Role within Darwin Project | Main Liaison for Ecological Monitoring Programme in BMNP |
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# Harenna Forest Bird Monitoring Protocol
# Bale Mountains National Park, Ethiopia

**Anteneh Shimelis & Addisu Assefa**

**August 2009**

**Bale Mountains National Park, Robe, Bale, Ethiopia**

**Contact: Anteneh Shimelis**

**or**

**Addisu Asefa Mitiku**

**Biodiversity Monitoring in Forest Ecosystems in Bale Mountains National Park (14-009, Darwin Initiative Project)**

**Contact: Michelle Pinard, University of Aberdeen, UK**

# Acknowledgements

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# 1. Introduction

The Harenna Forest is a moist afro-montane forest in Ethiopia. By extent it is one of the largest ecosystems of the Bale Mountains National Park, located at the South-western edge of the Harargehe-Bale massif. Clustered along an altitudnal gradient, different vegetation zones of the forest ecosystem are identifiable by changes in the presence and dominance of signature tree and shrub species that reflect the systems high diversity. Between 1500 m and 2000 m the surrounding environment is relatively dry and the forest canopy is generally open with trees of about 40 m in height. The dominant tree species in this zone include *Warburgia ugandensis*, *Croton macrostachyus*, *Syzygium guineense*, *Podocarpus falcatus,* and *Aningeria adolfi-friderici*. One also finds trees such as *Syzygium guineense*, *Alangium chinense*, *Olea capensis*, *Ocotea kenyensis* and *Strychnos mitis*. The understory in this low altitude area is composed of shrub species, including wild coffee *Coffea arabica*. Dominant tree species change along with increasing altitude and moisture. At altitudes above 2,400 m *Syzygium guineense* becomes dominant, along with *Schefflera abyssinica* and other montane forest trees, with patches of *Arundinaria alpina*. The density of epiphytes and woody climbers on the trees reflect the moist nature of this area which is often covered in low cloud and mist. The tree canopy is not very dense at these higher altitudes resulting in a rich herb flora in the forest. Above 2,800 m asl, *Hagenia abyssinica* and *Hypericum revolutum* become more common along with *Erica arborea* and *E. trimera*. This forest composition can be found up to 3,500 m asl.

The Harenna forest is highly affected by anthropogenic factors such as agriculture, logging, settlement and grazing. Although threat data collected throughout the National Park (NP) has not been analysed comparatively across ecosystems, any casual observer of the NP would easily conclude that human interference, at least, is greater in this forest than any other ecosystem of the NP. The relative severity of this in terms of negative ecological

consequences is not known at this stage, but indications show the ecosystem to be highly threatened.

Recognising the potential severity of ecological degredation the Darwin Initiative funded a research project with the purpose of developing a baseline data on vegetation, hydrology, bird communities and human use of the forest with the objective of developing a holistic means of long term ecological monitoring and conservation for the key ecosystem components. The task for our team has been to conduct research on the birds of the forest in line with the overall purpose of the project.

The bird research was carried out to determine and explain bird interrelationships related to 1) determining factors that affect community and species patterns; 2) determinging ecological functions of birds at the community and species scale; 3) determining indicator species to facilitate future monitoring of forest bird fauna; 4) quantifying threats and evaluating impacts both at the community and species scales. To achieve these objectives, we collected data on bird abundance, habitat structure, floristics, bird-plant foraging relationships and threats.

The data collected generates knowledge that is useful for an understanding of the state and importance of the avi-fauna of the forest ecosystem both at the community and species scales. The research experience gained is described in this document that has been developed to be used as a methodological tool for the Park biologists who will be responsible for undertaking long-term forest bird monitoring activities. We believe this tool will assist the NP and its partners to generate data that will be of use in making future conservation and management decisions.

The document is prepared to attain the following objectives:
1) To pass on knowledge and experience regarding field research on forest birds,

2) To pass on relevant data useful for repeating the research carried out by the Darwin-Initiative bird research team,
3) To provide a detailed and holistic guideline that will enable the National Park to contionue effectively monitor forest birds,
4) To develop/recommend a mechanism that will enhance national and international collaboration of use to the conservation of forest birds in the Bale Mountains National Park.

## 2. What is ecological monitoring?

Ecological monitoring is a necessary practice to determine the effectiveness of conservation and wildlife management practices for a National Park such as the Bale Mountains.  A monitoring practice involves carrying out regular censuses at permanent sample locations (Sutherland 1996). It is essential to ensure that the same techniques of monitoring are implemented each time a census is carried out. As the main objective is to make comparisons between years of censuses, changing the sample locations and the techniques used to count species would make comparative evaluation invalid. If a decision is made to change the census technique that has been used in previous years, it is necessary to have a period of overlap in which both methods are used to enable the relative efficiency of each technique to be determined and the data can be calibrated.

Monitoring is generally useful to determine the extent of change in the state of populations of species, and to determine the attributes of communities such as species diversity. To do this it is often not necessary to estimate the absolute population size of species, a relative measure of abundance may be sufficient. As well as determining the overall change in the state of desired ecological attributes at the scale of the whole forest, it is also essential to evaluate changes in the fate of subpopulations and subcomponents of a community at a smaller spatial scale. It is also very important to measure key process variables such as habitat physiognomy, floristic, and human induced

transformations of the habitat so that NP managers can relate these with changes in attributes of interest. Such an approach is essential to enable the responsible Park staff to assess whether a particular measurement is within the typical range of fluctuations or an indication of atypical event (Sutherland 1996). It is also essential in order to take in to account some seemingly irrelevant census specifics such as not counting birds during very windy and wet days, ensuring observers collect data that is comparable across years.

Determining the rate of change in the state of attributes of interest is very important as it facilitates decision making relating to how often data must be collected in order to detect changes over time. Birds generally breed at least once every other year which combined with it the rate of mortality, migration and emigration (Krebs 2001) determines how the state of populations both at the species and community scales change. Based on this knowledge regular timing of a monitoring census will be specified with the ideal situation that each sample is visited by observers on the same date that past observers carried out their counts.

## 3. Why monitor birds?

Birds are major components of ecosystems in the Bale Mountains National Park (Shimelis 2008, Shimelis & Assefa 2007, 2008). They are bound interactively both to the vegetation and other organisms that are living in a system through predator-prey and competitive interrelationships. Harenna forest is no exception and such interactions are key to the provision of ecosystem services and also for the overall health of the forest at all ecological scales. Some of the most important interactions observed as taking place in the Harenna forest included birds foraging on seeds and fruit of plants, birds feeding on insects and other invertebrates present at ground level, and birds feeding on invertebrates underground. These relationships are essential for the maintenance of a stable forest ecosystem and also for forest expansion, as birds are principal agents of seed dispersal for many plant species.

Preliminary analysis showed birds to be highly sensitive to the typical natural environment as demonstrated by their species-specific foraging responses in relation to the abundance of plant species. A significant amount of negative response to human induced threats such as conversion of land for agriculture and tree cutting was also noted.

The assembling of bird species into communities was found to be constrained by the floristic zones of the forest as well as by the degree of severity of human induced threats. This indicates the existence of an avifauna-plant interaction that is essential for Harenna to maintain a naturally stable and productive forest ecosystem. The long distance flight capabilities of birds means they play key roles in the dispersal and the consequent range expansion of plant species. This arguably makes birds the most important natural agents for the maintenance and growth of forest life. Due to their flight capabilities birds respond to negative changes in their habitat quicker than other organisms including plants. Therefore, they are one of the best indicators of the health of an ecosystem helping site managers to easily detect negative changes in the system and take appropriate corrective measures quickly.

Furthermore, forest birds that occur in all habitat types, are highly vocal and colourful organisms that are easy to learn and census, making them the easiest and cheapest indicators of ecosystem component health that can be monitored with the minimum possible cost.

## 4. The scope of monitoring of forest birds in the NP

Ecological monitoring is conducted in order to regularly evaluate the health and stability of a given ecosystem. In its holistic form an ecosystem is a result of trophic, competitive, biotic-abiotic and other interactions that connect the large number of species that naturally exist as communities. Monitoring an ecosystem as it exists in its naturally complete state is a tremendous task that

is very costly and requires involvement of a huge number of experts equipped with complete knowledge of the system. Consequently, it is necessary to carry out monitoring tasks at smaller scales of ecological organizations. Monitoring of animals is done by focusing on community and species-specific attributes.

The commonest community attribute monitored by conservationists worldwide is species richness or species diversity (Sutherland 1996, Krebs 2001). Although monitoring a forest bird community in the developed world is not a difficult conservation task, in a poor country such as Ethiopia where financial and human resources are scarce monitoring a bird community in its completeness is still an unrealistic objective to set by managers of a National Park such as the Bale Mountains. Therefore, it is very important to find a cheap but effective mechanism to enable Park Managers to carry out monitoring of bird communities with minimal loss of information. This can be achieved by selecting a group of few indicator species that effectively reflect the desired community attributes, such as species richness. To do this an initial exhaustive survey of the bird community in the targeted ecosystem must be carried out in order to determine the species richness of a community or communities along with the ecological processes that have the potential to affect temporal and spatial patterns.

Once this baseline data is collected and analysed the selection of indicator species can be carried out to infer species richness based on data gathered on the indicator species. The predicted species richness must be compared with that which is observed on the ground in order to be confident of the indicator value of these few species, at least at the scale of the area targeted in a given NP. If possible, it is highly recommended that the value of the indicator species be evaluated in similar ecosystems found in other National Parks or reserves. The reduction of the quantity of ecosystem components in this manner substantially reduces the cost and the required number and skillset of human resources that must be made available to monitor bird communities in a given ecosystem.

The Darwin bird research team is carrying out the described tasks to select a few species that are indicators of species richness of bird communities in the Harenna forest and this will be made available both to the Park and the international community as early as possible. We recommend the use of a mechanism such as that used by the Bale Mountains Park Managers while conducting a forest bird community monitoring at some future time.

Another essential point of note is that bird monitoring in a place such as the Harenna forest must not be restricted to community species richness and its indicator species. It is also vital to select species that are sensitive to negative changes in habitat. The data useful for such purposes already exists and preliminary analysis has already been conducted with a list of species identified. A comprehensive and exhaustive analysis of this data will also be carried out and the results will be made available to the Park and its partners as early as possible. It is also very important to include species that are globally determined as facing some level of extinction threat as targets of the forest bird monitoring activity that the Park will carry out in the future.

Other species of interest would be those that are endemic to forests such as the Harena in Ethiopia that reflect both the uniqueness and evolutionary history of the Ethiopian highlands relative to similar ecosystems in Africa and the rest of the world. Appendix 5 contains the list of species to be monitored. This list will be complete in the near future as the indicators of bird biodiversity are determined. Inclusion of such species as components of the forest ecosystem as a whole and also the bird assemblage in Harenna would make the monitoring task holistic and ecologically valid.

## 5. Basic needs towards bird monitoring

Censusing birds requires skilled human labour and the right type of equipment. Required skills includes the ability to identify birds and experience in implementing standard census methodology. Bird identification skills can be

developed either through personal effort or official training. Bird identification involves putting a name to the individual species encountered whilst conducting a census. To be able to do this the observer must have a very good knowledge of morphology, sound, and other relevant attributes of each species that is encountered in the field.

Knowledge regarding morphological attributes of species is essential particularly when individuals are encountered visually. These are attributes that include body size, bill shape, body coloration/plumage and feather or skin structures on the body. Although birds generally are very colourful, there are always differences in colour within the same species due to variations associated with age, sex, and season. Body size in some species may also be different between the sexes.

Visual detection of birds requires the use of binoculars and maybe a telescope. For a beginner experienced field guides are indispensable for an ornithological field exercise.  If not for all species, visual detection of birds in a forest habitat such as the Harenna is immensely difficult. The observer must rely on the sounds of species for most of the census period. This can be learnt by listening to singing birds that the observer can see. In many cases this is not possible and the observer must record the sounds of the birds that are in hiding. Playing back their own sounds to such birds would prompt them to show themselves to the observer who would then be able to identify them. Bird sounds are also very effective in differentiating species that are morphologically and behaviourally very similar.

The habitat types in which species occur are limited and this can be used to further verify the identification made based on morphology and sounds. Before embarking on an activity to census forest birds, the observer must make sure he/she has the required identification skills and the right equipment. One must not underestimate the fact that an observer with task of counting birds in a forest cannot easily rely on field notes and books, as a result they must come pre-equipped with this knowledge. Most of the standard

census methods are not flexible enough to allow the luxury of time to spend much time using binoculars and book to identify each bird encountered. It is also very important to have the skill to collect data on habitat parameters such as habitat physiognomy, floristic composition and threats.

The observers must also have a very good knowledge of appropriate census methodologies that are internationally used both for birds and habitat assessment. Those that are beginners must read the methods provided in this document very carefully and practice in the field before embarking on the collection of data that is desired for the monitoring purpose.

Four camp stations should be established to conduct the survey, at Rira, Katcha, Shawe River and Shisha River. During effective census, one line (10 sampling points) can be censused on one day. Therefore, including the days taken to get to and from the area and to move between stations a minimum of 15 days is required to complete the survey.

## 6. Census

A census is the counting of individual organisms of a species to determine either an absolute density or relative abundance in space. Prior to carrying out a census of activity on the ground, determination of sample locations is an essential component of a census activity. If additional samples are to be added to those that are already identified, a random selection based on a topographic map of the site must be done. Both the new and the old sample locations can be relocated using a Geographical Positioning System (GPS).

For all data types census sheets must be prepared and sample types recorded, these are provided as appendices to this report. Data sheets must be tested for their effectiveness before carrying out the actual census in the field. Ensuring compatibility of the data sheets for electronic data storage is also an essential part of their preparation.

## *6.1 Birds*

Most forest birds are highly vocal and colourful. Yet, forest habitat by nature does not make visual detection and identification of birds an easy task to the observer. As previously stated the observer must often rely on bird sounds to identify species. Due to the numerous physical barriers that inhibit observer movement in a forest and the high level of sensitivity of the birds to sound and disturbance caused by the human intruders, the “point count technique” is considered the most appropriate census method (Gibbons et al. 1996). This method involves the selection of point samples that are circular and require the observer to make an estimate of the distance of the location of each individual bird from the centre of the circle. Based on their specified distance measurements there are three types of the point count method:

1. The single band point count technique requires setting up a 25 meter radius to the selected circular plot to count birds that are seen or heard within this distance limit only.
2. The second type used by the Darwin Initiative team consists of two distance bands and involves counting birds both within and outside the 25 meter radius specified for a circular point location.
3. The third type involves estimating the distances of each individual bird seen or heard from the centre of the circle but does not have a specified distance band for counting purposes. This method assumes counts are done in a circular fashion from a specified central location.
4.

A point count technique requires the observer to carry out the census by being stationery at the central point and spending a limited time censusing at a given location. The counting time does not normally exceed 10 minutes per sample and an additional three minutes are allowed before the actual counting session. The Darwin Initiative bird team spent 11 minutes at each circular census location. Out of this the first three minutes were used to allow the shy forest birds to become used to the presence of the observers and the counts are conducted in the remaining 8 minutes. Birds that are seen or heard after the 11 minutes were not counted. All birds that are seen or heard in all

directions of the circular counting station must be counted by ensuring an individual bird is counted only once during the 8 minute period. To avoid further double counting the circular sample stations are located to ensure a minimum of 250 m gap between any of the sample locations.

The point locations were identified randomly on a topographic map before the onset of the census activity. A single line is composed of 10 sample locations as indicated with a gap of 250 m between the closet two circular stations. It is our experience that in a good day a maximum of 10 points are counted and the census activity must be carried out between 6 and 11 am. Birds are not counted while travelling between two census locations and the observer must not waste time whilst moving between sample locations for bird watching or other purposes. All counts must be carried out during dry mornings and counts must be suspended when the whether conditions are wet, highly misty or atypically cold. Extreme caution must be taken to reduce sound and other disturbance throughout the census period.

### *6.2 Environmental variables*

Environmental variables cause differences in the spatial occurrence of both plant and animal species in the Harenna forest. Since birds have strong relationships with plants, the importance of some environmental variables such as elevation is very important. Future changes in global and local climate may result in changes in the distribution of both plants and subsequently in the distribution of birds. It is therefore important to continuously monitor the state of the distribution and population of species in relation to elevation. A GPS is normally used to measure altitude at point sample locations. Even though the elevation of a given point location is always known, it is recommended to take records whenever bird and habitat data is collected.

### *6.3 Habitat Structure*

Measuring the forest habitat structure involves collection of data on variables that reflect the physiognomy of habitat. The types of variables to be measured

are presented in table 1. Their measurement requires quadrats to be placed of appropriate sizes at the point locations where birds are being counted. To be able to measure the density of the tree canopy at a given location requires a 50 m by 50 m quadrat placed from the centre of the circular point location, the proportion of the canopy covered with leaves and other plant material relative to the proportion of the visible sky must be estimated by eye (Bullock 1996). The same quadrat can be used to estimate the proportion of the ground covered with bush and shrub vegetation.

For the grass and herbaceous layer placement of four 2m by 2m quadrats within the larger vegetation quadrat is required. The proportion of the ground covered by each type of vegetation is estimated by eye using the area of the bigger quadrat surrounding the point location and the average used. The smaller quadrat can be used to estimate the proportion of the ground covered with rock and dead matter and also the amount of the ground that is open. An observer walks around the larger 50 by 50 m quadrat to count the number of all trees standing as well as their size categories as described in table 1.

Table 1: Types of structural variables those are useful to explain bird population and community patterns

| Vegetation structure | Structural density | Physical structure |
|---|---|---|
| % Tree canopy | Number of large trees (> 50 cm dbh) | % Rock |
| % Bush | Number of medium trees (> 25 cm dbh and < 50 cm dbh) | % open ground |
| % Shrub | No of small trees (< 25 cm dbh) | % dead organic matter |
| % herb | | |
| % grass | | |

## *6.4 Floristic*

Floristic composition refers to the plant species composition across spatial samples. Measurement involves counting or estimating the percentage proportion of all woody plants within a 50 m by 50 m quadrat that is placed within the bird counting point location.

### *6.5. Threats*

Threats in Harenna forest are mainly caused by human activities such as agriculture, grazing and tree cutting. To measure the impact of agriculture the observer estimates by eye the proportion of land in a 50 m by 50 m quadrat that has been transformed for the purposes of cultivation. Grazing intensity can be measured by estimating by eye the proportion of grass and other herbaceous vegetation with clip signs as result of grazing. This is estimated in the four 2 m by 2m quadrats. The number of basal remnants of cut trees is counted by walking the area of the large quadrat.

## 7. Data storage

Data must be stored in two formats, in hard copies of the filled sheets and from data entered into one of the electronic spread-sheets, preferably using excel. Two copies must be made of each hard sheet and stored at two different locations where they are protected from moisture and fire. It is also essential to have an effective back-up mechanism for the electronic data. It is highly recommended to do this locally, nationally and internationally. The national and international partners of the Park can serve as better keepers of electronic data and this also facilitates a wider expertise and involvement in the analysis and implementation of the results for conservation purposes.

## 8. Data analysis

The changes evaluated using the monitoring data maybe temporal or spatial in nature. Evaluation of a temporal change can be done both at small and large spatial scales. The simplest evaluation may involve changes in the mean abundance of species as a function of one or more of the variables determined as bringing about change in the state of the different habitats in the forest. This can be done using singular response and predictor variables in using univariate ANOVA. To evaluate the response of a single dependent variable to a multiple of predictor variable univariate generalised linear modleing can be done to detect changes both in time and space. Multivariate

generalised modelling can be used to determine the effect of multiple predictors on more than one response variables. Simple and multiple linear/non-linear regression modelling can help to determine changes in space and time as result of negative effects of habitat transforming variables.

## 9. The need for collaboration

The Bale Mountains National Park is a very good example to other protected areas in terms of establishing and using both national and international collaborative partnerships for site based conservation research and management practices. This has to be boosted further by involving relevant national and international stakeholders with experience in bird conservation around the world. The monitoring data must be shared with organizations such as the BirdLife International and Ethiopian Wildlife and Natural History Society that are leaders in bird conservation both in Ethiopia and globally. Their experience and involvement in different reserves and other locations abroad would provide the NP with the necessary up to date conservation tools used elsewhere that can be adapted for the local specific needs of the Bale Mountains National Park.

## 10. Importance of continuously updating this monitoring protocol

This monitoring protocol must not be seen as a final document as it stands now. Like any other document it has to be updated taking into account research developments from the National Park and elsewhere. The first updating step would be the inclusion of the results of analysis to determine indicator species useful to monitor bird community species richness in the Harenna forest. It is also very important analyse data to determine the sensitivity of species to human disturbance. The threat status of species as is determined globally has been changing over time and the recommended international network must be used to enhance the value of this monitoring protocol.

## 11. Concluding remarks

Bird monitoring is an essential component of conservation at the ecosystem level and this protocol developed as part of a Darwin Initiative forest biodiversity monitoring initiative is a timely output required to enhance current conservation initiatives in the national park.

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# Appendix 1: Data sheet for the collection of bird data

Date:_____, Line_____, Point_____, Weather_____, Location_____

| Species name | <25 m | > 25 | < 25 m | > 25 m | < 25 m | > 25 m |
|---|---|---|---|---|---|---|
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# Appendix 2: Data sheet for the collection of habitat structure and threats

Date: _____, Line_____, Point_____,

Location_____

| Variable | Measurement |
|---|---|
| % Tree Canopy | |
| % Bush | |
| % Shrub | |
| % Herb | |
| % Cultivation | |
| % Grazed Vegetation | |
| Cut trunk | |
| Herb | |
| | |
| | |
| | |
| Grass | |
| | |
| | |
| | |
| Open ground | |
| | |
| | |
| | |
| Dead Organic Matter | |
| | |
| | |
| | |

## Appendix 3: Data Sheet for the collection of data on floristic composition of a site

Date_____, Line _____, Point_____, Location_____

| Species Name | Number |
|---|---|
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# Evolving Local Resource Management Institutions in the Harenna Forest of Southern Bale Mountains National Park, Ethiopia

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**9/30/2009**

**Biodiversity Monitoring in Forest Ecosystems in Bale Mountains National Park (14-009, Darwin Initiative Project)**

**Contact: Michelle Pinard, University of Aberdeen, UK**

# Introduction

In the Harenna forest of southeast Ethiopia, forest based livelihoods play a significant role in supporting local communities. Forest coffee, forest beekeeping, and the use of forest land for seasonal grazing contribute most significantly to the livelihoods of local communities. Within Ethiopia there is a long tradition of beekeeping; which has been practiced throughout the country for thousands of years (Fichtl and Adi, 1994). The wide climatic and edaphic variability throughout the country results in diverse and unique flowering plants highly suited to bees and to beekeeping (Fichtl and Adi, 1994). Thus, traditional practices and institutions associated to beekeeping are present in the forested landscapes of the country. Several studies have shown forest management and beekeeping to be strongly interdependent with beekeeping contributing to ecosystem functioning, biodiversity conservation, honey production and plant pollination (LeFevre, 2007).

Ethiopia is the centre of origin of *Coffea arabica*. The wild populations of *C. arabica* occur in the humid forests of the Southwest and Southeast and are separated from each other by the Great Rift Valley (GRV), at altitudes ranging between 1,000 and 2,000m. Within the Southeast, the Harenna forest is the only place where wild coffee exists. The remaining seven locations of wild coffee are in the Southwest of the country (Tadesse, 2003). In the forest coffee zone of Harenna forest more than 200 flowering plant species have been recorded as being naturally associated with forest coffee (Feyera and Denich 2006). Forest coffee management in this region has evolved through a process of different management practices and property rights that have in turn shaped the management systems and institutions associated with forest coffee.

Within Africa, Ethiopia has the largest livestock population. As a result subsistence pastoral and semi pastoral society predominate. The pastoralist and semi pastoralist society living around Harenna forest and lowland areas of Delo Mena District seasonally migrate to the forest to make use of available grazing land. Thus, seasonal grazing forest land use and associated institutions are also influenced by different regimes. In this study we describe the evolving and interlinked nature of traditional institutions and resource management systems associated with forest coffee management, forest beekeeping and seasonal forest grazing land use in Harenna forest.

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## Objectives of the study

Our general objective was to investigate and document the evolving local institutions (formal and informal) that govern resource management in Harenna forest and infer from this the institutional change that may be required to bring sustainable resource management in Harenna.

The specific objectives of the study are:

1. To describe the trends in local resource management systems/institutions over time in Harenna forest,
2. To identify management practices, sanctions, restrictions, rights and enforcement mechanisms exercised during the different regimes (related to resource management) and how these have changed through time,
3. To examine the major social, economic, and political factors that contribute to weakening/strengthening of the institutions/resource management systems and,
4. To imply future actions to facilitate the design of institutional change for sustainable management of Harenna forest.

## Materials and Methods

Multiple research methods were utilized to collect data for the study. Data collection included structured interviews, key informant group interviews and trend analysis participatory learning and action (PLA) tools, observations and a review of relevant reports and documents. The study assumes traditional resource management systems/institutions mainly centre on the major valuable economic activities that include seasonal grazing, forest coffee management and forest beekeeping. Both quantitative and qualitative data focus on these practices. Because resource use and decisions about forest resource uses are made at the household level the unit of analysis of the study is household.

### *Data Collection*

Structured interviews were conducted with household heads from 14 villages (*Kebeles*) (selected using a systematic sampling approach) neighbouring the Harenna forest in the Delo Mena *Woreda* (District). The Delo Mena *Woreda* (District). *Kebele* is the lowest administrative unit in the government administration structure that has elected executive members. People in all the 14 *Kebles* livelihoods are supported by subsistence agriculture or livestock keeping, or mixture of the two. A total of 13573 household heads (2554 women and 11019 men) inhabit the Delo Mena *Woreda* with differing degrees of dependency on the Harenna forest. The location of permanent residence of households in the 14 *Kebele* range from inside the forest to up to 75 km away from the forest.

In each village 5%+ of the total households were selected randomly. A total of 720 household were interviewed, of these we collected complete data on 680 (542 men and 138 female) household heads for analysis. Questions focussed on household socioeconomic characteristics, seasonal migration for grazing, forest coffee management and forest

beekeeping management practices. Data collection commenced February and March of 2009 by trained field workers able to speak the local language and official language of *Afan Oromo*. For simplicity the questionnaire was translated to *Afan Oromo.*

In interview, participants were asked to explain situations in the context of different regimes. We used four government regimes: Geda system (before 1900), the Imperial regime (1900-1974), the Militery regime (1974-1991) and EPDRF (1991- to date). When participants reported a change in situation they were asked to state reasons why these changes had occurred. Information generated was agreed upon by participants and recorded following group agreement. Group discussions focussed on current resource management systems.

### *Data Analysis*

Data from structured interviews were coded and entered for descriptive analysis. Data from group discussion and trend analysis were sorted according to topic using context analysis. Information obtained from group discussions was triangulated with information obtained from different group discussion. Qualitative data was used to describe different regimes and changes in resource management systems/institutions, specific management practice through time and the causes for change.

## Results

### *Summary of trends in forest management systems*

Group discussion and trend analysis revealed that in most instances major change in property regimes, resource management and institutions are experienced directly following regime change. In 16$^{th}$ century, oral histories from the local community refer to a period where major conflict between the different Oromo clans lead to defining specific territory. Until the expansion of contemporary Ethiopia in the early 1900's, the Harenna forest belonged to the Siko and Mando sub clans of the big Arsi Oromo clan, residing between the two major rivers of the region: the Genale river and the Wabe river. Subsequent regimes following the Geda regime introduce different property rights and institutions in order to manage the Harenna forest.

### *The Geda Regime (Before 1900's)*

The Oromo traditional governance system is called the Geda system. At this point the Harenna forest was common land mainly used for wild coffee collection, forest honey harvesting, and seasonal grazing. The harvest of these resources was not a concern of forest management as the lower woodland was utilised for its rich forest products used for construction wood and fuel wood. At the start of the regime arvest from communal forest land was for subsistence, towards the end of the regime market penetrates into the area.

The forest resource was considered as communal property of Arsi clan that was situated between two rivers, Genale and Wabe, but with resource use regulation by *Bokku*, the ritual head of the Geda system. Abba Geda *(Bokku*) is democratically elected leader that can hold office for eight years. To be elected Abba Geda (*Bokku*) a person should be rich (more than 1000 cattle) and have witness from society that he is wise.

During Geda governance systems Harenna forest was divided into different blocks based on physical features and *Jeldhaba* as assigned by *Bokku* to enforce the regulations. Each *Jeldhaba* constitutes different *Sedeta* responsible for eight families in its vicinity. *Sedeta* is responsible for day to day monitoring of resource use. The organization of both *Jeldhaba* and *Sadeta* is based on their proxy to each other in their permanent residence place. Seasonal resource use also follows the *Jeldhaba* and *Sadeta* cluster.

***Seasonal grazing forest land use***

Livestock rearing was the main economic activity of people surrounding the Harenna forest. The tradition of forest seasonal grazing is the oldest form of forest land use. Lowland pastoralists seasonally migrate to the forest each year for up to three months in order to supply their livestock with good water, fodder and to shelter from dry season lowland sunstroke. Abba Boku, the head of Geda system regulated seasonal grazing through use of *Jeldhaba* and *Sedeta*. All land use rights and restrictions were agreed upon in general assembly, *Yaa'a Afrach*, and proclaimed as rule (*Leleba*), by *Bokku*. The major decisions related to seasonal forest grazing use include defining the territory of each *Jeldhaba* and *Sedeta*, specifying the date of entry to the forest and exit from the forest and resolving related conflicts. Each year the *Bokku* specify the date of entry and exit based on weather conditions. For example, if the dry season starts early the grazing season starts early and if the rainy season starts early seasonal grazing must end sooner. The *Jeldhaba* and *Sadeta* enforce the regulations and disseminate the announcements. Other social norms related to tree and climber cutting, fire and settlement were also monitored by *Sadeta*.

Because farming was not common practice during Geda regime all family members migrate to the forest with the livestock during the dry season for forest grazing. Different *Sedeta* settle in different localities and only in rare cases do the herds of one *Sedeta* meet the herds from other *Sedeta* as populations were small. During seasonal grazing only calves and sick animals remain around temporary villages, the rest of the herd move into the forest for grazing and back to the village in the evening. The women looked after calves and sick animals, providing tree leaves and grass, while the men mainly worked on beekeeping related activities. Children looked after the herd.

During the Geda regime seasonal grazing areas were located in the lower part of the Harenna. Today this area is used for forest coffee management practice. Most of the seasonal grazing settlements were built in glades in order to easily monitor the livestock

every morning and in late afternoon. Beehive placing was located deep into the forest away from the seasonal grazing area.

***Forest Coffee Collection***

Coffee was naturally dispersed across the lower part of the Harenna. In the beginning coffee was used only for blessing and preying to keep away evil things from livestock and people. The blessing ceremony of coffee is called '*Bune Kela*'. *Buna Kela* is prepared by boiling red ripe coffee cherry (with out removing coat) with milk and butter in a pot. After fumigation and blessing the coffee is served to adult men and women for drinking and eating. Only traditional healers led the *Bune Kela* ceremony until the tradition of coffee drinking was introduced into the area by the Muslim religious teachers of Arabia.

Originally, coffee was collected from the forest as a common property mainly for the blessing service. The introduction of coffee drinking did not change the communal property rights system of coffee. Until end of the Geda regime members of the Arsi clan, as far as 200 km away, had the right to collect forest coffee during the harvest season. Rules for the coffee collector included: coffee cherry collection only from standing plants and not from fallen coffee, only ripe red coffee should be collected and breaking the coffee branch during collection was forbidden. Rule compliance was enforced by *Jeldhaba* and the practice was monitored by *Sedeta*. Rights and restrictions were decided on at the general meeting, *Ya'a Afrach* and proclaimed by *Bokku* through Afrecha.

***1.3 Forest Honey collection***

Forest honey harvesting is the second oldest form of forest use. Oral history suggests honey harvesting began approximately 300 years ago when people of the area and their livestock were wiped-out due to starvation due to drought. Local people believe 'God' brought bees from '*Dello-Kuyisa'* (*Dello* is a lowland area below the forest and *Kuyisa* is a termite mound) meaning mound dwelling bees from Dello area, to save the people. Initially, wild honey was harvested from natural hollow wood and openings in rocky cliffs without any management practice. Honey was first used for domestic use and was collected only from wild bee colonies. Through time people known by repeatedly using wild bee colony in particular area (cave or hallow wood) and show tendency to first hold and use.

Over time the local people started to imitate the natural hollow wood and prepared log hives from tree species that were easy to work on. The log hive is prepared and placed on the tree branch in a location where there is a wild bee colony. Until today log hives are the only beehive type used around the Harenna. The introduction of the log beehive reduced the effort needed to find wild bee colonies in the forest. This practice increased as the honey market opened on the border of Somali and in the far lowland area.

***Management practices, restrictions and sanctions***

Local communities living in different parts of the world have developed different indigenous management practices and perceptions for the forests they use. In doing so, people modify the floristic composition and structure of forests during the process of use in order to get the best of goods and services. Indigenous management practices include activities such as conserving some patches of forest, sparing or planting desirable species, introducing new species, eliminating competing species, thinning to protect the forest from fire, and stimulating fruit production (Tadesse, 2003). Such management practices were uncommon during the Geda regime except some relating to beekeeping. Most management rules were restrictions on harvesting, period of use, and communal use of territory. Thus, the management practices were resource use restrictions to support sustainability. The monitoring system of restriction was well organized and functioned because it was decentralized from the settlement pattern.

Some of the rules became social norms in the area, with unacceptable practices that include cutting a standing tree for log beehive preparation, cutting a climber or tree unless for use, breaking tree and coffee branches, carrying fire in the forest without water at hand.

After the honey market opened on the border of Somali, honey became an important exchange commodity. The tradition of log beehive making through reciprocal support increased honey production at the household level. For example, if a family suddenly lost its assets due to fire or lost livestock due to disease relatives and neighbours would support the family by preparing a large number of beehives. Only on such an occasion could the life tree, *Pouteria adolfi-friederici*, be cut for hive preparation to symbolize true support for the affected family. Climbers could be cut for the construction of houses and to tighten the outer parts of the beehive with bamboo sheath, grass or dead tree bark. All climbers harvested had to be fully utilized. In relation to beekeeping the strict rules related to fire use. An individual who used fire for honey harvesting must carry water and extinguish the fire to avoid a fire hazard, likewise log beehives had to be made of dry wood.

Until the 1940's local communities in the Harenna harvested wild coffee without any formal management practice due to pre established social norms. Some restrictions such as not collecting coffee cherry from the ground encouraged natural regeneration in the forest and increase coffee plant production. Without integration into social norms it would have been difficult to monitor most regulations. Dates for the start and end of coffee harvesting were announced by *Bokku* through *Jeldhabas,* as with seasonal grazing. Individuals who break rules were disciplined at different level depending on the extent of rules broken. The investigation and penalties were enforced by elders, clan leader or *Sadeta* depending upon the issues seriousness. For example, fire misuse was considered a worse crime than collecting unripe coffee. Penalty types include advice from elders, beating by clan members, punishment by slaughtering an offenders Ox and denying forest use rights for specified

period of time. Each *Jeldhaba* assigned its own *Sedeta* for each village, constituting eight households, in order to monitor forest users practice.

### *1.5 Emergence of Private Property Rights*

Regardless of generations of using fixed areas in the forest in some areas private property rights to seasonal grazing land use was not in place in the Harenna. Different watering points, glades in the forest, hills and settlement sites were named after a person known to use that area or an elder in that area. There were no socially recognized exclusive use rights for forest grazing. Seasonal grazing settlement areas of a certain group (where a hut is built) was a recognized property right and most villages. The seasonal settlement is also in communal use by a group of people from same village, *Sedeta* member.

In relation to forest coffee and forest honey, changes in practice emerged due to the trade route developed between Somalia and the region. Trade initiated by bartering Ivory with cattle. Somali merchant men brought livestock to exchange with Ivory. A pair of Ivory tusks from an elephant could be exchanged for up to 40 cattle. The exchange of livestock with Ivory continued until the population of elephant was wiped out from the lowland area south of the Harenna. As elephant numbers declined, coffee and honey began to be exchanged with matches, cloth, and utensils such as knives, axle, pots, etc. This market for coffee and honey, on the border of Somalia changed forest honey production and forest coffee collection systems. Local communities began to spend more time in honey production and in preparing log hives. Log hives were prepared from tree log sizes reaching up to 30 cm diameter and 1.2 meters in length and placed on top of tree branches near wild bee colonies. The hive is fumigated with herbs to attract a bee colony and covered with a grass or bamboo sheath to protect it from rain and to regulate the inside temperature. Dimensions and preparation of beehives improved over time. Placing the beehive on the upper part of the tree branch helps to avoid natural predators. Occupying forestland for beekeeping allowing exclusive use for specific families began after agreement in the general assembly *Ya'a*.

Following the introduction of log beehives, the Geda system introduced further rules to regulate resource use. Initially the regulation of honey collection focussed on proper use of fire. Later regulations ensured the hive be made from dead trees and exclusive use rights for owners of forest blocks were enforced. As beekeeping increased the practice of chasing wild colonies shifted to attracting bee colonies and local elders (clan leaders) allocated blocks of forest to individuals. In most cases individuals were already occupying the land and by explaining this to the elders their property rights could be recognized and enforce. In the beginning, land for beehive placing was separate from seasonal grazing land to maximize bee fodder. As human population increased demand for seasonal grazing increased. As a result seasonal grazing inside the beekeeping forest block was allowed but not the cutting of trees and climbers. Building temporary huts inside beekeeping forest blocks during the seasonal

grazing period was not allowed as fire and fire smoke from settlements would chase out the bee colony from the hive. Today this practice is enforced in most places of the Harenna.

Beehive site selection is based on availability of wild bee colonies in the area to maximize the possibility of rapid colonization of the new hive. Therefore, any wild bee colony inside the territory of an individual forest block is exclusively owned by the beekeeper. River banks, forest areas with more climbers and areas inaccessible for grazing were commonly selected for beekeeping. Owner rights for beekeeping blocks were enforced by local elders and *Jeldhaba*. Owners had the right to inherit and exclude others from beehive placing, tree cutting and settlement during seasonal grazing. Forest beekeeping is the first land use related private property rights in the Harenna.

The market on the border of Somalia had less impact on forest coffee management. No clear private property rights related to coffee land were in place until the re-occupation of the area by the Ethiopian central government during the Imperial regime after their defeat of Italian aggression (1941). Coffee management and property rights were introduced by a northern warlord after the 1941 reoccupation of the area.

***The Imperial Regime (1900 – 1974)***

The expansion of contemporary Ethiopia to the south through military intrusion became successful and the central government started to exercise its administration system in the area in the 1900's. After controlling the area, the imperial regime abandoned the traditional governance system of the Geda regime and imposed a different administration system. The old Imperial (1889 – 1913) order meant all forests including trees on private land are the Kings property and as a result state property (Bekele, 2003: 86). Most decrees and regulations focused on agricultural land because forestland is state property. To aide administrative needs and minimize conflict the King granted use rights and a portion of the conquered land to the overlord and to some traditional rulers. These administrators and overlords from Northern and Central Ethiopia were not interested in cultivating land, but in collecting contributions from the productive peasants. Local community had to contribute tributes in kind (honey, ox, goat, etc). The land owners and the local community became tenants and the warlord become overlord.

No new administration happens without challenge from local people. Within time, this regime escalated to civil unrest in opposition to the conqueror forcing the landlord and administration to leave the area and administer from a distance, in the provenance capital. The people in the Harenna continued to collect tributes to send to the absentee landlord in the provenance capital (Goba) to keep them away from the area. As a result the traditional administration and property rights enforcement continued informally with the help of elders. Furthermore, the local community internally agreed to show solidarity not to take any conflict to the formal administration instead relying on elders and clan leaders. This

situation continued until the Italian force conquered Ethiopia (1936). The Italian force did not enforce any new policy during their five year occupation. However, they abolished tributes paid to overlord.

An organized central government system was effectively imposed in the area after Haileselase came back from asylum in 1941. Until then, external people, landlord and overlord were unaware of the presence of forest coffee in the Harenna. The forest was divided into different administrative blocks in the traditional administration system (*Jeldhaba*) and overlord (*Melkenya*) was assigned to administer and collect tributes from tenants.

In 1942 a decree changed the tribute system to one of land tax related to land categories set as *lem* (cultivated), *lem-tef* (semi cultivated) and *tef* (uncultivated) land. The respective tax levy per *gasha* (40 hectare) was fixed to 15, 10 and 5 for *lem, lem-tef* and *tef* respectively. Forestland was categorized as *tef*, forest coffee land as *lem-tef*. The *Melkenya* (overlord) divided forest coffee resources amongst those willing to own forest coffee and pay tax. People who previously used forest coffee in the same territory with close kinship started to form groups and pay tax and related tributes in their group, others were allowed to collect coffee from that which was confiscated from peasants and owned by the overlord on an equal share arrangement base. As a result of the private coffee holding regime all unoccupied forest coffee lands were automatically placed under the usage rights of overlord. A nobleman who was given land without peasants could offer attractive land rights to tenants, often from the north, in order to manage the forest coffee or be employed to work on his forest coffee. Thus, forest coffee management practice including removing climbers, large trees and undergrowth was introduced to the Harenna through the overlord.

In 1944 a new land order endorsed by the King enabled land use rights given to the overlord to be converted to full private holding. Forest coffee land in the Harenna was granted to higher government officials and royal family members as private property. The new land owners employed laborers from other parts of the country to undertake forest coffee management via canopy opening, slashing under growth and refilling using wild seedlings from the forest. The local communities were excluded from land use rights of forest coffee. In 1944 forest coffee land tax increased to 40 ETB per 40 hectare making forest coffee ownership difficult for the local people. In response to the denial of forest coffee use rights, the local people started an armed struggle against the government using the Somali border to smuggle through weapons. To resolve the conflict the King reversed the forest coffee land granted to central government officials and restored the tenant-landlord system.

Traditional use rights for seasonal grazing and beekeeping remained unchanged except for a tax levy imposed on use rights. The change in tenure system and other related changes on forest seasonal grazing land and beekeeping occurred without reshuffling the place of use of land users. This new system was introduced without disrupting the traditional

use area. For seasonal grazing a group of people grazing in the same area paid as a group 15 ETB per 40 hectare (uncultivated land rate). The property rights to a block of forest for beekeeping and the communal use rights for seasonal grazing were strengthened during this regime due to associated tax payments.

***The Military government regime (1974-1991)***

In 1974 the Military government came to power and ruled until 1991. This regime nationalized rural land, landlords were expelled and all agricultural land was allocated to the tenants. Forestland became state property. Tenants were allowed to maintain use rights for forest coffee, forest coffee was under the ownership of *Melkenya* and redistributed to local people without forest coffee land by the *Kebele* administration. Government began to favour settled agriculture over the pastoral system and most familys started crop production. Schools were built at the village level that most family enrolled their children to school.

At first, government tried to stop seasonal grazing as part of its support for settled agriculture and forest protection but was unable to enforce this. As all forest uses, including coffee were not recognized by government, no tax payment was required. The practice of seasonal grazing was modified due to school attendance and expansion of agriculture. Agriculture spread to the lower edge of the Harenna forest. Most seasonal grazing land users maintained their traditional holdings for both beekeeping and seasonal grazing. Elders or clan leaders resolved any conflicts in the seasonal grazing area.

Major change in forest blocks used for beekeeping occurred after the “Land for Tiller” proclamation. The proclamation states that forestland belongs to the state with no associated tax in recognition of private property rights for a block of forest. Young people started to place beehives inside other peoples private blocks. Individual use rights were reduced to tree use rights as enforced by elders and clan leaders. Individuals were only able to claim as his property trees he or his late family used for beehive placing. Property rights were recognized irrespective of whether a beehive was in place on a tree as long as it was once used by the individual or his family.

Some social norms like cutting live trees were no longer enforced as institutions enforcing rules changed along with the tenure system. Furthermore, wild bee colonies, for example those in trees and in caves became open access. Every year individuals aimed to find a wild bee colony as early as possible and to place signs of holding on it ensuring those coming late recognise it as occupied. The same applied to young trees in a potential bee site. Individuals could place a sign to indicate holding for future beehive placing. Signs used include fresh pollarding of the branch, small signs tree trunk using a machete or making a clearing around the selected tree. All activities are part of the social norms of the area and conflict is not common. If conflict were to occur the elders mediate.

Until the end of the regime the forest coffee management practice was focused on opening up the tree canopy and removing undergrowth to encourage natural regeneration as well as restocking coffee by planting wild seedlings. During the military regime coffee contributed 60% of foreign export income and all coffee produced in the country was prioritized for export. In most forest coffee producing areas, coffee was directly purchased from producers by state owned agricultural produce marketing enterprises. Coffee produced in the Harenna forest, until the end of the regime, was purchased by traders and taken to Arsi, highland Bale, Borena and Harer and sold for local consumption. As a result the price of coffee was very low in the area compared to other parts of country.

The low price of coffee gave no incentive for farmers to intensively work on their forest coffee holding. State forest protection was so strong that people were afraid to cut trees as aggressively as they do today as forest coffee was located in the lower part of the forest where monitoring is easy. Forest coffee systems were of smallholder farmers using natural forest or forest coffee. The same was true for seasonal grazing and forest beekeeping, with no tax payment related to forest coffee use.

Towards the fall of the regime the enforcement capacity of government reduced and most forest coffee areas were already owned by individuals. Young farmers and farmers wanting to expand their forest coffee started to plant wild seedlings in areas where there was no forest coffee. Large trees were removed to open the canopy and simplify the ecosystem, resulting in semi forest coffee management. Semi forest coffee systems are characterized by more or less uniform age coffee with few trees and few species as management favours coffee production.

***EPRDF regime, 1991 to date***

The Ethiopian peoples revolutionary democratic front (EPRDF) replaced the military regime in 1991. Many policy reforms have been introduced since the current government came into power, though little concerned the traditional forest land tenure systems. All natural forests fall within either the state or the regional forest category. Thus forestland continues to be under the ownership of the state, but the local communities continue to practise traditional use rights for seasonal grazing, forest coffee and beekeeping. Seasonal grazing advanced deep in to the forest. Due to increased livestock and human populations large groups broke into smaller groups and established their own *Arda* (seasonal grazing settlement) further into the forest. No major change in beekeeping occurred from the previous regime.

The marketing system of coffee improved since 1994 and wholesale buyers began buying coffee in the local market supplying the central market for export. As a result the market chain for forest coffee was improved and the price of coffee increased. However, in

the first five years of the regime, the new government focussed on political stability with little emphasis on forest resources. Over time forest coffee management intensified by clearing and burning for new coffee plantations in areas where there was no natural wild coffee in the forest.

The majority of the Harenna forest was open access during early years of the EPRDF regime. The situation has changed slowly since a major forest fire in the area in 2000 destroyed more than 25000 ha. The fire moved from forest areas where fire is used to prepare coffee plantation land, the dry climate enabled the fire to spread quickly. Following the forest fire the government tried to organize seasonal grazing based on the traditional system of settlement. The intensive forest coffee management pushed seasonal grazing into ungrazed areas deep into the forest where some of the grazing areas were converted to semi forest coffee.

***Current Level of Forest Land Use***

The current level of dependency on the Harenna were assessed for Delo Mena District (*Woreda*) considering forest coffee, seasonal grazing and forest beekeeping uses. The people living around Harenna forest in Delo Mena *Woreda* are highly dependent upon forest resources. The sample survey indicates the Harenna to be used for 36.3% seasonal grazing, 61% forest coffee and 22.9% for beekeeping. The level of use for all three reduces when the users live further away from forest border. Table 1: summarizes the percent of people who use Harenna forest based on their location. Only 22.8% of the people living around Harenna forest do not use any of the three major products.

| Location of the Kebele from forest border | Total No. Kebeles | No sample household | Forestland Use type | | | Non Users |
|---|---|---|---|---|---|---|
| | | | Grazing | Coffee | Beekeeping | |
| Forest border | 8 | 416 | 180 (43%.3) | 347 (83.4%) | 121 (29.1%) | 44 (10.6%) |
| 15 – 30 km away | 3 | 148 | 44 (29.7%) | 53 (35.8%) | 27 (18.2%) | 70 (47.3%) |
| More than 31 km | 3 | 116 | 23 (19.8%) | 15 (12.9%) | 8 (6.9%) | 41 (35.3%) |
| Total | 14 | 680 | 247 (36.3%) | 415 (61%) | 156 (22.9%) | 155 (22.8%) |

Table: 1 – Harenna forest use of local community living in different location with respect to forest edge

**The Women in Harenna Forest Use**

The data collected from village level indicates that 19% the household living around the Harenna forest have female headed households. Our random sampling gives us only 10.7% (73 HH) fall within our sample study. Female headed households use the Harenna for seasonal grazing, forest coffee management and beekeeping but less so than male headed households. The study indicates the female headed households are more involved in forest coffee management (47.9%) followed by seasonal grazing (21.9%). Only a few female headed households (8.2%) use the forest for beekeeping.

| Sex | Total HH in the study area | Total sample | Forestland use | | |
|---|---|---|---|---|---|
| | | | Grazing | Coffee | Beekeeping |
| Male | 11019 (81%) | 607 (89.3%) | 231 (38%) | 381 (62.8%) | 148 (24.4%) |
| Female | 2554 (19%) | 73 (10.7%) | 16 (21.9%) | 35 (47.9%) | 6 (8.2%) |
| Total | 13573 | 680 | 247 | 415 | 157 |

Table 2: Harenna forest use of local community with respect to sex of household head

**Demand for Institutional Change in seasonal Grazing area**

From the total of 680 sampled households, 36% or 247 household practiced forest seasonal grazing land use, and 96% regularly take their livestock to particular place every year, 86% have people with whom they settle together every year. Ninety percent of the interviewees agreed to the need to regulate current seasonal grazing land use and 49.8% agreed on the need to define grazing zone for different *Arda*, 87.8 % demand to fix the grazing start date and 87.4% demand to fix the date of exit from forestland.

**Conclusion and recommendations**

By looking at forest land based livelihoods across four different regimes in Ethiopia, we illustrate that a series of social-economic drivers have influenced the environmental sustainability of the Harenna. Past regimes preserved traditional land use rights that were overseen by an effective and transparent system of local governance. Traditional systems of restrictions, sanctions and punishments served to protect forest resources over generations. With each passing regime local populace returned to traditional systems of management. The current regime places unprecedented pressure on forest resources causing anthropogenic destruction within the Harenna. The combined socio-economic drivers are likely to increase the vulnerability of the Harenna forest ecosystem and reduce the ability of the system to support the local populations. Our results suggest that traditional resource governance has worked best over time. Increasing demand within the local community to better define current forest resource uses suggests the vulnerability of forest resources is also an issue of concern for local communities.

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**Appendices**
**Appendix I. Name of Participants**

1.Aliyyi Balda, Rira village
2. Umar Husein, Rira
3. Haji Kadir H/Husein, Rira
4. Haji Nure Mohammad, Rira
5. Sultan H/Gobe, Rira
6. H/Kassim Harbe, Rira
7. Gishu Yange, Hawo
8. Kassim Obsa, Hawo

**Appendix II. Questions used for the discussion**

# LOCAL RESOURCE USE AND ASSOCIATED INSTITUTIONS IN HARENNA FOREST

## INFORMATION ABOUT THE STUDY

## AIM OF THE STUDY

The purpose of the study is to improve understanding about the different forest resource users (seasonal grazing, honey and forest coffee) and associated local institutions used to govern resource use.

## OBJECTIVES OF THE STUDY

A. To understand socioeconomic characteristics of people engaged in seasonal grazing, forest coffee production and forest honey production,
B. To investigate perception of forest resource users about natural resource degradation and their demand for change in resource governance system, and
C. To understand about the current local resource governance systems (institutions) related to seasonal grazing and forest honey production.

## EXPECTED OUTPUTS

1. Socioeconomic characteristic of people engaged in transhumance, forest coffee management and forest honey production
2. Resource users perception about resource degradation
3. factors that determine resource users demand for institutional change (resource governance systems)
4. Local community norms, institutions, cultures, etc that support resource use system
5. Estimated number of households using Harena forest and the number of livestock grazing used to graze in the Harena forest during the dry season can be extrapolated.

## PARTICIPANT OF THE STUDY

Systematically selected household heads, these depend on Harena forest for different forest products and services, from 14 peasant associations in Delo-Mena Woreda. The sample covers at least 5% of the households in the 14 peasant associations. The sample size is around 750 household heads.

## ESTIMATED DURATION OF THE INTERVIEW PER INDIVIDUAL

1hour and 30 minute

## CONTACT DETAIL OF THE RESEARCHER

Dereje Tadesse Wakjira, Bale Mountains National Park
P. O. Box 165, Bale-Robe,
Email:

## SECTION FOR ENUMERATOR

Dear enumerator your contribution is highly valuable. Please give your comment about the overall interview and about the issue that were of your concern during the interview process. You may also give any suggestions in relation to particular questions whether they were understood or not by the respondents.

| Date of Interview _____ | Questionnaire ID No _____ |
|---|---|

**1. RESPONDENT'S (HOUSEHOLD) DEMOGRAPHIC PROFILE**

1.1 Can you tell me the name of Kebele where you and your family reside? _____

1.2 Respondent's residence place distance from Edge of Harenna forest _____Km

1.3 Gender of the respondent 1. Male 2. Female

1.4 Could you please tell me your age? _____

1.5 Could you please indicate your highest level of education you attended (0 to 12)? _____

1.6 Could you please indicate your marital status?

1. Single 2. Monogamous 3. Polygamous

4. Divorced 5. Widowed

1.8 Could you please indicate the number of your **family member** including household head?

Male _____ Female _____ Total _____

1.9 If you have children, how many children do you have (only those under his/her support)?

Male _____ Female _____ Total _____

1.10 How many of your children are above five years old?

Male _____ Female _____ Total _____

1.11 How many of your children are attending school?

Male _____ Female _____ Total _____

1.12 Do you own house in town?

0. No 1. Yes 2. I don't' know

**2. HOUSEHOLD LIVELIHOOD**

2.1 Could you mention your major livelihood sources? Rank them according to their importance for your family support?

**0**- Not important; **1**- Important; **2**-Less Important

| No | Economic activity | Rank | No | Economic activity | Rank |
|---|---|---|---|---|---|
| A | Crop farming | | E | Wood and wood sale | |
| B | Animal husbandry | | F | Off-farm activity | |
| C | Forest coffee | | G | Fruit and vegetable | |
| D | Forest honey | | H | Others, please specify | |

2.2 On a scale of 0 – 2, please rank in terms of importance the following sources of labour for your agricultural practices (crop, coffee, fruit, honey etc)

**0** = Not important **1 =** Important **2 =** Less important

| **Source of labour** | Score |
|---|---|
| A. Family | |
| B. Reciprocal support/*Debo or Jiga*/ | |
| C. Hired labour | |
| D. Allowing share cropping | |
| E. Other, please specify | |

2.3 Which off-farm activities are you practicing to support your family?

1. Run small shop/cafeteria
2. Petty trade
3. Grain mill
4. Sell Wood and wood product
5. Carpentry
6. I am not practicing off-farm activity

2.4 Please indicate the use pattern of land under your ownership

| No | Type of land use | Land size in Ha |
|---|---|---|
| A | Rain-fed agriculture | |
| B | Irrigated agriculture | |
| C | Home garden | |
| D | Private pasture | |
| E | Fruit orchard | |
| | Total land holding | |

2.5 Are you plowing all your land under your ownership?

1. Yes, I plow myself
3. I plow part of my land and share crop part of it
3. Share crop all my land
4. Lease all
5. I don't have agri land

2.6 Are you farming other farmer's land through share cropping or contract?

0. No
1. yes
2. I don't know

2.7 Could you please indicate the total number of livestock owned by your family?

| No | Type of livestock | Number | No | Type of livestock | Number |
|---|---|---|---|---|---|
| 1 | Ox | | 6 | Sheep | |
| 2 | Cow | | 7 | Goat | |
| 3 | Calf | | 8 | Horse | |
| 4 | Bull | | 9 | Mule | |
| 5 | Heifer | | 10 | Camel | |

| | | | | | |
|---|---|---|---|---|---|
| | Total | | 11 | Donkey | |

2 .8 Are you keeping your relative's or other people's livestock?

0. No 1. Yes 2. I don't know

2.9 If the answer question 2.8 is yes, what type of arrangement you agreed for the service you provide?

1. Income sharing during sale 2. Collecting fee per year/month
3. Part of support to each other 4. Use the animal for service

**3. SEASONAL GRAZING LAND USE**
**TRANSHUMANCE TO THE HARENNA FOREST**

3.1 Are you taking your livestock regularly to Harenna forest as transhumance (Godantu) for seasonal grazing?

0. No 1. Yes 2. I don't know

**If the answer for question number 3.1 is no please proceed to section 4**

3.2 Can you give **two main** reasons why you practice transhumance (Godanca)?

1. Lack of water 2. Lack of fodder
3. Lack of land (space) 4. Tradition/culture
5. Lack of shade/escape sunstroke 6. Other (specify)

3.3 Do you have particular place where you took your cattle regularly in the forest during seasonal grazing?

0. No 1. Yes 2. I don't know

3.4 If the answer for question 3.3 is yes, can you list in order the name of places where you took your livestock for grazing in the forest?

1st place _____
2nd place _____
3rd place _____

3.5 Why do you select these particular places for grazing? Because:

1. My ancestors was using the area 2. My relatives/kin are using it
3. My village using the land 4. My PA use the land
5. The land has good grass and water 6. Other (specify)

3.6 Who will accompany your livestock during forest transhumance for seasonal grazing?

1. Relatives/Neighbor 2. All family members
3. Only household head 4. Household head and some family members
5. Children 6. Spouse and some family members
7. Only spouse 8. Other (specify)

3.7 Are you regularly changing your place of settlement and grazing within the same year in the forest?

0. No 1. Yes 2. I don't know

3.8 If the answer for question 3.7 is yes, why do you change?

1. When the fodder decreased 2. When water source for cattle dried
3. To avoid degradation 4. To escape sunstroke
5. Other (specify)

3.9 Have you ever changed your old seasonal settlement and grazing area in the forest because of one or more of the following factors?

**0** = No **1** = Yes 2. I don't know

| Factors | Rank | Factors | Rank |
|---|---|---|---|
| A. The land is occupied by coffee | | D. Luck of water | |
| B. The quality of grass is poor | | E. Kebele administration prohibit | |
| C. The area is over taken by others | | F. Number of my livestock increased | |

3.10 Did your parents practice transhumance in the forest for seasonal grazing in the past?

0. No 1. Yes 2. I don't know

3.11 If the answer for question 3.10 is yes, can you list the names of particular place where your parents settle for seasonal grazing in the forest?

1_____ 2 _____

3.12 Who will determine the time of transhumance to and from the forest during seasonal grazing in your village?

1. The villagers 2. Individual preference
3. Based on rain season 4. Animals move by themselves
5. When the fodder is finished 6. Other (specify)

3.13 Do you have a particular group of people with whom you are yearly settling in the forest for seasonal grazing?

0. No 1. Yes 2. I don't know

3.14 If the answer for question 3.13 is yes, why do you select your group member?

1. Relative/family/kin 2. Neighbor
3. Same Kebele 4. Same (village) Gere/Birki
5. Past family relation 6. Other (specify)

3.15 Have you encountered any conflict related to seasonal grazing land use in the forest?

0. No 1. Yes 2. I don't know

**If question 3.15 is yes proceed to 3.16 otherwise 3.18**

3.16 What type of conflict?

1. Occupy my settlement site 2. Cattle grazing in my territory
3. Plant coffee in the area 4.Animal looting
5. Other (specify)

3.17 Who mediate the conflicts?

1. Elders 2. Kebele admin/court
3. Woreda court 4. Not settled 5. Other (specify)

3.18 Which of the following issues are problem in your seasonal grazing area in the forest?

**0= Not problem 1= Problem 2= Serious Problem**

| No | Issues | Rank | No | Issues | Rank |
|---|---|---|---|---|---|
| 1 | Shortage of fodder in the forest | | 6 | Expansion of coffee to grazing area | |
| 2 | Shortage of water | | 7 | Occupying settlement area by other people | |
| 3 | Grass is overtaken by weed | | 8 | Competition for grazing area | |
| 4 | Wild animal attack | | 9 | Early leaving for seasonal grazing | |
| 5 | Degradation of fodder | | 10 | Extended period of grazing | |
| | | | 11 | Other | |

3.19 Do you think all the seasonal users should discuss and develop rules to overcome problems stated under the question 3.18?

1. No 1. Yes 2. I don't know

3.20 Which of the following proposed rules do you think important to be included to regulate the current unregulated seasonal forest grazing land use?

**0. Not Important** **1. Important**

| Regulation | Rank |
|---|---|
| A. Defining grazing area for group of users | |
| B. Setting fixed date for seasonal grazing start months | |
| C. Setting fixed date for grazing season | |

3.21 In your opinion what type of development do you think that will stop people from forest seasonal grazing with out affecting their livelihood?

1. Supply of enough Fodder 2. Water supply for cattle
3. Building Shade 4. Irrigation scheme
5. Providing grass hay 6. Introducing non farming activity

3.22 Do you agree or disagree on the ideas in the table below?

0. Disagree 1. Agree

| Ter. | Yaada | response |
|---|---|---|
| 1 | Every year during forest seasonal grazing, you worry whether you can found good grass and fodder for your cattle or not | |
| 2 | Every year during forest seasonal grazing, you worry for the coming generation in case the forest is degraded and they loss seasonal grazing forest | |
| 3 | You worry in case government deny use right of the forest seasonal grazing in the future | |
| 4 | You worry for the future generation in case government deny them use rights of the forest for seasonal grazing | |

3.23 If this forest is protected and you are denied to graze inside the forest, how significant would be its effect on your livelihood?

0. No effect at all 1. Less significant
2. Significant 3. Highly significant

## 4. TRANSHUMANCE TO THE LOWLAND

4.1. Are you practicing transhumance (Godantu) for seasonal grazing to lowland?

0= No 1. Yes 2. No

**If the answer for question 4.1 is no please proceed to section 5**

4.2 Can you give **two main reasons** why you practice transhumance to the lowland?

1. To find more animal fodder 2. Lack of land (space) for cattle

3. Tradition/culture 4. To escape animal disease

5. Other (specify)

4.3 Why do you select the area where you are regularly taking your livestock in the lowland for seasonal grazing?

1. It was my ancestors land 2. It is my relatives/kin land

3. It is communal land of my Kebele 4.It is open to everybody

4.4 Have you ever abandoned/changed your regular seasonal grazing place in the lowland because of the following factors?

**0** = No **1** = Yes 2. I don't know

| Issues | Rank | Issue | Rank |
|---|---|---|---|
| A. The land is occupied by agriculture | | D. Shortage of water | |
| B. The land is taken by other farmers | | E. Wild animal problem | |
| C. Shortage of fodder | | | |

4.5 Did your parents practice transhumance in the past to the lowland for seasonal grazing?

0. No 1. Yes 2. I don't know

**5 .FOREST COFFEE MANAGEMENT**

5.1 Do you have coffee land?

1. No 2. Yes 2. I don't know

**If the answer for 5.1 is no proceed to section 6**

5.2 Type of coffee land size in hectare?

| No | Type of coffee | Area (ha) |
|---|---|---|
| 1 | Old Semi forest coffee (Mintaro Duri) | |
| 2 | New semi forest coffee (kan baddaa jala dhaabame) | |
| 3 | Plantation coffee (Atakilti) | |
| | Total | |

5.3 How do you first own your different forest coffee land?

-*You may choose **several** answers* -

1. Inherited from family/relative 2. Planted by my self in the forest

3. Owned and managed wild coffee by myself 4. Bought from other farmer

5. Allocated by Kebele administration 6. Lease from other farmer

5.4 Do you think there is a need to develop common rule and regulation by which everybody should abide during forest coffee management practice to conserve biodiversity?

1. Yes 2. No

**6. BEEKEEPING**

6.1 Are you engaged in Beekeeping?

1. Yes 2. No

**If the answer for question 6.1 is no please proceed to section 7**

6.2 Where do you and your family keep (place) your beehive for honey production?

1. Home garden 2. In the forest of my village

3. In the Harenna forest 4. In the Lowland woodland

6.3 How do you access these places for hanging the beehive?

1. My earlier family use the area (tree) 2. Hold and claim the land (tree)

3. It is my private land 4. Allotted by administration

6.4 How many beehives do your family own? _____

6.5 How many kilograms of honey did your family harvest in average annually in Kg? ____

6.6 Do you have a particular group of people with whom you are placing beehive in one surrounding?

1. Yes 2. No

6.7 If the answer for question 6.6 is yes, why do you select the group with whom you are placing beehive in same area?

1. Relative/family/kin 2. Neighbor

3. Same Village 4. Have past family relation

6. Other (specify)

6.8 Have you encountered any conflict related to beekeeping in the forest?

1. Yes 2. No

**If question 6.8 is no proceed to section 7**

6.9. What type of conflict?

1. Placing beehive in my territory 2. Theft
3. Cutting tree 4. Coffee planting in the area
5. Grazing in the area 6. Other (specify)

6.10 Who mediate these conflicts?

1. Elders 2. Kebele admin/court
3. Woreda court 4. Not settled 5. Other (specify)

6.11 How is the situation of respecting the traditional rules related to beekeeping tree and land use as compared to earlier time?

1. Increasing 2. Decreasing 3. Same

6.12 Do you support introduction of rule and regulations, based on traditional rules, to secure ownership right and responsibility of beekeeping area of an individuals

1. Yes 2. No

**7. PERCEPION**

6.1 What is your personal feeling on the following ideas?

**0.** Disagree **1.** Agree

| Forest Activity | Rank |
|---|---|
| A. Forest coffee management degrade forest | |
| B. Forest coffee management deteriorate fodder availability for livestock | |
| C. Forest coffee management will destroy bee fodder | |
| D. Forest coffee management reduce availability of construction material | |
| E. Forest coffee management will reduce wildlife abundance | |
| F. Forest seasonal grazing degrade bee fodder availability | |
| G. Forest land seasonal grazing (Transhumance) degrade forest quality | |
| H. Forest seasonal grazing destroy forest coffee | |
| I. Forest seasonal grazing land use will reduce wildlife abundance | |
| J. Traditional beehive making destroys forest | |
| K. Beekeeping in the forest will cause forest fire | |

**At the end for the respondent: -**

Thank you very much for spending your precious time to share your knowledge and wisdom with us. We are looking forward to meeting with you in the near future and inform you about the over all picture we obtained in relation to coffee management in the community. However, before we close our discussion we would like to invite you to share with us any views and opinions you, your family members or your relatives have in relation to coffee management or regulations relating to coffee management in your area.

THANK YOU!!

## Appendix III. Settlement Pattern in the seasonal grazing area

Current seasonal forest land grazing use settlement has a structure. The settlement structure is ordered as: **Genda, Olla, Arda and Lega**.

**Genda** is the smallest settlement unit that consists between 1 – 5 households. In most cases Genda consists brother, father, son and son in law settling in one area and sharing one or more livestock crush (*Mona*) together. Other close relatives or neighbors can also form Genda having an independent hut and crush for livestock in the middle. Among Genda members household daily uses like food, milk, coffee, etc, flow during seasonal grazing. They livestock graze together and keep one herd with the family members.

**Olla**: a group of Genda forms Olla. Olla is a group of Gendas settling within close territory at certain distance (within a kilometre distance from each other) from each other. In most cases the family are from the same village or neighborhood. They settle in close areas but with separate housing and livestock crush. Olla consist of 5 – 10 Gendas living in one territory. Their livestock graze in the same territory but do not move together as one herd. Even though resources flow between them the Gendas are limited as the people are very close to each other. They support each other by carrying food and consumables from permanent settlement to seasonal settlement place, support on market days (buying and selling consumables), household heads stay with livestock and keep watch in turn (travelling between the seasonal and permanent settlements) while children or one family member per household remain with the livestock. They also support each other in agricultural activities in their permanent settlement place through working on field, relieving members from herding to go home agricultural practice.

**Arda**: is the biggest functioning unit in terms of seasonal grazing resource use. Arda is a group of Ollas that share the same territory of forest land for grazing and beekeeping that evolved from earlier customary use rights. The neighbouring Gendas within Arda can be within 3 - 5 km range. They closely support each other in three main areas; beekeeping, herding and community. During beekeeping the member can work as *Jiga* (reciprocal support) in beehive preparation (preparing hive cover, fumigating hive and placing hive on the tree) and honey collection during seasonal livestock grazing in the forest. In herding they help by chasing predators such as Lion from village, they look after weak cattle, and search for lost cattle. They also support in community issues like funerals, helping sick

people, carrying sick people to the health centre, supporting the poor by contributing honey in kind, etc.

**Lega**: A group of Ardas are called Lega. This is the largest unit in the settlement structure of easonal migration. In this study we reached one Lega that consisted of 16 Ardas.