Conserving biodiversity in the modernising farmed landscapes of Uganda

First Annual Report

April 2005 – March 2006

Site selection visits. Pictured are Dianah Nalwanga-Wabwire (PhD student, Makerere University) and David Mushabe (NatureUganda)

Submitted by

British Trust for Ornithology

May 2006

Darwin Initiative

Annual Report

1. Darwin Project Information

Project Ref. Number	14-032
Project Title	Conserving biodiversity in the modernising farmed landscapes of Uganda
Country(ies)	Uganda
UK Contractor	British Trust for Ornithology (BTO)
Partner Organisation(s)	Nature Uganda (NU); Makerere University Institute of Environment & Natural Resources (MUIENR); Makerere University Department of Forest Biology and Ecosystems Management; Danish Institute for International Studies (DIIS); Ugandan Wildlife Society (UWS); Plan for Modernisation of Agriculture (PMA); National Agricultural Advisory Development Service (NAADS); National Environment Management Authority (NEMA); Royal Society for the Protection of Birds (RSPB), Bournemouth University
Darwin Grant Value	£65,915 (this period)
Start/End dates	Start June 2005; End December 2008
Reporting period (1 Apr 200x to 31 Mar 200y) and annual report number (1,2,3..)	1 April 2005 to 31 March 2006. Annual Report 1.
Project website	http://www.bto.org/research/projects/farmland/uganda.htm
Author(s), date	Phil Atkinson, David Mushabe & Juliet Vickery, May 2006

2. Project Background

Traditionally the wider countryside has been relatively under valued for its biodiversity. Instead, attention has focussed on biodiversity hot spots and protected areas. This project begins to address this knowledge gap by providing quantitative information on patterns and trends in biodiversity (birds, insects [with an emphasis on pollinators] and trees) in relation to agricultural land use in a sample of smallholder and large-scale farming systems in the Ugandan banana / coffee arc around Lake Victoria.

The work will be undertaken in sites that are stratified across a gradient of agricultural intensity, ranging from smallholder mixed-cropping systems to large agricultural systems characterised by mono-cropping and high use of fertilisers and pesticides. Census and survey techniques will be used to quantify the patterns of biodiversity (e.g. species abundance, richness and diversity) in each of these sites. This will be done in parallel with socio-economic studies of these agricultural systems in order to identify agricultural practices that benefit biodiversity and enhance income. These data will be used to identify best practices for sustainable land use options that also support high levels of biodiversity. These best practices will, in turn, be disseminated to agricultural development agencies and service providers and selected local communities within Uganda and be used as a basis for policy advice to the Ugandan Government. The project will also aim to identify indicators of high biodiversity in farmland and data collected will serve as a baseline for future

monitoring programmes (particularly for birds and insects) in agricultural systems in Uganda. We expect the results to be applicable to similar agricultural systems elsewhere in eastern Africa and that the approach adopted could serve as a framework for addressing similar issues further afield.

3. Project Purpose and Outputs

The project log-frame is given in Annex 1. This sets out the project purpose and outputs and these remain the same as in the original application. The overall purpose is to identify best practice for the long-term conservation of biodiversity in selected farmed landscapes in Uganda and establish a framework for sustainable agricultural development and monitoring.

The broad objectives are:

i. To understand the relationships between biodiversity and farming practices and identify best practices (including novel approaches).

ii. To identify and quantify the economic importance of on-farm biodiversity and its loss, and economic implications of novel land management approaches.

iii. To enhance capacity in agricultural biodiversity science, policy and practice.

iv. To translate best practices, including novel approaches, into practical advice for farmers.

v. To make policy and relevant advice developed within the project available to all relevant parties and stakeholders.

vi. To establish a system for the long term monitoring of agricultural sustainability.

vii. To create a framework for integrating biodiversity issues into national policy.

4. Progress

Objectives of the first year

By the end of this project year the aim was to have established efficient management structures, recruit PhD students, Research Assistants and other project staff at NU and UWS, identify field sites, provide initial training for PhD students and Research Assistants in sampling design and field protocols, finalise field methods and complete the first round of fieldwork. These aims have been achieved although by 31 March 2005 we were approximately six weeks behind in the fieldwork schedule due to delays in selecting sites. The modifications we have subsequently made to the fieldwork schedule will mean that the extent of data collection will not be compromised by this delay (see section f below).

Progress and achievements

a. Recruitment of project staff

The PhD research positions were widely advertised through networks such as Birdlife International (East Africa partners), Tropical Biology Association and personal contacts at a number of Universities in East Africa. We had 17 PhD applications from five countries (Democratic Republic of Congo, Kenya, Tanzania, South Africa and Ethiopia) and 22 applicants for the Research Assistants (open to Ugandans only). We interviewed 12 applicants for the posts. The interview panel comprised Juliet Vickery (BTO) Professor Derek Pomeroy (Ornithologist - MUIENR), Frank Kansiime (Director MUIENR), Philip Nyeko (Entomologist – FFNC) David Mutekanga (UWS) and Achilles Byaruhanga (NU). Applicants were scored by each panel member against a set of criteria listed on the score sheets included in Annex 2. These scores were used to guide selection but we also discussed applicants with respect to their ability to fit into a team and work well together. We appointed Dianah Nalwanga-Wabire as the ornithological PhD student and Theodore Munyuli as the

Entomological PhD student with Maurice Mutabezi and Raymond Katebaka as the two Research Assistants.

Nature Uganda and Uganda Wildlife Society were responsible for their own recruitment and appointed David Mushabe (NU) and David Mutekanga (UWS) and Olivia Nantaba (UWS).

b. Project management systems

Establishing an efficient project management and steering group structure was a major goal of the first year. This has been required at three levels; between the project and external stakeholders such as PMA and NAADS, between project partners at the overall management level; and between field workers and scientific supervisors. The management structures we have implemented operate at these different levels, although they are not mutually exclusive

The project was launched at a 'Project Inception Meeting' in the Africana Hotel in Kampala in September 2005. The meeting was attended by 22 participants from 14 different organisations (a full report is given in Annex 3). The meeting served to raise awareness of the project from its inception and engage a range of organisations involved in agriculture and environment research and policy initiatives. Future meetings are planned as part of the agricultural biodiversity working group and the Natural Resources Sub-Committee of the PMA.

Co-ordination between project partners in Uganda is assisted by regular (monthly) management meetings between UWS (David Mutekanga with Olivia Nantaba as deputy) NU (Achilles Byaruhanga with David Mushabe as Deputy) and MUIENR (Frank Kansiime with Derek Pomeroy as deputy). In addition Olivia Nantaba is responsible for collating and producing brief monthly email updates to all project partners (Uganda and UK) by the end of the first week of every month. These report on key activities of all staff and any difficulties/delays that have arisen or are likely to arise in the near future. More formal steering group meetings take place twice a year between BTO and Ugandan partners. These have been held in September 2005 and March 2006.

Scientific supervision of the field team is through a scientific steering committee comprising Derek Pomeroy & Frank Kansiime (MUIENR), Philip Nyeko (FFNC), Juliet Vickery & Phil Atkinson (BTO), Paul Donald (RSPB), Simon Bolwig (DIIS), Simon Potts (University of Reading) and Adrian Newton (University of Bournemouth). The students are required by MUIENR to produce bi-monthly brief reports on progress. We have also asked for weekly brief email updates from the two PhD students informing us of progress with respect to sites visited and sampled and any major delays.

c. Site selection

Considerable time and expertise was devoted to the issue of site selection, central to the success of the research programme. The selection of study sites took much longer than anticipated but all project partners agreed on the necessity of ensuring we had selected the optimal combination of sites at the outset and we are confident this is now the case. The aim was to select at least 20 sites that encompassed a broad range of agricultural systems all within 'working distance' of Kampala. We used population density as a surrogate for agricultural intensity and selected 5 clusters sites: Very high (400-500 pers/km2) – Bujagali; High (200-400) – Masaka and Kamuli; Medium (100-200) – Kalagi and Mpigi; Low (50-100) – Nakaseke. In addition, we selected two sites in plantations of each of the following; sugar cane coffee and tea, making a total of 26 sites. These sites are within 200 km of Kampala, three clusters requiring overnight trips in order to carry out early morning bird surveys. The clusters all fall within the banana-coffee arc around Lake Victoria (see map in Annex 4). Individual sites comprise an area of roughly one square kilometre and baseline maps of each of the 26 sites have been produced using hand held GPS and data and

expertise from the National Biodiversity Data Bank at MUIENR. A full report on site selection is included as Annex 5.

d. Training of PhD students, Research Assistants and other field staff

A one-week training course was run in February 2006 by Paul Donald of RSPB. This included a two day formal workshop 'Estimating numbers of wild animals: An introduction to survey and census methods'. The timetable and contents of this course are given in Annex 6 along with a copy of the certificate issued to the students. This provided basic theoretical and practical training in experimental design, sampling protocols and field methodology. Following this course Paul Donald spent three days in the field with the team trialling field methods and discussing the data these field methods yielded. Subsequent field methods were based, in part, on pilot data collected during this training workshop. These have been modified and adapted through email exchanges and two subsequent visits by Phil Atkinson and Simon Bolwig.

e. Summary of field methods

Within each 1-km square, birds are surveyed using Timed (TCs) and Point Counts (PCs), both 10 minutes long, at 10 random locations within each site. Each site is surveyed over two days. On day 1, TCs are carried out at five points and PCs at the other five and vice versa on day 2. These two methods were trialled and it was found that the species accumulation curve on PCs was much slower than for TCs. The main reason for this was that extra effort had to be taken on PCs, as birds have to be placed into distance categories for density estimation using DISTANCE. This more intensive sampling (on TCs only species lists are made) meant that rarer species were under-recorded in comparison with TCs. To ensure that there are sufficient data for both density estimation (common species only) and also presence/absence type data (rare species), it was decided to use a combination of the two methods. Habitat and environmental data are recorded in circular plots of 25 m radius at each point count location.

Insect pollinators are sampled using pan traps and butterfly traps and transects along a 1 km transect roughly through the centre of each site (see diagram in Annex 7). Initially 60 pantraps (20 blue, 20 yellow, 20 white – all sprayed with UV reflective paints) are being used but this may be reduced to 30 depending on the size of the catch. The traps are being placed in the early morning and collected the following morning. They will therefore be open for one day and one night. During the day butterfly recording and sweep netting are performed along the transects. Habitat data are recorded around traps and along this transect.

Land use data for the entire site is recorded along 5 x 1 km transects through the square following a protocol successfully used by a recent International Food Policy Research Initiative (IFPRI) study in Uganda. To describe the woody vegetation, trees and shrubs will be described in 20, 15 m radius plots. Socio economic data will be collected later in the fieldwork, around the time of harvesting from a subset of forms in each site (the location of the transects and point counts are shown in a schematic diagram in Annex 7).

The field data sheets used for species and habitat recording are included in Annex 8.

The logistics of carrying out this sampling regime, with three teams collecting different data from each site has required a great deal of careful planning. The second round of visits is now underway and most of the difficulties encountered in this respect seem to have been overcome. Supervisory visits are planned for June (Simon Potts) and July (Phil Atkinson and Juliet Vickery) to ensure any difficulties can be quickly addressed following the second round of fieldwork. Overall we are confident that the sampling regime developed is one that will yield a unique and high quality data set combining quantitative information on biodiversity and socio economics at the same location.

f. Fieldwork timetable

For the first year of fieldwork, our original plan was to have two three month field seasons. In subsequent discussions it became clear that a more detailed seasonal picture was desirable, especially for insects. This would be more accurately obtained from five to six eight-week rounds of fieldwork spread throughout the year rather than two 12 week field seasons. The fieldwork timetable has been modified accordingly. Each eight week round will comprise approximately six weeks in the field and a two week period in the lab, sorting and identifying specimens, entering data and writing reports. We feel confident that this will provide a comprehensive year-round data set on the bird, insect diversity as well as cropping patterns and yields.

g. Raising awareness of the project

Due to the delay in study site selection no formalised meetings have been held with groups of farmers. Rather, on field visits, we have ensured that extended discussions have been held with local councillors ("LC Chairmen and Secretaries") and individual farmers to obtain their permission to work in the area and disseminate information about the project. These have taken place at each site and have led to a good understanding between field workers and local people and a general acceptance of and interest in the project.

The Agricultural Biodiversity Working Group has met for the first time and terms of reference are being finalised. This has also raised awareness of the project and the group should provide the route through which scientific results can be used to inform policy in agriculture, land use and conservation.

After discussions with partners at the beginning of the project, it was decided that the project website should be hosted in Uganda by MUIENR. Unfortunately, the implementation of MUIENR's new website has been severely delayed and in the meantime the project web site has been hosted on the BTO's website. We are exploring options to host the website locally in Uganda until the MUIENR web site is operational. The project has been publicised in the UWS, NU and BTO newsletters and press releases have been made in Uganda.

Difficulties encountered

The project has encountered relatively few significant difficulties in the first year. Site selection proved much more complex and time consuming than anticipated. It was largely overcome by Simon Bolwig (DIIS) making an additional visit to the BTO to discuss site selection before his scheduled visit to Uganda (see Annex 9 for his discussion document on criteria for selecting sites). We are now confident that the 26 sites selected represent a common gradient in agricultural intensity in this part of Uganda and include the major crop types and/or systems.

Student laboratory space in MUIENR has been more difficult to find than expected. This is in part due to the need to find a room that is big enough to store large numbers of invertebrate samples and is accessible after hours for the students when they return from fieldwork. This has now been resolved and we are renting a room in the Department of Zoology.

Power is currently only available in Kampala on alternate days. This has had implications for UWS because the Darwin Publishing Unit can no longer be used to produce the publications for which they are responsible so these are now being put out to contract.

The disruption caused by the national elections, held in early 2006, meant we were unable to make a presentation to the Plan for Modernisation of Agriculture (PMA) Natural Resource sub-committee. This presentation will be made in the coming year.

Enhancement of project design

The project has been enhanced in two key ways; the timing of the sampling programme (i.e fieldwork timetable) and the rigour of the insect pollinator sampling. Fieldwork was originally planned as two discreet field seasons (Dec-Feb and June-Aug). Discussions between collaborators in relation to scientific value and logistical issues led us to decide to increase the intensity of fieldwork in year one to secure five to six rather than four visits to all 26 sites. This will increase the seasonal detail and accuracy for the biodiversity and socio-economic measures and yield a much more comprehensive data set.

We have established a good collaborative link with Dr Simon Potts of Centre for Agri-Environment Research at University of Reading. Dr Potts has a number of 'insect pollinator' research projects, some of which are Darwin funded, in South America, West Africa and India. He has been actively involved in advising on sampling protocols and those we are now using form part of, and follow methods adopted by, an international network following the same approach (developed through the ALARM project http://www.alarm-project.ufz.de/ see Annex 10). Dr Potts will be visiting the project in early June 2006 to advise in the field and laboratory. His involvement will undoubtedly enhance the rigour, efficiency and value of the insect data collection.

Timetable (workplan) for the next reporting period

July 2006	Second round of field visits completed.
July 2006	Third project Steering Committee meeting and additional training visit by UK staff and experts external to MUIENR for PhDs, research assistants and NU/UWS staff.
August 2006	Agreement reached between NAADS advisors and NU/UWS on the most effective approaches for technology participatory development. Newsletter for farmers drafted by PhD students.
September 2006	Formal discussion forum held between NU/UWS and local farming communities.
February 2007	Final round of field visits completed.
February 2007	Drafts of training material (for NAADS coordinators and private extension service providers) and information leaflets (for smallholders) produced and trialled at training workshops for NAADS coordinators, service providers and NU/UWS staff.
February 2007	Fourth project Steering Committee meeting (this has been advanced to coincide with the final round of data collection).
March 2007	Second round of discussions held between NU/UWS and key government staff, reporting on progress to date and confirming members of agricultural biodiversity working group.
March 2007	First exchange visit of Ugandan staff to UK, visiting BTO, RSPB and Bournemouth University. (This was originally planned for October 2006 but the alterations in the fieldwork protocol mean that it would compromise data collection so we have decided to postpone the training visit to coincide with the end of data collection.

5. Actions Taken in Response to Previous Reviews (if applicable)

Not applicable, this is the first annual review of this project.

6. Partnerships

This project has been very successful at developing and enhancing partnerships. Collaboration between UK & Ugandan/Danish project partners has been excellent. NatureUganda have taken the role of coordinating project activities in Uganda and all the project funds are channelled through them to reduce bank charges. This has the additional benefit of making accounting easier as they collate all financial records from the project partners. Collaboration has also been greatly facilitated by regular visits (four in the first year of the project) by Professor Derek Pomeroy to the UK. These visits have been as part of other work Professor Pomeroy is involved with but they have provided the opportunity for a day of discussions in Cambridge on each occasion.

One initial problem we had was the lack of close communication between partners in Uganda. Over the past year, each partner has tended to undertake its tasks in isolation to the others. To overcome this, regular management meetings now take place between partners and email communications are circulated to all project staff. This will be coordinated by UWS. Olivia Nantaba (UWS) will speak to all staff each month and send round an email detailing progress by the end of the first week in each month. She will also arrange management meetings between the Director of MUIENR, senior NU and UWS staff at regular intervals to discuss project management and solve problems

The Agrobiodiversity working group has opened up a number of new collaborations including the VI Agroforestry project in Masaka, Uganda, Send a Cow, NARO Research Institutes and several departments at Makerere University. Within the UK, close collaboration with Dr Simon Potts (Reading University) has led to links with two other Darwin funded projects - Strengthening the National Biodiversity Strategy in Congo Brazzaville (Ref: 666; Simon Potts as PI) and Bees, Biodiversity and Forest Livelihoods in the Nilgiri Biosphere Reserve (Ref: 594; Simon Potts as UK project partner).

7. Impact and Sustainability

The first year has been devoted largely to recruitment, establishing steering groups and management systems and finalising field sites and protocols. In terms of the profile of the project the latter has involved many discussions with local people at all 26 sites. These have certainly raised the profile of the value of biodiversity outside reserves in general and on farmland in particular. The Project Inception Meeting (see Annex 3) and the establishment of the Agricultural Biodiversity Working Group has ensured policy makers are aware of the project and its aims. The existence of the project as quite a major one within MUIENR has also raised the profile of the issue of biodiversity loss on farmland among university academics.

The two students and the two research assistants have already received a great deal of training in project design, sampling protocols and quantitative survey techniques. This has been achieved through a formal training course with classroom and field teaching, field visits with University and UK supervisors and regular email correspondence.

8. Outputs, Outcomes and Dissemination

Project implementation timetable as defined by the milestones in the original proposal document.

Date	Milestone	Comments
June - 2005	Project start date	Project started on time.
August - 2005	Project management system and Steering Committee established.	The format of the Steering Group Committee and management systems were discussed and finalised during the visit to interview candidates in July.
August - 2005	Project web site established.	The project website was due to be hosted by MUIENR. However, their website is currently being designed and long delays have meant that the project web site is being hosted by BTO in the short term.
August - 2005	New project staff recruited in Uganda (2 PhD students, 2 field assistants, 1 NU post holder and 1 UWS post holder).	The staff and PhD posts were advertised and interviews for the PhD posts held in late July 2005. The NU & UWS postholders started on 1 September 2005 and students on 1 November 2005.
September - 2005	First project Steering Committee meeting.	This was held on the 26 September 2005 and a report is available at: http://www.bto.org/research/projects/farmland/inceptmtg.pdf
September - 2005	Study sites identified in the banana-coffee arc.	A visit was made in September 2005 by Phil Atkinson to discuss site selection. A report on this is available at: http://www.bto.org/research/projects/farmland/siteselection.pdf (Annex 5). After this initial visit, further sites were visited and mapped in October and November 2006.
September - 2005	First discussion forum held between NU/UWS and local farming communities.	During the site visits discussions were held with local official (LC Chairmen) and farmers within the villages and areas in which the

		project will be working. Because site selection took much longer than expected, we decided to invest time in informal discussion with as many farmers as possible in order to be able to start field data collection rapidly. We considered this a better way of talking to many farmers at many sites.
September - 2005	Training visit by UK staff and experts external to MUIENR for PhD students, field assistants and NU/UWS staff in study design, field skills/techniques, sampling and survey protocol training.	Two visits were made. The first in September 2005, coinciding with the first steering group meeting, was made by Phil Atkinson (BTO) & Simon Bolwig (DIIS). During this visit meetings were held with all project staff to discuss how we were going to implement the project and the type of data to be collected. A formal training visit was made by Dr Paul Donald (RSPB) 10-19 January 2006.
February - 2006	First three month season field season completed.	This was completed 6 weeks later than planned on April 14th. This was due to the complexity of site selection and poor weather. However, restructuring of fieldwork should make it possible to 'catch up' by scheduling more visits to each site in year one.
February - 2006	First discussions held between NU/UWS and key government staff, presentations made to PMA natural resource sub committee and framework/format for agricultural biodiversity working group discussed.	The Agrobiodiversity Working Group met and was formed on 3 March 2006. This involved government staff, NGOs, agricultural research institutes, university academics and project staff. PMA staff were invited but could not attend. A presentation has not yet been made to the PMA as the presidential elections in February 2005 caused serious disruption.
March - 2006	Second project Steering Committee meeting.	This was held on 10 February 2006.

Dissemination activities have included the production of a fact sheet about the project for students to hand out to interested parties, particularly during field trips to the 26 sites (see Annex 10). This is aimed at a broad general audience and provides an outline of the work, the aims and major outputs and contact details of collaborating

organisations. A poster about the work has also been produced for local people. The two radio programmes scheduled for this first year have been delayed but are scheduled to take place before mid June. One of these will be in Ugandan and one in English with the aim being to raise awareness of the value of biodiversity outside reserves in general and on farmland in particular. As described under section 7 there have been a large number of discussions between the field team and local people including chairmen of local councils on whose land the work is being carried out. Also as outlined under section 7 the establishment of the Agricultural Biodiversity Working Group has ensured policy makers are aware of the project and its aims. In the third year of the project time will be devoted to fund raising to continue aspects of the work and one of these will be to further publicise the results and key findings.

Outputs are given in table 1 following standard output measures.

Table 1. Project Outputs (According to Standard Output Measures). These include all the outputs for the project but not that most will appear later in the project.

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	TOTAL
1AB	2 PhD students appointed	2				
5	Other project staff receiving training	4				
6B	Number of training weeks provided	4				
7	Poster and project brochure produced for dissemination to farmers, government and NGOs	2				
8	Number of weeks spent by UK project staff on project work in the host country	30				
15ABC	Number of national press releases in Uganda,UK	2				
16ABC	Articles appear in BTO, NU and UWS newsletters	3				
17A	Agro-biodiversity Working Group established	1				
19A	Number of national radio interviews/features in host county(ies)	(due early in project year 2)				
19B	Number of national radio interviews/features in UK					
20	Estimated value (£'s) of physical assets to be handed over to host country(ies)	£18,000				
23	Matched funding from BTO	£13916				

- In Table 2, provide full details of all publications and material produced over the last year that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Details will be recorded on the Darwin Monitoring Website Publications Database. Mark (*) all publications and other material that you have included with this report.

Table 2. Publications.

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £

9. Project Expenditure

- Please expand and complete Table 3.

Table 3. Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March).

- Highlight any recently agreed changes to the budget and explain any variation in expenditure where this is +/- 10% of the budget.

10. Monitoring, Evaluation and Lessons

Monitoring and evaluation

We have implemented two relatively informal systems of monitoring progress; (a) weekly email updates from students to supervisors, these are very brief and designed simply to alert us if they have encountered any major problems in meeting the field work timetable, (b) monthly progress reports to all project partners via email (see also section 6). As for the student updates these are designed to be brief and ensure everyone is informed about progress and any problems that have or are likely to arise.

The University also requires students to submit more formal bi-monthly reports as a way of monitoring progress. These go to University Supervisors as well as Frank Kansiime the Director of MUIENR.

To date the main output of the project is the data being collected by the field team. The bird count data from round one has been sent to the BTO already and we will be examining this to ensure the methods remain appropriate given the sample sizes. Professor Pomeroy of MUIENR has a wide range of experience of bird survey work in Uganda and will also be examining these initial data. The PhD supervisors, Professor Pomeroy and Dr Philip Nyeko have also made several field visits with the students to ensure the field methodology is being applied rigorously.

Contribution of outputs and outcomes to project purpose

To date the main outputs of the project have been the training received by the field team and the data they have subsequently collected. Both are ongoing and central to the project, the former is part of the direct aim of capacity building, the latter will provide the information required to identify optimal agricultural practices for biodiversity and productivity.

The second main output has been the establishment of the Agro-Biodiversity Working Group. This will ensure policy makers are aware of the project and its aims and ultimately that the results of the project can be used to inform policy in land use, agriculture and conservation and hence help the Government meets its obligations under the CBD.

Lessons learned

The main lesson learnt is that it was necessary to improve project management by having one organisation in charge of logistics in Uganda and improving communication by making it one person's responsibility to contact all project staffonce a month and email progress. In addition, we have increased the frequency of email contact with PhD students during fieldwork to ensure progress is closely monitored.

11. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum)

■ I agree for ECTF and the Darwin Secretariat to publish the content of this section

In this section you have the chance to let us know about outstanding achievements of your project over the year that you consider worth highlighting to ECTF and the Darwin Secretariat. This could relate to achievements already mentioned in this report, on which you would like to expand further, or achievements that were in addition to the ones planned and deserve particular attention e.g. in terms of best practice. The idea is to use this section for various promotion and dissemination purposes, including e.g. publication in the Defra Annual Report, Darwin promotion material, or on the Darwin website. As we will not be able to ask projects on an individual basis for their consent to publish the content of this section, please note the above agreement clause.

ANNEXES

Annex 1	Log-frame and achievements
Annex 2	Score sheet used to evaluate PhD candidates & Research Assistants
Annex 3	Project inception meeting report
Annex 4	Map of study sites
Annex 5	Site selection report
Annex 6	Certificate awarded to participants of the week long census and field techniques training course
Annex 7	Diagram showing a stylised location of bird, invertebrate and land use transects
Annex 8	Field recording sheets (birds)
Annex 9	Discussion document regarding the rationale behind site selection
Annex 10	Details of invertebrate collection methods

Annex 1. Report of progress and achievements against Logical Framework for Financial Year: 2005/2006.

Project summary	Measurable Indicators	Progress and Achievements April 2005-Mar 2006	Actions required/planned for next period
Goal*:* 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 • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.			
Purpose *Identify best practice for the long-term conservation of biodiversity in selected farmed landscapes in Uganda and establish a framework for sustainable agricultural development and monitoring.*	*Advice on best practice disseminated to policy makers and agricultural extension service providers and integrated into agricultural development strategies by year 4. Baseline data, field and analytical protocols established for monitoring agricultural biodiversity (birds and insects) by year 3.*	The route through which research results can be translated to policy makers has been set up. Fieldwork and research to identify best practice is on target.	- *continue fieldwork and research* - *develop the Agro-biodiversity Working Group and strengthen links with the PMA and NAADS staff.* - *Draft out plans for the agriculture extension workers handbook and initiate establishment of demonstration plots*
Outputs			
2. Relationships between biodiversity and farming practices are understood and best practices (including novel approaches) identified.	Effects of changing agricultural policies and practices on biodiversity can be predicted by year 4. Biodiversity indicators identified and best practices (including novel approaches) described and documented by year 4.	Sites have been selected and the first round of fieldwork completed.	*Site selection proved difficult but was essential to get right to quantify these relationships. The fieldwork schedule has been reworked in the light if the logistical constraints imposed by selection of this series of sites.*

Project summary	Measurable Indicators	Progress and Achievements April 2005-Mar 2006	Actions required/planned for next period
3. Economic importance of on-farm biodiversity and its loss, and economic implications of novel land management approaches are identified and quantified.	The financial implications of changes in farmland biodiversity (particularly loss of pollinators) can be assessed and predicted by year 4. Best practices identified are related to income (from existing IFPRI data) and costs and benefits of novel approaches can be assessed by year 4.	Sites have been selected and the first round of fieldwork completed.	*Fieldwork will be undertaken in Year 2 as planned.*
4. Capacity enhanced in agricultural biodiversity science, policy and practice.	At least two African students trained to PhD level and up to 6 research assistants trained in biodiversity survey and census techniques. At least 50 NAADS agricultural service providers attend two training workshops in biodiversity assessment. Two NU/UWS staff trained in biodiversity assessment, participatory development proposal writing and raising of public awareness. Agricultural working group established.	Two PhD students and two Research Assistants and two NU/UWS staff have been recruited. They have taken part in the supervisory visits from UK project staff and took part in the workshop on survey techniques, study design and data analysis taught by Dr Paul Donald of the RSPB.	*Capacity enhancement of local partners is going well but in subsequent years the project will need to ensure that a good relationship is built up with agricultural extension workers and the Plan for the Modernisation of Agriculture staff so that capacity can be built in these organisations.*

Project summary	Measurable Indicators	Progress and Achievements April 2005-Mar 2006	Actions required/planned for next period
5. Best practices, including novel approaches translated into practical advice for farmers.	Increased awareness of and hands on experience with biodiversity issues and increased recognition of the value of biodiversity among farmers within the study area by year 2 and from nearby communities by year 4. Ability and willingness by these farmers to adopt and trial novel land management approaches by year 4. At least 50 NAADS agricultural extension service providers trained.	Contact has been made with the farmers and local council officials (themselves farmers) in the study sites. We have discussed the aims of the project with them and many were receptive to trialling novel land management techniques.	*Farmer fora meetings will be held in Year 2 and we expect to see more progress in this output in the coming year.*
6. Policy and relevant advice developed within the project is available to all relevant parties and stakeholders.	Information and materials on best practices packaged and distributed to policy makers and agricultural extension service providers by year 4. Biodiversity and agricultural manual produced for extension service providers and distributed by year 4. Two demonstration plots. Two supplementary funding applications submitted to potential donors by year 4.	The agrobiodiversity working group has been formed which included government officials as well as NGO and academic staff. This will be the main forum through which this output will be achieved.	*The main lessons learnt are that government officials are busy and so attracting them to meetings can be difficult. To overcome this we follow up any invitation with phone calls and ask for representatives to be sent, if the main invitee is not available. We also follow up absentees with a phone call. We will also be going direct to government organisations to make presentations to them.*

Project summary	Measurable Indicators	Progress and Achievements April 2005-Mar 2006	Actions required/planned for next period
7. System for long term monitoring of agricultural sustainability is established.	Readily repeatable, spatially referenced multi-taxa data collected and entered into National Biodiversity Database (NBDB) by year 4. Monitoring methodology/ protocol established and study sites geo referenced by year 4.	The transect routes and sampling points have been georeferenced.	*Over the next 2 years data will be entered into the NBDB. The data collection is such that it can be readily integrated.*
8. Integration of biodiversity issues into national policy is created.	Project proposals produced. Sustainability mechanism established through establishment of an agricultural biodiversity working group to promote biodiversity issues into future agriculture policy by year 4.	The working group has been formed and has met. Articles of association are being drawn up.	*See point 6 about attracting high level government officials to the meetings.*

Note: Please do NOT expand rows to include activities since their completion and outcomes should be reported under the column on progress and achievements at output and purpose levels.

Annex 2. Score sheets used to evaluate PhD candidates & Research Assistants.

a. PhD candidates (20th July 2005).

Panel member:
PhD Candidate:

Field experience survey work
Background knowledge
Local knowledge
Liaison skills
Courses / work experience
Knowledge of survey design
Level of field skills
Data handling
Computing/analytical skills
Writing skills
Working on own initiative
Overall academic ability
Science of presentation
Quality of presentation
Driving
Overall level of motivation
Other

Scores 1=low 5=high

b. Research Assistants (20th July 2005).

Panel member:
RA Candidate:

Field experience survey work
Background knowledge
Local knowledge
Liaison wskills
Courses /experience
Knowledge of survey design
Overall academic ability
Level of field skills
Data handling
Computing/analytical skills
Writing skills
Working on own initiative
Driving
Overall level of motivation
Other

scores 1=low 5=high

Annex 3. Project inception meeting report.

Conserving Biodiversity in the Modernising Farmed Landscapes of Uganda

Proceedings of the
Project Inception Meeting

Africana Hotel, Kampala, 26th September 2005

Prepared By
David Mushabe, Project Coordinator
NatureUganda

October, 2005

Project Partners

British Trust for Ornithology (BTO)

NatureUganda

Makerere University Institute of Environment & Natural Resources (MUIENR)

Makerere University Department of Forest Biology and Ecosystems Management

Danish Institute for International Studies (DIIS)

Ugandan Wildlife Society (UWS)

Royal Society for the Protection of Birds (RSPB)

University of Bournemouth

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Acronyms

BTO	British Trust for Ornithology
EU	European Union
FFNC	Faculty of Forestry and Nature Conservation
GIS	Geographical information System
MC	Management Committee
MUIENR	Makerere University Institute of Environment and Natural Resources
NAADS	National Agriculture Advisory Services
NARO	National Agricultural Research Organisation
NBDB	National Biodiversity Data Bank
NFA	National Forestry Authority
NGO	Non-Governmental Organisation
NU	NatureUganda
PEAP	Poverty for Eradication Action Plan
PMA	Plan for Modernization of Agriculture
RSPB	Royal Society for the Protection of Birds
UK	United Kingdom
UNFFE	Uganda National Farmers Federation
UWA	Uganda Wildlife Authority
UWS	Uganda Wildlife Society

Group Photograph of the Meeting Participants

From left back row: Mr. Achilles Byaruhanga (Executive Officer, NU), Mr. Ambrose Mugisha (Conservation Projects Officer, NU), Assoc. Prof. Frank Kansiime (Director, MUIENR), Mr Munyuli Theodore (PhD Candidate), Ms. Pauline Nantongo (Deputy Executive Officer, NU), Ms. Nakibuuka Marjorie (NBDB), Ms Dianah Nalwanga Wabwire (PhD Candidate), Mr. David R. Mutekanga (Executive Secretary, UWS), Ms. Sheila Taylor (Kulika Trust Uganda)

From left front row: Mr. Xavier N. Mugumya (National Forests Management Specialist, NFA), Ms. Beatrice Nabwire (GIS specialist, ICRAF), Mr David Nkuutu (Researcher, Botany Dept, Makerere University), Assoc. Prof. Joseph Obua (Head, Dept. Forest Ecology & Ecosyetm Mgt , FFNC), Dr. Philip Nyeko (Senior Lecturer, FFNC), Mr. Augustine M. Mwendya (Chief Executive Secretary, UNFFE), Ms. Vanice Mirembe (UWA), Akello Zerupa (Agric. Econ. Dept, Makerere University), Dr Phil Atkinson (BTO)

Overview

This report presents the proceedings of the inception meeting convened by NatureUganda (NU) for the project entitled "Conserving Biodiversity in the Modernising Farmed Landscapes of Uganda" that was held on 26th September 2005 at Hotel Africana, Kampala. The meeting, which lasted for a half-day and attended by 22 participants (see Annex 2 for full list of participants) that are engaged in various agriculture and environment related research and other activities in Uganda, was aimed at achieving the following objectives:

- Introduce the agro-biodiversity project and the work plan to key stakeholders and project collaborators.
- Present proposed research concepts/questions and methods on the project thematic study areas:
    - Birds
    - Pollinators
    - Socio-economic variables
- Discuss mechanisms/strategies for improved stakeholder participation in the implementation of the agro-biodiversity project (including, dissemination and application of research results).
- Constitute a steering committee for the project and
- Receive feedback on the proposed project implementation approach

The meeting combined presentations by project staff with discussions, comments and questions from participants on specific key issues that emerged from the presentations. The meeting had three sessions; the first two sessions, chaired by Assoc. Prof. Frank Kansiime, started with registration of participants, welcome remarks from the Chairman NatureUganda, Mr. Paul Mafabi, and this was followed by the opening of the meeting by Mr. David Mutekanga on behalf of the Chairman Uganda Wildlife Society (UWS). Presentations were made including an introduction of the project to the participants by Dr. Phil Atkinson (project background and objectives) while Mr. Achilles Byaruhanga gave an overview of the project work plan. This was followed by discussions and a coffee/photograph break.

The third session of the meeting, chaired by Assoc. Prof. Joseph Obua entailed presentation of the research concepts/questions and the proposed approaches by Dr Phil Atkinson. After questions/comments and clarifications arising from the presentation, the way forward and closing remarks were given by Mr. Achilles Byaruhanga and finally, participants were served lunch.

1. Opening Session

Chairman - Assoc. Prof. Frank Kansiime, Director MUIENR

1. 1.1: Introductory Remarks – Mr. Achilles Byaruhanga, EO NatureUganda

Mr. Achilles Byaruhanga introduced to the participants the guest of honour, Mr. Paul Mafabi chairman Nature Uganda, the project manager Dr. Phil Atkinson and the chairman for the first and second session of the meeting Assoc. Prof. Frank Kansiime. While highlighting the contents of the meeting agenda (see Annex 1), Mr. Byaruhanga also explained the purpose and objectives of the meeting, and handed over to the session chairman, who later invited the guest of honour to give the welcome remarks.

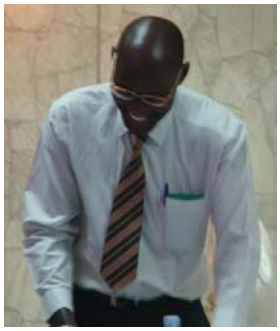
2. 1.2: Welcome Remarks - Mr. Paul Mafabi, Chairman NatureUganda

Mr. Paul Mafabi, Chairman, NatureUganda and Assistant Commissioner Wetland Inspection Division - Ministry of Water, Lands and Environment (MWLE), welcomed all the participants to the project inception meeting and expressed his appreciation for their participation. Before discussing the purpose of the project, Mr. Mafabi summarised the background and activities of NatureUganda. He pointed out that NatureUganda is a membership non-governmental organisation with a mission to promote the understanding, appreciation and conservation of nature. In pursuing this mission, he stressed that NatureUganda seeks to create a nature friendly public, enhance knowledge of Uganda's natural history, advocate for policies favourable to the environment, and take action to conserve priority sites, species and habitats. He further cited some of the important programmes that NatureUganda has been implementing such as the Important Bird Areas programme, including various community based conservation projects in some parts of Uganda.

Mr. Mafabi observed that this project largely complements the already existing community conservation initiatives and other projects by NatureUganda in and around the region. He reiterated that this meeting was only the beginning of the process and therefore counted on participants' experiences and knowledge of the area to supplement this project to finally come up with an intended benefits to provide Government and NGOs, development and conservation organisations and agricultural extension service providers in Uganda with the knowledge and capacity necessary to develop and promote land management approaches that integrate agricultural productivity and biodiversity conservation.

While stressing the link between biodiversity management and agricultural productivity, Mr. Mafabi further pointed out that the task of finding sustainable approaches to conserving biodiversity in the modernisation of farmed landscapes in Uganda is critical and challenging and that NatureUganda cannot do it alone. He thanked the development and funding partners in particular the Darwin Initiative and British Trust for Ornithology as well as other project partners in the UK and Uganda for coming up with such an important timely initiative. He argued participants to seize the momentum to develop mechanisms for successful implementation of the project and looked forward to fruitful deliberations.

3. 1.3: Opening Remarks – Chairman, UWS



Mr. David Mutekanga, on behalf of Mr. Yakobo Moyini Chairman UWS, thanked the participants for honouring the invitation to this meeting. He gave a brief background of UWS and explained the role UWS will partake in the project. He went on to appreciate UWS working relationship with the project partners, and in particular he acknowledged that the project funder-the Darwin Initiative, has in the past supported programmes at UWS and therefore, this current project would serve as an opportunity to harness such relationship. Mr. Mutekanga, once again, highlighted the objectives of the meeting and informed the participants that this was the project's first meeting. He wished for useful deliberations in the meeting and finally declared the meeting open.

4. 1.4: Introductions of the Participants

Before the self-introduction of the participants, the chairman for the first session of the meeting and also on behalf of MUIENR, Assoc. Prof. Frank Kansiime explained the role of MUIENR in the project implementation with reference to the expected output by the project-supported PhD students who are attached to the Institute. Each participant introduced him/herself and afterwards the chairman requested Dr. Phil Atkinson to give an overview of the project background.

2. Session Two

5. 2.1: Overview of the Project Background – Dr. Phil Atkinson, BTO

On behalf of Dr. Juliet Vickery – the project leader, who was unable to attend the meeting, Dr Phil Atkinson gave a brief background of BTO, including its working relationships with other organisations/partners in the UK and elsewhere.

In regard to the project background, Dr. Atkinson highlighted the ways in which habitat loss, from the global perspective, through agriculture, affects biodiversity, in particular birds. He reiterated that agricultural intensification is the greatest threat to all bird species across Europe, and a single important driver of biodiversity loss in the UK as well as the developing countries. He further demonstrated and compared bird species richness and abundance in traditional and modern coffee plantations, of which he pointed out that traditional coffee generally holds higher species richness than modern coffee although large forest species are often absent in coffee plantations.

While explaining how farming in Uganda in undergoing a massive series of changes, he cited the Ugandan government's commitment (through PMA and PEAP) to eradicate poverty through modernization of agriculture by improving farming practices and increasing farmer access to suitable markets. He, however, cautioned how these agricultural changes will inevitably impact on land use, land cover and biodiversity leading to overall environmental degradation contrary to the objectives of the country's National Environmental Management Policy. As such, Dr. Atkinson expressed an urgent need for an integrated approach to land use planning and management that can promote increased productivity of agricultural land while at the same time conserving biodiversity but that such approach requires good quality information base for successful implementation. Therefore, the proposed research project will make a big contribution by providing required baseline information.

Dr. Atkinson further brought to the attention of the participants that it is against the above background that BTO was awarded a grant by the Darwin Initiative to address this concern, in particular, determine how the changes in farming will impact on biodiversity (mainly birds, invertebrates and/or plants) and devise methods of mitigating some of the negative effects. The proposed project implementation area will be the banana/coffee arc around the Lake Victoria region (see map in Annex 3).

6. 2.2: Project Management, Objectives & Work plan – Mr. A. Byaruhanga, NU

Mr. Achilles Byaruhanga began by highlighting other aspects of the project background. He informed the participants that initial talks about the project started early 2004 (first consultative meeting was held on 1st March 2004) while the project proposal was submitted to Darwin Initiative in October 2004 through BTO as UK lead organization, in collaboration with local implementing partners (NU, UWS, and MUIENR). Other partners included DIIS and RSPB among others.

He further articulated the roles of each partner in the implementation of the project: BTO being the lead organization; NU, UWS, and MUIENR form a management committee (MC) responsible for day-to-day implementation of the project; while other partners: DIIS, RSPB, MUFF, PMA, NEMA, NAADS, NEMA, etc together with the MC form the steering committee for overseeing/ advising overall implementation of project, dissemination and communication of project results. In addition, NatureUganda provides the central co-ordination/management of the project.

With regard to the purpose of the project, Mr. Byaruhanga mentioned that while targeting the banana/coffee arc around Lake Victoria, the project will identify best practice for the long-term conservation of biodiversity in selected farmed landscapes in Uganda and establish a framework for sustainable agricultural development and monitoring. Specifically, he emphasised that the project objectives include:

1) Capacity building of partners in Uganda,
2) Identification of indicators and collection of baseline data to enlarge the scope for future monitoring of biodiversity (particularly birds and insects) in agricultural systems,
3) Identification of best practice regarding sustainable land use options in Uganda,
4) Dissemination of best practice to agricultural development agencies and service providers and selected local communities within Uganda, and to
5) Give policy advice to the Ugandan Government both on national policy and also in meeting its international conservation obligation, mainly the CBD.

Mr. Byaruhanga further summarised the project work plan for the three year period. He mentioned that the project activities in year one will include:

a. Establishing project management systems with roles and responsibilities of each organisation/partner, namely the project steering committee, supervisors for the PhD students, recruitment of local project staff, PhD students, research assistants, and establishing contacts with communities and government organs.
b. Establishing/selecting study sites.
c. Research and monitoring.

d. Developing and testing research methods.

e. Commencing data collection in the selected sites. He was happy to note that the project is on right track, and so far, activity (a) above has been accomplished while activity (b) is in progress.

In the second year of the project, activities will among others include:

a. Supervisory training by UK (University of Bournemouth, RSPB and BTO) staff

b. Research staff attending training in GIS,

c. Biodiversity assessment training for partners (NAADS, NU, UWS)

During year three of the project, the project activities will focus on:

a. Training of agricultural service providers,

b. Establishment of demonstration plots,

c. Completion of PhD studies,

d. Advocacy; dissemination and communication of project results including lessons.

Finally, Mr. Byaruhanga informed the participants of the crosscutting project activities, which included:

- Production and distribution of advocacy materials,
- Steering committee meetings,
- Consultative meetings with various partners and target audience,
- Monitoring and evaluation,
- Fundraising, vis-à-vis sustainability of project activities, and
- Establishing an agricultural working group.

He concluded by, once again, emphasizing the purpose of the project and called upon everyone's contributions to the scheduled project activities.

7. 2.3: Discussion, Questions, and Comments

Mr. Augustine M. Mwendya, Chief Executive Secretary UNFFE: Bees are key. The President of Uganda has made a point of promoting bees and highlighting loss in some areas.

Dr. Philip Nyenko, Senior Lecturer FFNC: Need to fix on one or two specific questions. It is possible to spread too thinly and end up answering nothing.

Mr. Xavier N. Mugumya, National Forestry Authority: We need to determine economic benefit. E.g. for 1 kg of sunflower oil, how much is a bee worth? In some areas farmers have noted that they have bees and sunflower heads are full. In other areas with no bees they are not.

Ms. Sheila Taylor, Kulika Trust Uganda: Difficult to select sites – base line info is really needed. This will be addressed in this project.

Mr. Augustine M. Mwendya, Chief Executive Secretary UNFFE: There has been much environmental degradation in the east (around Butamira forest) and people have remarked at the loss of birds there. Is this an area we should be interested in? Some discussion talking about areas, ever expanding the work area but people were reminded that you can't do everything and there is a need to concentrate on one key area.

Various: Clear criteria for site selection needed. The project and its conclusions will stand or fall on whether we can get answers to some key questions. In the presentation we talked about many different factors to look at and if we look at too many we will end up answering none.

Ms. Beatrice Nabwire, GIS Specialist ICRAF: Projects come and go. A clear exit strategy is needed. How are results going to be implemented on the ground? Dr. Phil Atkinson: NAADS and other organizations are a key delivery mechanism and will ensure sustainability.

Assoc. Prof. Frank Kansiime, MUIENR / Mr. Achilles Byaruhanga, NU: funding will be sought. Prof Kansiime considered that these kinds of issues are currently 'hot' and that EU would fit into EU criteria for funding. BUT any funding proposal will be set against to PEAP/PMA and must address issues in these.

3. Session Three

Chairman – Assoc. Prof. Joseph Obua

8. 3.1: Research Concept/questions & Proposed Approach – Dr Phil Atkinson, BTO

Once again, Dr. Phil Atkinson highlighted that agriculture in Uganda makes up majority of the land area and that much of the biodiversity is in the wider countryside and not just in national parks. He cited the role of such biodiversity and includes - pollinators, pest control, seed dispersal, and provision of shade among others. On the aspect of biodiversity indicators to be considered in the research project, he informed the participants that birds were chosen because they are some of the good indicators of ecosystem health while insects are important to farmers in terms of pollination.

In light of the different models/approaches of how agriculture will change in Uganda, Dr. Atkinson mentioned that while designing the project, the following questions were kept in mind:

- How and where will the PMA change agriculture in Uganda?
- What will be the effects of these changes on biodiversity?
- What can we do to minimise impact on biodiversity?
- Can research results be used to influence Government agricultural policy?

Although these questions could possibly allow achieving the project purpose, Dr. Atkinson also acknowledged that there are complicating factors, especially in the selection of the study sites. Climate, as one of the factors, tends to determine the type of crops grown and this implies that site selection process would require sites where such broad scale factors can be kept relatively constant. Another complicating factor is the distance to the nearest forest; forests tend to have high biodiversity and this also affects comparison of results for sites selected nearer or far from the forest.

With regard to the data types and data collection approach, Dr. Atkinson clarified that this will be the responsibility of the PhD students in collaboration with their supervisors and project staff, however, he ahead mention the following key approaches:

- Point counts and time species counts would be used in case of birds,
- Traps and direct observations would be employed in the study of insects, while
- Transect walks would be use to study habitat details such as vegetation in the study plots as well as the socio-economic data including crops grown, crop husbandry, yields, and benefits derived by the farmers.

9. 3.2: Discussion, Comments/Questions and Clarifications

Assoc. Prof. Joseph Obua, FFNC: Site selection should not only look at yield but also things like practices – e.g. pesticide inputs, fertilizer application etc. Farmers in flower growing areas complain bees are disappearing because of inputs. He also inquired whether site selection will take care of the agroecological zones in Uganda. Discussion looked at the possibility of including flower farming specifically - looking at sites close to and far away from farming operations. But, the consensus was one could get caught up in these minutiae and lose track of the original proposal. From discussion, participants wondered that since soil fertility varies as well, should we select sites by this. Dr. Philip Nyeko, FFNC: No, we need to concentrate on a few things to look at and try not to bias your sample with these other things. Choose sites at random and these other factors will not bias your results unduly.

Various: Could we choose sites across agroecological zones? Some discussion. Some said we should sample across these gradient, others thought we should sample within. With limited manpower it will be difficult to tell whether differences in biodiversity are due to farm management or due to the ecological zone, e.g. birds in dry rangelands will inevitably be different to birds in coffee/banana cropping systems irrespective of the intensity at which the crops are farmed at.

Ms. Beatrice Nabwire, GIS Specialist ICRAF: expressed concern over the complexity of intercropping in the study region which could complicate computation of yields. She mentioned that the project could consider other sources of data. NARO institutes are a source of good practice information and also yields. Agreed to follow up and make contact with NARO - Kawanda Research Institute and others.

Ms. Sheila Taylor, Kulika Trust Uganda: Heard lots about policy, advocacy, extension workers etc but what about farmers. Lots of discussion about the importance of involving farmers at the beginning and making them feel part of the project 'ownership'. All very well producing glossy brochures but farmers will just put it on the shelf to say they've been involved and ignore the findings… Get farmers involved and LISTEN to them. See what their concerns are and what they want out of the project.

Various: NAADS extension workers are one-time contract workers – e.g. they will provide advice about aspects of coffee husbandry and production and do not give general extension advice. How are they going to spread the info? Need to think about other delivery mechanisms such as District Farmers Associations, Kulika Trust (training farmers to train farmers) etc.

Ms. Vanince Mirembe, UWA: Biodiversity can be a problem. Black Kites – top predator eat chickens… Mousebirds eat young beans…etc. What happens if the project determines biodiversity is bad for farmers?

Ms. Sheila Taylor, Kulika Trust Uganda: is yield per se important, i.e. if yield goes up does biodiversity inevitably go down? Dr Phil Atkinson, BTO: no probably not, its practices that make the difference rather than yield per se. Mulching may increase yield but have little or no impact on birds.

Mr. Augustine M. Mwendya, Chief Executive Secretary UNFFE: how can you separate out impacts of yield vs these other factors? Response: Dr Phil Atkinson, BTO: with difficulty – they are all interrelated but we need to identify the main gradients in farm management and relate these to yield.

Lots of discussion regarding yields by all: Farmers won't disclose yields/incomes or may lie! Some pointed out we could perhaps estimate this on the ground using some criteria scoring. Others thought it more difficult as you may be able to estimate cash crops, but what about all the other things that are used all the time, e.g. Irish potatoes, greens etc. Maybe need some other scoring system.

Mr. David Mutekanga, UWS: often works best to ask about recent harvesting and scale up.

Dr. Philip Nyeko, FFNC: not worried about yield. We are working in these areas for several years. Not a problem. How about using agricultural institutes e.g. Kawanda, Kabanyolo, etc as they will have a network or farmers with yield and socio economic data. Also use farmers associations – they have much useful info that can be mined.

Various: Timing of sampling is crucial. Perennial crops may flower etc once/twice a year (coffee twice) and you need to be there for that short period. This limits site selection to sites that can be got around in that time.

When thinking about complicating factors e.g. climate, proximity to forest. Tenure is also key. Many farmers are tenants and their attitude to land management will be different – e.g. little long-term planning.

Ms. Sheila Taylor, Kulika Trust Uganda responded to a question as to whether the project will look at plantation cropping. She thought it should not & there was general consensus that this was a separate issue that could be addressed in a separate project. Dr Phil Atkinson, BTO: also mentioned the other end of the spectrum – natural forest – and said that could be the focus of other projects. Small scale agriculture is always going to be the major component of agriculture in Uganda and this project should concentrate on how this will change and be modernized.

Dr. Philip Nyeko, FFNC: various contributions to the discussions above. Yields – choose your crops and measuring yield is easy – just needs some intensive effort once/twice a year. Choose your research questions carefully and selectively, otherwise you will end up with few useful results. Flower growing – easy to look at but perhaps a separate project. Focus on one crop e.g. coffee. Also made the useful point that crops compete for pollinators. The degree of pollination may also therefore be related to what other crops/trees are in the landscape. Crop diversity may be good or bad for pollinating your cash crops.

Ms Pauline Natongo, NU: Other issues such as disease - banana / coffee wilt, how do we deal with such? Dr. Philip Nyeko, FFNC: just part of the landscape. Record it but don't specifically include/exclude areas.

Ms. Dianah Nalwanga, MUIENR: which sites have lost more biodiversity compared with others?

Mr. Achilles Byaruhanga, NU: honing down this intensity gradient is key, but difficult. Must be relevant and easily relatable to PMA, otherwise it will get lost, e.g. needs to be simply measured.

Mr. Theodore Munyuli, MUIENR: site selection will also depend in some part on statistical issues. We need to know something about methods first, then choose numbers of sites.

Ms. Sheila Taylor, Kulika Trust Uganda: Lots of variables have been mentioned. One thing not mentioned is the history of sites, which can be v important in determining what types of things are on site. A bunch of farmers being innovative may only be a recent phenomenon and you may be measuring the recent history.

Again Ms. Taylor wondered why include larger enterprises. Get baseline info. Also yield/income – farmers may send kids to school by selling another bag of cassava rather than coffee. Don't just concentrate on one crop e.g. coffee/bananas.

Mr. Achilles Byaruhanga, NU: how can we take this to the target audience i.e. farmers. He couldn't think of a project that had successfully done this. Other projects produce glossy leaflets/reports etc and have grand advocacy/policy meetings. Ms. Beatrice Nabwire, GIS Specialist ICRAF: get farmers involved at beginning. Use farmers groups. Ms. Sheila Taylor, Kulika Trust Uganda: No glossy publications!

Assoc. Prof. Joseph Obua, FFNC: Training NAADS comes in strongly in to log frame. As previously discussed other organisations may be better placed. Made the point that there are so many organisations dealing with agriculture/natural resource management in Uganda that there is bound to be such an organisation wherever we work.

Mr. Augustine M. Mwendya, Chief Executive Secretary UNFFE: could consider using District farmer's associations.

Dr. Philip Nyeko, FFNC – responded to a point that we need to id policy gaps and influence policy makers. He said policy makers are often not the problem. We need to go after the implementers.

Mr. Xavier N. Mugumya, National Forestry Authority: The proposal makes lots of reference to the CBD. How are we going to make it relevant? Mr. Achilles Byaruhanga, NU: MUIENR is acting as information collector to the CBD on behalf of NEMA. Data from this project will be fed to MUIENR.

Ms. Sheila Taylor, Kulika Trust Uganda: How do we measure biodiversity? Spp richness/nos is all very well but only a score. How do we put a value on it. You may have 10 good spp or 10 pest spp. Dr. Philip Nyeko, FFNC: you need to place values on some spp. e.g. forest spp. Pollinators you are looking for best mix of spp e.g. spp that pollinate early/late on in day.

Mr. Xavier N. Mugumya, National Forestry Authority: who pays for biodiversity if harmful? Dr Phil Atkinson, BTO: yes, this is an issue. The final result may not be good for farmers but if that's the case then the model of full protection vs high intensity crop management may be the best to follow.

Assoc. Prof. Joseph Obua, FFNC/ Dr. Philip Nyeko, FFNC: Bees may not be kept in all places – could be useful +/- for site selection.

Dr. Philip Nyeko, FFNC: "Can we have biodiversity and lunch?" i.e. a win-win situation?

4. Closing Remarks – Mr. Achilles Byaruhanga

Mr. Achilles Byaruhanga summarised the deliberations of the meeting and thanked all the participants for their contributions. He confirmed to the participants that project workplan is on schedule although in early stages.

On the way forward, the project staff together with the project management committee, is to follow up the key issues raised by participants (see summary in the next section 5) to ensure the project meets the intended objectives.

5. Summary of Meeting Outputs, Actions and Way Forward

Meeting Objective	Output	Action/way forward
1. Introduce project and work plan to key stakeholders and project collaborators	• Project purpose & objectives explained	
	• Project partners (and their roles) introduced	
	• Appointed project staff introduced	
	• PhD Students introduced	
2. Present proposed research concepts/questions and methods on the project thematic study areas	• Research questions presented	
	• Biodiversity indicators (birds, insects/and or vegetation) suggested	
	• Study/target region named	▪ Could consider agroecological zones
	• Study sites selection approach presented and other several selection criteria/factors suggested	▪ Zero on a few justifiable factors/criteria in study site selection ▪ Study sites should be chosen at random with the assumption that other factors will not bias the results unduly ▪ Consider site baseline info/history in site selection ▪ Site selection should also consider farming practices – pesticide use, fertilizer application, etc ▪ To think of statistical issues involved for site selection

	• Data collection methods presented and discussed	▪ Need to define "intensity gradient" in relation to PMA and develop a measure ▪ To be fully developed by PhD students together with their advisors and project staff
	✓ Birds	▪ To harmonise the perception of birds as pests (e.g. Black Kites eat chickens, mousebirds eat young beans, etc)
	✓ Pollinators	▪ Need to consider timing of sampling due to flowering differences as this could limit time to visit all sites ▪ Bee keeping could be considered in site selection
	✓ Socio-economic variables	▪ To consider other sources of data (NARO institutes eg. Kawanda RI, APEP and others) and make follow up ▪ To develop a clear mechanism for assessing yield attributed to biodiversity
3. Discuss mechanisms /strategies for improved stakeholder participation in the implementation of the project (including, dissemination and application of research results)	• Community/farmer participation agreed upon	▪ To get farmers involved IMMEDIATELY and listen to their concerns first
	• Results implementation /dissemination presented	
	• NAADS identified as key project results implementers /disseminators though they work on contract	▪ Need to include other organisation e.g. District farmer groups, key organisations working with farmers (Kulika Trust, VI Agro-forestry project, etc)
	• Mechanism to make project results relevant to CBD discussed	▪ Data collected to be fed in MUIENR's data bank
	• After-project discussed	▪ Need clear exit strategy ▪ Should think of funding proposals along PMA/PEAP goals ▪
4. Project management/steering committee meetings	• Discussed	▪ NU to draw plan for regular management committee meetings ▪ Next steering committee meeting to be held in February/March 2006

Annex 1: Agenda

Monday, September 26th

1: Opening

Chairperson: Assoc. Prof. Frank Kansiime, MUIENR

08:15	Registration	
08:30	Welcome Remarks	Paul Mafabi, Chairman NatureUganda
08:45	Opening of the Meeting	Yakobo Moyini, Chairman Uganda Wildlife Society

2: Introduction to the "Conserving biodiversity in the modernising farmed landscapes of Uganda" project

Chairperson: Assoc. Prof. Frank Kansiime, MUIENR

09:00 **Project background and aim** – Dr. Juliet Vickery, BTO

09:30 **Overview of the project work plan** – Achilles Byaruhanga, NatureUganda

10:00 Discussion

10:30 Coffee/photograph

3: Presentation of Research Concepts/questions and proposed methods

11:00 Dr. Juliet Vickery and Dr. Phil Atkinson, BTO

12:20 Questions/clarifications/Discussion

4: Way forward and closing remarks

13.00 Lunch

Annex 2: List of Participants

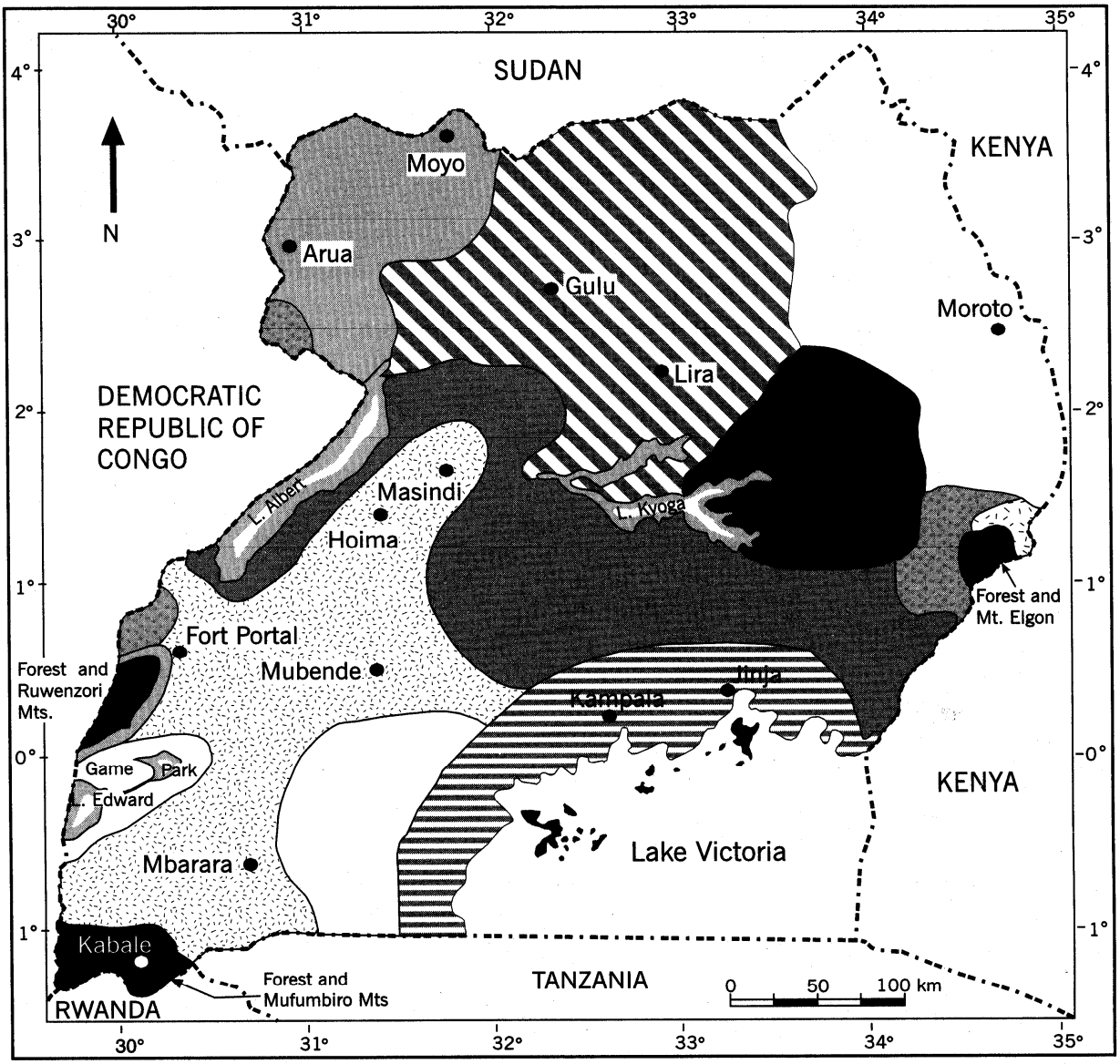
Assoc. Prof. Frank Kansiime Director	Makerere University Institute of Environment & Natural Resources PO Box 7298 Kampala, Uganda Tel:
Dr. Philip Nyeko Senior Lecturer, Entomology and Plant Pathology - Dept. of Forest Ecology & Ecosystem Management	Faculty of Forestry & Nature Conservation, Makerere University P.O. Box 7062, Kampala, Uganda Tel:
Mr. David R. Mutekanga Executive Secretary	Uganda Wildlife Society Plot 51 Kanjokya Street Kamwokya, PO Box 7422 Kampala Tel:
Mr. Herbert Tushabe NBDB Data Manager, was represented by **Ms. Nakibuuka Marjorie**	Makerere University Institute of Environment & Natural Resources Box 7298 Kampala, Uganda Tel:
Assoc. Prof. Joseph Obua Head, Dept. of Forest Ecology & Ecosystem Management	Faculty of Forestry & Nature Conservation, Makerere University P.O. Box 7062, Kampala, Uganda Tel:
Dr. Jim Syler Chief of Party, was represented by Mr. Sam Korutaro	PRIMEwest Program Plot 32 Nakasero Road, P.O. Box 7761, Kampala, Uganda Tel:
Dr. Jean-Marc Boffa Tree Domestication & Biodiversity Scientist, was represented by **Ms. Beatrice Nabwire** GIS specialist, Tel:	ICRAF Plot 13 Bonyombe Road, Bugolobi P.O. Box 26416 Kampala Tel: Email:
Mr. Moses Mapesa Executive Director, was represented by **Ms. Vanice Mirembe** Tel: Email:	Uganda Wildlife Authority Plot 7 Kira Road, Kamwokya, PO BOX 3530, Kampala Tel:

Assoc. Prof. B. Bashaasha Head, Agric. Econ. Department, was represented by Ms. **Akello Zerupa,** Tel:	Faculty of Agriculture, Makerere University P.O. Box 7062, Kampala, Uganda Tel: Email:
Ms. Sheila Taylor Kulika Trust Uganda	Kulika Trust Uganda PO Box 11330 Kampala, Uganda Tel: Email:
Mr. Augustine M. Mwendya Chief Executive Secretary	Uganda National Farmers Federation Plot 27, Nakasero Road, PO Box 6213, Kampala Uganda Tel:
Mr. Xavier N. Mugumya National Forests Management Specialist	The National Forestry Authority 10/20 Spring Road, P.O. Box 70863, Kampala Uganda Tel:
Mr David Nkuutu Researcher, Botany Department	Faculty of Science, Makerere University Tel: Email:
Mr. Yakobo Moyini Chairman, UWS	Uganda Wildlife Society Plot 51 Kanjokya Street Kamwokya, PO Box 7422 Kampala, Tel: Email:
Mr. Paul Mafabi Assistant Commissioner, Wetland Inspection Division and Chairman, NatureUganda	Ministry of Water, Lands and Environment P.O Box 9629 Kampala,Uganda Tel: Email:
Dr Juliet Vickery Head of Terrestrial Ecology Unit, and Project Leader – Dr. P. Atkinson stood-in for her	British Trust for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU, UK Tel: 0 Email:
Dr Phil Atkinson Research Manager, Habitats Research Department	British Trust for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU, UK Tel: Email:
Mr. Achilles Byaruhanga Executive Officer	NatureUganda Plot 83 Tufnel Drive Kamwokya, P.O.Box 27034, Kampala, Uganda Tel:
Mr. David Mushabe Coordinator, Agro-Biodiversity Project	NatureUganda Plot 83 Tufnel Drive Kamwokya, P.O.Box 27034, Kampala, Uganda Tel:

Mr. Ambrose Mugisha Conservation Projects Officer	NatureUganda Plot 83 Tufnel Drive Kamwokya, P.O.Box 27034, Kampala, Uganda Tel:
Ms. Pauline Nantongo Deputy Executive Officer	NatureUganda Plot 83 Tufnel Drive Kamwokya, P.O.Box 27034, Kampala, Uganda Tel:
Ms Dianah Nalwanga Wabwire PhD Candidate	Makerere University Institute of Environment & Natural Resources PO Box 7298 Kampala, Uganda Tel:
Mr Munyuli Theodore PhD Candidate	Makerere University Institute of Environment & Natural Resources PO Box 7298 Kampala, Uganda Tel:

Annex 3: Project Target Region

The major agro-ecological zones of Uganda - the project will be sited within in the intensive banana-coffee-lakeshore system.

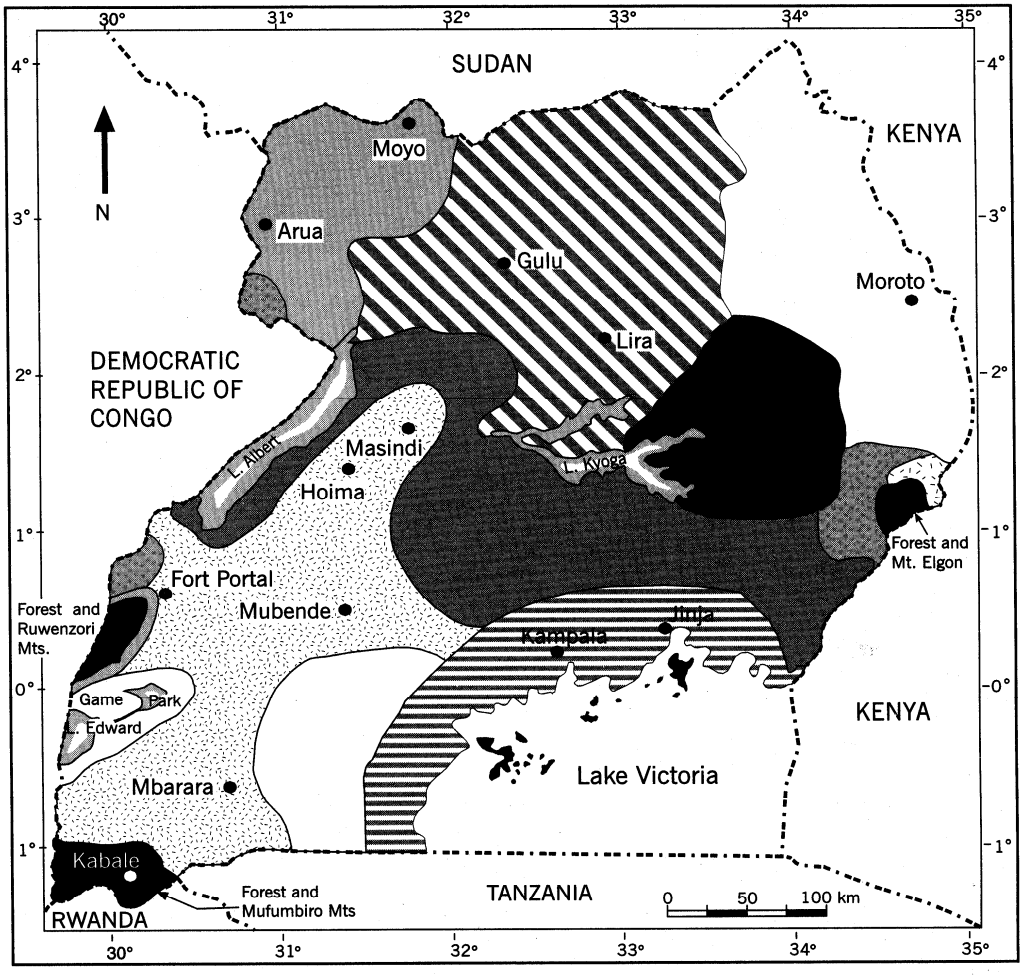


LEGEND

- Intensive banana–coffee–lake shore system
- Medium-altitude intensive banana–coffee system
- Western banana–coffee–cattle system
- Banana–millet–cotton system
- Annual cropping and cattle, Teso system
- Annual cropping and cattle, northern system
- Annual cropping and cattle, West Nile system
- Pastoral and some annual crops
- Montane systems

Coffee Break/Pictorial

Annex 4. The location of the study area within the major agro-ecological areas in Uganda - the project will be sited within in the intensive banana-coffee-lakeshore system.



LEGEND

- Intensive banana–coffee–lake shore system
- Medium-altitude intensive banana–coffee system
- Western banana–coffee–cattle system
- Banana–millet–cotton system
- Annual cropping and cattle, Teso system
- Annual cropping and cattle, northern system
- Annual cropping and cattle, West Nile system
- Pastoral and some annual crops
- Montane systems

Annex 5. Site selection report.

Due to its large size this can be downloaded from the project website:
http://www.bto.org/research/projects/farmland/uganda.htm

Annex 6. Course outline and certificate awarded to participants of the week long census and field techniques training course**.**

Estimating numbers of wild animals:
an introduction to survey and census methods

Day 1 Tuesday 6 December, 2005

09.00 - 09.30 Introductions and workshop aspirations

09.30 - 10.00 Session 1. An introduction to surveys, censuses and monitoring (PD)

10.00 - 10.30 Coffee

10.30 - 12.00 Session 2. Precision, accuracy, bias and sample sizes (PD)

12.00 - 13.00 Session 3. Sampling strategies (PD)

13.00 - 14.00 Lunch

14.00 - 15.30 Session 4. Survey methods (1): simple assessments, mapping methods and specialist techniques (PD/DP)

15.30 - 16.00 Coffee

16.00 - 18.00 Session 5. Survey methods (2): transects and point counts (PD/DP/AN)

Day 2 Wednesday 7 December, 2005

09.00 - 09.30 Session 6. Counting colonial and flocking species (PD)

09.30 - 10.30 Session 7. Habitat measurements and calculations of habitat use (PD)

10.30 - 11.00 Coffee

11.00 - 12.00 Session 8. Invertebrate survey methods (PN)

12.00 - 13.00 Lunch

13.00 - 16.00 Session 9. Field exercise: Using GPS and point counts in field surveys (DM/PD/DP/DN)

16.00 - 17.30 Session 10: Exercise: combining sampling strategy, survey methods, habitat measurement and project management

17.30 - 18.00 Final conclusions and workshop evaluation

Facilitators:

PD - Paul Donald

DP - Derek Pomeroy

PN - Philip Nyeko

DM - David Mushabe

AN - Annet Nakyayune

DN - Dianah Nalwanga

Certificate

This is to certify that

.....

attended and successfully completed a course

Estimating numbers of wild animals: An introduction to survey and census methods

6-7 December 2005
Makerere University, Kampala

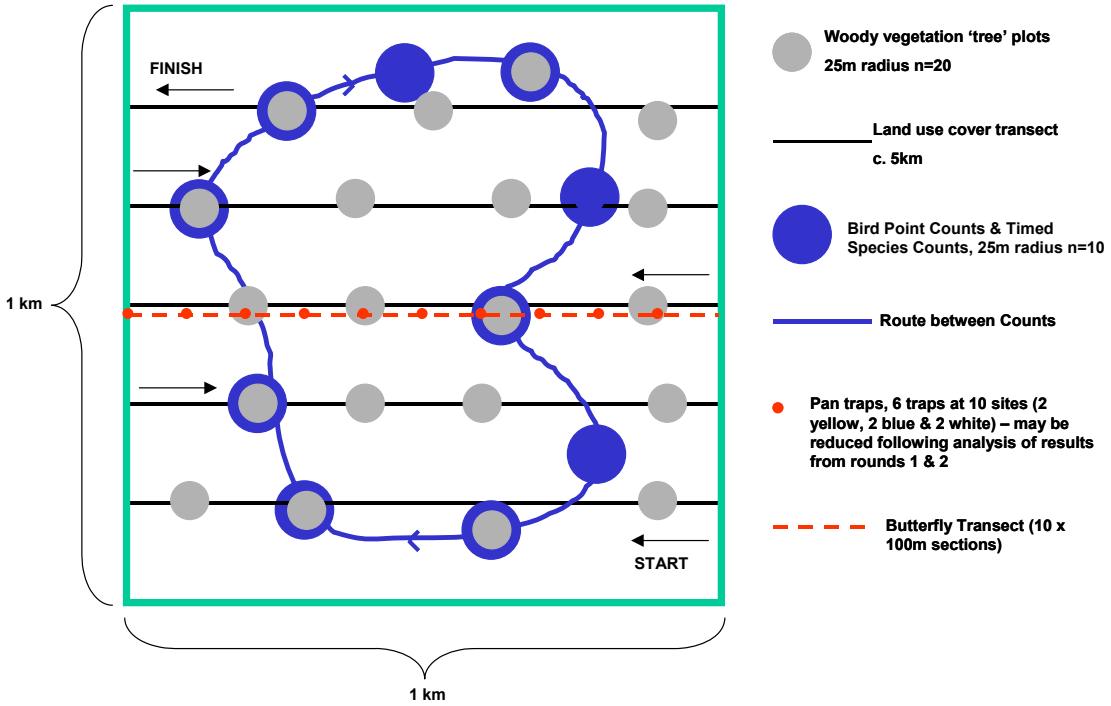
_____ _____

Dr Philip W. Atkinson **Prof. Derek Pomeroy**

The BTO promotes bird conservation through volunteer-based surveys
BirdLife International is a worldwide partnership of conservation organizations that seeks to conserve all wild bird species and their habitats
The Royal Society of the Protection of Birds is the BirdLife International Partner in the UK
The Darwin Initiative promotes biodiversity conservation and the sustainable use of natural resources

Workshop funded by a UK Darwin Initiative grant to the BTO

Annex 7. Diagram showing a stylised location of bird, invertebrate and land use transects.



Annex 8. Field recording sheets (birds).

Data recording form: comparison of point counts and timed species counts							
Point:	Site:				Cluster:		Notes:
POINT COUNT Date:	**Start time:**				**TIMED SPECIES COUNT Date:**	**Start time:**	
Species	**<25m**	**25-50m**	**>50m**	**flight only**	**Species**	**minute**	**flight only**
African Thrush					African Thrush		
Angolla Swallow					Angolla Swallow		
Barn Swallow					Barn Swallow		
B & W Casqued Hornbill					B & W Casqued Hornbill		
Black Kite					Black Kite		
Black-crowned Waxbill					Black-crowned Waxbill		
Black-headed Weaver					Black-headed Weaver		
Blue Flycatcher					Blue Flycatcher		
Blue Spotted Wood Dove					Blue Spotted Wood Dove		
Bronze mannikin					Bronze mannikin		
Common bulbul					Common bulbul		
Eastern grey plantain-eater					Eastern grey plantain-eater		
Great Blue Turaco					Great Blue Turaco		
Grey-backed Camaroptera					Grey-backed Camaroptera		
Grey-headed sparrow					Grey-headed sparrow		
Lizard Buzzard					Lizard Buzzard		
Olive-bellied Sunbird					Olive-bellied Sunbird		
Red-billed firefinch					Red-billed firefinch		
Red-cheeked cordon-bleu					Red-cheeked cordon-bleu		
Red-eyed dove					Red-eyed dove		
Scarlet-chested sunbird					Scarlet-chested sunbird		
Tambourine dove					Tambourine dove		
Tawny-flanked prinia					Tawny-flanked prinia		
Wattle Eye					Wattle Eye		
Yellow White-eye					Yellow White-eye		
Yellow-fronted Canary					Yellow-fronted Canary		
Yellow-fronted Tinkerbird					Yellow-fronted Tinkerbird		
Yellow-rumped Tinkerbird					Yellow-rumped Tinkerbird		
Comments					**Comments**		

Habitat Data recording form

Date:	Weather:	Site:	Notes:

		No. Trees				Habitat coverage							
Point	Transect	0-1m	1-3m	3-8m	>8m	Cover(m)	Habitat Type	Ht(m)	Bare(%)	Canopy	Flowering	Fruiting	Comments

Annex 9. Discussion document regarding the rationale behind site selection.

Socio-economic and land use variables and indicators for selection of (mainly smallholder) study sites and suggestions for specific sites

Simon Bolwig, DIIS, 2005-11-05

1. Intensity of agricultural land use

Theories of agricultural intensification and biodiversity implications

Wild biodiversity is negatively related to the intensity of agricultural land use. Especially specialist species suffer from agricultural land conversion and are affected already at low levels of conversion.

According to Boserup's (1965) theory of induced innovation, which has great empirical validity, population density, through its ('push') effect on the land/labour ratio and on the ('pull') effect on local demand for food, is a key factor of inducing farmers in pre-industrial societies to adopt more intensive land management practices. Given that other conditions are favourable, population pressure is also a key driver of technological development. Increased population density also makes infrastructural investments cheaper (per person) and induces institutional innovations such as privatisation of land rights.

In Boserup's model of population-induced agricultural intensification, the starting point is a long-fallow, shifting cultivation system where fields are rotated on all available land and laid fallow after 2 -3 years when yields decline, after which a new field is opened. Over time, agricultural intensification occurs as the same land is cultivated more frequently, corresponding to shorter fallow periods and a consequent change in fallow vegetation from primary to secondary forest to bushes and then grasses.

Other factors than population induce or impel agricultural land conversion. The most important is increased demand from external markets (urban, export) as communities become more 'connected' through the development of infrastructure and marketing institutions. Another is land degradation, which induces farmers to open up virgin land that before was left uncultivated due to distance, low quality, etc.

Hence, in the Boserupian model agricultural intensification affects biodiversity mainly through its impact on the extent and composition of fallow vegetation. In the real world, population pressure also impels farmers to clear (i.e. include in the cultivation-fallow cycle) natural vegetation that before had been left untouched (e.g. because it was protected by the state, religious beliefs, was found too infertile, was too distant, etc.).

At higher population densities, intensification also involves the clearing of vegetation in field boundaries and along streams, small patches of trees, and other 'micro habitats' (what is the term?), as is commonly observed in Europe. These changes are also likely to reduce the patchiness (clumping) and contiguousness of natural habitats.

Finally, different landscape elements are typically cleared for cultivation at different phases of intensification. Last to be cleared are typically low quality soils (in terms of nutrients, water properties, susceptibility to erosion) and land requiring more labour for cultivation (e.g. wetlands requiring drainage, heavy clays, forests with very large trees). This has implications for which wild species are affected when in the historical development of farming systems.

With respect to trees, it is commonly observed that tree density declines with intensification, but only up to a certain point when fuel wood and other tree products have become so scarce (expensive) that farmers start to conserve and plant trees, so that tree densities actually increase at high cultivation intensities (an U shaped curve). The diversity in trees species may still decline though as farmers prefer certain species over others (in Uganda, especially eucalyptus and fruit trees). Higher tree densities have also been observed near villages and homesteads compared to on fields further away.

Crop diversity / intercropping and intensification

Crop diversity and the extent of intercropping is not necessarily related to intensification within smallholder systems (see Table 3.1 in MUIENR/IFPRI report) but is strongly associated with the scale of farming (smallholder versus commercial farms) and the level of mechanisation (mechanised land preparation rarely allows for intercropping).

The Yield – Biodiversity Relationship

Yield per unit of area in the cultivation cycle (area under fallow and crops in a given year) increases with intensification, implying a negative relationship between biodiversity and yields (Rhys et al 2005). This is not the case for yield per unit of area under crops (disregarding fallow land), which is often higher at lower intensities, due to the positive effect on soil fertility of long fallows.

Common measures of intensity of agricultural land use

1. Ratio of crop land to total farmland (farmland = area included in cultivation cycle = crops + fallow).
2. Ratio of crop land to total area (total area = crops + fallow + natural vegetation)
3. Ratio of farmland to total area.
4. Labour input per unit area of farmland (days/ha/year) Labour is difficult to measure accurately and it does not directly influence biodiversity.

Agricultural land use dimensions that directly influence biodiversity

5. Ratio of fallow plus natural vegetation to total area, by type of vegetation
6. The patchiness and contiguousness of fallow/natural vegetation (vegetation strips along farm boundaries, streams and roads; woodlots as opposed to single trees, etc.
7. Type of trees on farms (native vs. exotic).
8. Crop type (e.g. coffee trees vs. annuals)
9. Farm management practices that may affect insects and birds – crop diversity, intercropping, weeding method (clean weeding versus slashing), pesticide use, use of cover crops, use of shade trees in coffee, use of mulch, integrated pest management, etc.

2. Criteria and data sources for site selection

The definitions and measures discussed below are those for which secondary data are likely to exist and so may be used for site selection.

Farming system and altitude

The Darwin proposal states that the focus of the research is the coffee-banana systems. I think that should include highland areas in western Uganda (slopes of Rwenzori in Bushenyi district) and/or Eastern Uganda (slopes of Mount Elgon in Mbale and Kapchorwa districts). While it may complicate the study of birds/insects, there are important potential benefits:

1) Most highland areas have higher agricultural potential (volcanic soils, good rainfall) and a cooler climate, which lend them to cultivation of high-value crops, which in turn may facilitate the adoption of the biodiversity-enhancing technologies that we expect to identify and promote as part of the project. For example, there is an organic arabica coffee project in Mount Elgon, which includes promotion of tree planting (for shade, water conservation, and erosion control) and other sustainable measures. The price paid to these farmers for their coffee is three times that paid for conventional Robusta coffee in the lowlands (by the project in Kamuli that I also study – see below). There is also production of arabica coffee on the slopes of the Rwenzoris (Rwenzori Finest Coffees, which is exported directly to supermarkets in South Africa).

2) There are large primary and biodiversity-rich forests in both the eastern and western highlands of Uganda, as you are aware.

3) Research findings from highlands might be relevant to many other parts of East Africa, where highlands are more common than in Uganda. There is a special, long-term research programme on sustainable agriculture in the African highlands, managed out of Kampala, called the African Highlands Initiative, which we could link up with.

4) There are several ongoing 'sustainable agriculture' and NRM projects in the Ugandan highlands that could usefully be linked with to create synergies in data collection and putting recommendations into use (see also 'Suggestions for specific sites' below). In the western highlands, there are both smallholder and commercial tea plantations, unlike in Central Uganda where there are only commercial plantations. Tea is an interesting crop from a biodiversity conservation perspective, because it is so 'mono' but at the same time associated with the planting of woodlots used for drying the tea.

Population density

Population density, or the land/labour ratio, is a common indicator of cultivation intensity because of the strong effect of population on farming intensity and because of good data availability compared to other indicators. Density may be measured per unit of total land area, or (if available) per unit of arable land (subtracting land cover categories such as built up land, roads, high mountains, national parks). We have population data at the parish level dating from the 2001 Census, in GIS format, see Figure 5.4 p. 19 in the attached document ('CH 5') that also has predicted densities in 2010 and 2015. To test the validity of population density as an indicator for cultivation intensity (and so criteria for site selection), using this GIS data we (David Mushabe) can find the population density for each of the sites surveyed in the IFPRI/MUIENR study (adding an extra column in Table 3.1 in the IFPRI report).

Market access and level of commercialisation of farm output

Ease of access of a locality to urban and overseas markets may intensify natural resource use, in the form of increased production of crop and livestock products or increased harvesting of wild flora and fauna (e.g. for charcoal, bush meat). Common measures of market access include is physical distance or travel time. Figure 5.2 (a-e) in the attached document ('CH 5') shows the accessibility to different types of output markets in Uganda, as well as a 'composite access to multiple markets (5.2f). The measure used is travel time calculated as a function of distance and road quality. Box

5.1 in same document describes the methodology. In Figure 5.4 (B) on page 20, access to urban centres has been projected to 2015.

Agricultural potential

Agricultural potential is the synthesis of factors that circumscribe the absolute potential of a given location to produce agricultural commodities. Components of agricultural potential include climate as well as biophysical factors, and are subject to both natural and human-induced changes over time. In Figure 5.1 in the attached document ('CH 5') agricultural potential is represented by the average level (very low to high) and seasonal distribution (unimodal or bimodal) of rainfall. One would expect higher levels of intensification in 'high' and 'medium' rainfall areas.

Agricultural development domains now and towards 2015

In a geographical information system (GIS) such as ArcView it is possible to overlay the three above criteria – population density, market access, and agricultural potential – into composite 'domains for market-driven agricultural intensification'. Figure 5.4.C. in the attached document ('CH 5') highlight areas that combine high or medium agricultural potential, very high population densities (above 200 pers/km2) and easy access to urban markets (within 4 hours of 50,000 + population). We may regard these areas as places where the conditions for adopting more intensive agricultural practices are particularly favourable and hence the threat to wild biodiversity the greatest (in the absence of regulation). The right-hand map show these areas when projecting urban and rural populations to 2015 and assuming a 25% reduction in travel time as a result of improvements in transportation. It may be argued that long-term interventions such as typically biodiversity conservation should be based on future scenarios of agricultural development rather than present conditions. The idea of 'dynamic development domains' is discussed on page 16 – 23 in 'CH 5'.

Type and extent of natural vegetation within farmed areas

The National Biomass Study (NBS) data set from 1996 (based on satellite images from 1990 and extensive ground truthing in 1990-96) has various relevant land cover categories and we (IFPRI and MUIENR) have the full data set at the 1:50,0000 scale. The National Biomass Study Technical Report (2003) published by the Forest Department is the only coherent description of the study/data. A document with definitions of categories is attached ('NBS Classification codes'). The farmland classification is rather coarse, distinguishing only between Small-scale Farmlands and Uniform Farmland. Yet among the 13 sub-categories, 'bush type' and 'bush percent' may serve as indicators of how much natural or fallow vegetation is left within the farmland (see 'NBS Classification codes'). Another is Biomass stock (there is a map of biomass density distribution on page 49 in the NBS Technical Report).

A more recent data source on forest coverage is the FAO Africover (2000) I believe that MUEINR has a copy of the full data set. Finally, the famous Langdale-Brown vegetation map gives an idea of the distribution of native vegetation in Uganda. Herbert Tushabe has these data in a GIS format. I have attached an overview from 2003 of these and other environmental data.

Vegetation dynamics

The rate of change (positive or negative) in wild vegetation cover may also be a criterion for site selection. The National Biomass Study Technical Report (2003) includes spatial analysis of the dynamics in tree biomass between the mid and late 1990s, based on re-measurements of 11800 (out of original 5000 sample plots (50m x 50m). Figure 6-4 on

page 64 gives an overview (plus analysis starting on page 53), while the methodology is described on page 30.

10. 3. Suggestions for specific sites

I would like to suggest the inclusion of 2 – 3 sites that are situated within the coffee – banana system and where important synergies could be achieved between this research project and other (research and development) projects, with respect to data collection and use of the recommendations ('extension messages') that we expect to make on biodiversity-friendly land management.

Sustainable coffee project in Kisozi sub-county, Kamuli district

This area / project (titled Sustainable Coffee Production in Kisozi Sub-County, Kamuli District, Uganda) is one of the case studies of my (SBO) ongoing research project on small farmers' market linkages and their effects on land management. Including Kisozi as a site in the Darwin project would therefore enable us to achieve very significant synergies in the collection of land use and socio-economic data. The project itself is also planning to collect data, as described below. Kamuli/Kisozi is located in the coffee-banana zone about two hours drive northeast of Kampala.

Moreover, because biodiversity conservation is an important dimension of the Common Code for the Coffee Community, which the said coffee project is testing and implementing (among other activities), it might offer a fertile ground for implementing the land management recommendations ('extension messages') generated by the Darwin project, plus, I presume, an interested partner to discuss how biodiversity conservation might best be reconciled with production and income objectives. The overall project management rests with a consulting company in Hamburg (EDE Consulting), which is a subsidiary of a large German coffee company (Neumann Kaffee) that also owns the exporting company in Uganda (Ibero) to whom the project farmers in Kamuli supply coffee under contract. The farmers moreover receive technical support from a USAID programme (APEP).

Excerpts from the project description

As a continuation of the project for the development of the Common Code for the Coffee Community realised as a joint project of DKV and GTZ, DKV is now interested in testing the application of sustainable coffee practices such as specified in the 4C Code in the field and to gain insights into the practicability and relevance of the concept under farmer conditions.

Biodiversity dimension of the Common Code for the Coffee Community:

Environmental Dimension		Criteria			
Category	**No.**	**Principle**	**Green**	**Yellow**	**Red**
Biodiversity	1a	Conservation of wildlife and endangered species is facilitated and supported	Conservation of wildlife is practiced and endangered species are protected by demarcation and signage on coffee farms.	No hunting, ensnaring, poisoning and exploitation of endan-gerred and protected species is practiced and actors along the chain cooperate to develop a communication strategy for the conservation of wildlife.	Hunting, ensnaring, poisoning and exploitation of endangered and protected species is partly practiced.
	1b	Native flora is protected and enhanced.	Native flora including watersheds and biodiversity habitats are protected and enhanced.	According to national legislation, no exploitation of native flora or watersheds on the farm is evi-dent and a strategy to protect and enhance native flora is developed.	Irreversible, destructive exploitation of native flora.

The project aims at improving the living conditions of organised small-scale coffee farmers and their families in Kisozi Sub-county, Kamuli District by means of increasing the farm income through sustainable coffee farming and promoting other promising crops. … The project will serve the purpose of implementing and further developing the concept of sustainable coffee. The concept of sustainability represents an important opportunity for tackling the situation of the coffee farmers in Uganda. … Their active involvement in the adaptation of the practices to the specific conditions in their region and in the design of concrete steps of implementation shall provide project participants with a clear picture of the farmers' potentials and required incentives in order to advance in sustainable agricultural production.

The project focuses on Robusta coffee being produced under smallholder conditions and shall incorporate the following aspects:

- Thorough analysis of the social and socio-economic situation of smallholder farmer families and identification of gaps with the 4C code.
- Adaptation and implementation of practices for sustainable coffee production under the specific conditions in Uganda.
- Identification of best practices for sustainable smallholder Robusta production and processing.

- Encouraging the formation of farmer organizations such as producer organizations and depot committees within the target area.
- Training and empowering those organisations to better implement the sustainability concept.
- Commercialisation of coffee from project farmers to the international market.
- Evaluation of costs and benefits of sustainable coffee production for project farmers.
- Analysis and definition of preconditions for the successful implementation of the concept of sustainable coffee in Uganda on a broad scale.
-

Organic arabica coffee project in Kapchorwa district (Mt Elgon)

The Kawacom organic arabica coffee project in Kapchorwa district is one of the case studies in my (SBO) research project on small farmers' market linkages and their effects on land management, involving the same advantages in data collection as described above for the Kamuli site. The project has been operating since 2000. The implementing company, Kawacom, belongs to a large multinational group of agro-industrial companies (Ecom). The organic coffee project is promoting a number of biodiversity-friendly practices, such as native tree planting, cover crops, non-use of pesticides, etc. The project area is bordering a national park (montane forest on Mt Elgon). Financial support comes from Sida through EPOPA, a regional programme for support to organic agriculture. Sida/EPOPA pays for the technical services of organic production consultants. The key consultant, Alan Tulip, is a Dutch citizen living in Uganda. He would be a useful discussion partner.

Organic robusta coffee project in Bushenyi district (western Uganda)

Kawacom runs a similar organic robusta coffee project in Bushenyi district, western Uganda (altitude between 1400 and 1550 meters) that might also be relevant as a site, although it is not presently a case study in my research. This project started in 1998.

PEMA project in Kasyoha-Kitomi Central Forest Reserve (western Uganda)

The forest lies within the counties of Bunyaruguru, Igara and Buhweju in the administrative district of Bushenyi, Ibanda county in Mbarara and Kibale county in Kamwenge District between 0005′-0025′ South and 3005′-30020′ East. The reserve covers an area of 399km2 with an altitudinal range from 975 – 2,136 masl. The forest has a total boundary length of 145km, of which 142km adjoins rural community lands (agricultural land) and 3km adjoins Kalinzu Forest Reserve. **Our site would be somewhere on these agricultural lands near the forest**. Agriculture is the main economic activity in both districts with Bushenyi having bananas, coffee, cotton, tea, pineapples, passion fruits and vegetables as major cash crops and Coffee and bananas for Mbarara.

The main reason for including this as a site is the considerable amount of socio-economic data that PEMA (Participatory Environmental Management Programme – see description below) are collecting in the agricultural communities bordering the Reserve. These data include household-level poverty data, NRM stakeholder analysis, and other (I can get more details). My colleagues at the Danish Institute for International Studies are participating in the collection of these data.

Another reason to have a site within this area would be the potential for feeding our research results into the work of PEMA, which is planned to continue until 2012. Significant here, perhaps, is that PEMA claims to have adopted a "landscape approach" implying "management of forest resources within a broader rural landscape to capture

and address social/economic /environmental interdependencies, and ecological connectivity." It also helps that Nature Uganda is one of the implementing partners of PEMA in Uganda.

About PEMA

Summarised from: http://www.pema-eastafrica.org/docs/about_pema.htm and http://www.pema-eastafrica.org/docs/pema_uganda.htm

PEMA (Participatory Environmental Management Programme) in Uganda is being implemented by a partnership composed of Birdlife-Denmark, CARE-Denmark, **the Danish Institute for International Studies, NatureUganda**, the World Wide Fund for Nature-Denmark, and the World Wide Fund for Nature-Eastern Africa Regional Programme Office.

PEMA's mission is to pilot and promote an approach to the management of natural resources in high-biodiversity areas that reconciles the conservation and development interests of multiple stakeholders at local, national and international levels.

PEMA began in January 2004, and work is expected to continue for at least eight years.

Throughout this period, PEMA will act as a:

- Convenor of locally owned processes designed to address and shape stakeholders' interests into a common vision
- Facilitator of innovative approaches to conservation which emphasize the equitable sharing of benefits between the rural poor and wealthy/powerful interest groups
- Mobiliser of resources to reward poor countries and poor communities for their central role in biodiversity stewardship
- Advocate for those people whose legitimate needs and interests are frequently the least reflected in natural resource management plans
- These roles are intended to empower rather than replace the efforts of local people, their institutions and government.

PEMA works in the landscapes encompassing Uganda's Kasyoha-Kitomi Forest Reserve and Tanzania's South Nguru Mountains, which are located within the (Northern) Albertine Rift and Eastern Arc Eco-regions, respectively.

Kasyoha-Kitomi was selected for a variety of reasons. Chief amongst these is the fact that it lies within some of the planet's most important "hotspots" for biodiversity and biological distinctiveness. Kasyoha-Kitomi is the largest tract of medium altitude moist forest in Uganda. As such, it is home to an exceptionally high number of endemic plants and animals.

Annex 10. Details of invertebrate collection methods.

Standardised Toolkit for Monitoring Pollinators: GEF Project Pilot study 2005

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1. Aim:

The overall aim is to develop a set of field methods to assess pollinator abundance, diversity and community composition across a range of agricultural and semi-natural habitats. In this pilot study we want to test the feasibility and practicality of using these methods in partner countries of the GEF project.

2. Background:

Given the variety of insect orders which pollinate crops and wild plants, and the range of plant forms and habitats they are found in, it is hardly surprising that approaches to measuring the abundance and diversity of pollinators are equally as varied. The number of methods, spatial scales, time periods, taxonomic groups and sample units employed make it very difficult to reliably compare the findings across existing studies. There is a need therefore to develop a standardised set of methods to allow rapid, reliable and repeatable assessments across habitat types and in different geographic regions. Such a set of methods can be viewed as a 'toolkit' allowing researchers, conservationists, farmers and other groups to ask specific questions relating to pollinator biodiversity.

The ALARM project (Assessing LArge-scale Environmental Risks to Biodiversity with Tested Methods; http://www.alarm-project.ufz.de/) has been testing multiple methods across a wide range of habitats in Europe. Of all the possible methods two have been identified as showing particular promise for use in all habitats both within and outside Europe, and these have been recently tested in Ghana. The methods are water-filled pantraps and collecting with hand nets.

3. Pantrap methods:

3.a. What are pantraps?

Pantraps are small coloured bowls which attract insects to them and then catch them in the water (Figure 1). Different insects are attracted to different colours and so a variety of pan colours are used: blue, yellow and white usually work best. The pans are filled with water and a few drops of a detergent are added. The purpose of the detergent is to break the surface tension of the water which stops the insects from escaping. The pans are put out in relatively open areas of the habitat where insects are normally active and where flowers are present. They are left in place for about 2 days and then the contents collected.

Figure 1. Looking down into a yellow pantrap

3.b. How to make the pantraps.

Pans should be have a diameter of 10 – 20 cm and be 7 – 15 cm deep; a variety of plastic bowls and food containers are suitable for this. The pans must be sprayed with paints which are 'ultra-violet bright' this is because insects are much more sensitive to ultra-violet colours

than humans and so are attracted to them much more than non ultra-violet colours. Once the pans have been sprayed (inside and out) two small holes (2-3 mm diameter) should be made in the sides 1 cm below the top. This is to let excess water drain out of the pans should it rain heavily without the insects being washed away. A second pair of holes near the top of the pans may be needed to allow string to be attached if the pans are to be hung from tress or shrubs (Figure 2).

Figure 2. Pantrap hung on a branch

3.c. Putting out the pantraps.

At each site, 15 pantraps (5 blue, 5 yellow and 5 white) should be put out in areas where pollinators are likely to be found. i.e. where the vegetation is open and the pans can be seen from some distance, and if possible where there are flowers which the pollinators may visit.

- If the habitat has very low vegetation (e.g. short crops or grass) then the pans can be placed on the ground as long as the vegetation does not hide them.
- If the vegetation is higher (say up to a few 10s of cm) then the pans can be placed on stones or mounds of earth to make them conspicuous.
- For tall vegetation, and areas with trees and shrubs, then the pans can be hung on branches to make them easily visible (Figure 3).


Figure 3. Filling a pantrap with water

The pans should be placed in typical vegetation for the habitat and cover the commonest types if a variety of are present. The spacing between pantraps should be at least 5 m. Once the pantraps are in place fill them with water up to the drainage hole, add 4 or 5 drops of detergent and gently mix.

3.d. Collecting in the pantraps.

The pantraps should be left out for 2 days; ideally they should be set up in the morning of day 1 and collected on the morning of day 3. The contents should be poured through a small sieve or gauze to separate the insects. Any leaves or large bits of vegetation can be discarded. The insects should then be placed in sample tubes with 70% alcohol, this will preserve them so that they can be counted and/or identified at a later date. A unique label should be added; this can either be written in pencil or printed on a laser printer (but not a bubble jet printer otherwise it will wash off in the alcohol). The label should contain the following information: country, site details, date, pan colour, pan number, and collector. For example:

> Kenya, Thika, Pumkin field no. 2
> 4th March 2005
> Yellow pantrap no. 3
> John Beecatcher

3.e. Equipment list for each site:

- 15 pans (5 blue + 5 yellow + 5 white)
- String
- Water (enough to fill the pans)
- Detergent
- Gauze, netting or small sieve with holes less than 1 mm
- Storage bottles with 70% alcohol
- Labels


Fieldworker ready for action

4. Hand net methods:

4.a. What is hand netting?

This method involves a collector walking through the habitat for a set time and recording or catching pollinators with a hand net. Some insects may be very distinctive and can simply be recorded 'on the wing'; however, others will need catching and keeping for identification. The choice of whether to record or keep will depend upon the level of experience of the collector and also on what type of information is required (see 4.c).

4.b. Setting up and surveying a site.

Prior to the start of collecting, an area of about 1 ha (100 x 100 m) should be selected and marked out using tape or peg to indicate each corner. The area should be representative of the target habitat to be surveyed and include patches of the flowering plants or crop. During the survey the collector can move freely through the marked area for 30 minutes recording/collecting pollinators on flower patches, nesting sites or elsewhere. The person doing the survey can move around as they want but are not allowed to spend more than 5 minutes at any single plant or flowering patch and should not re-visit the same patch again. Insects can either be recorded directly on a data sheet if they can be identified unambiguously, or specimens can be kept for later identification. Insects should be caught with a hand net and carefully put into a killing jar. Specimens can either be dried and pinned or stored in 70% alcohol.

4.c. When to do your surveys.

Two 30 minute surveys a day are adequate and should cover the main period of pollinator activity (usually between mid morning and early afternoon). Spending a few hours at the site before starting the survey is useful to identify the peak times of pollinator activity. For instance if pollinators are most abundant between 9:00 and 14:00 then surveys at 10:00 and 13:00 should be sufficient.

4.c. To record or to collect?

Prior to starting the surveys it is extremely useful to take voucher specimens by catching representative species near the area where you plan to work. These can be pinned and used to make a reference collection for field workers. If collectors are experienced and can confidently identify some key taxa while flying or on flowers then these can be recorded on a data sheet in the field. However, many species look very similar and can only be separated by a trained taxonomists so be careful! If the aim is to survey the abundance of common groups of pollinators, then several species can lumped together into single categories e.g. stingless bees, honeybees, large solitary bees etc. Your reference collection will help you decide upon appropriate categories. In addition, if some pollinators are very common (e.g. honeybees), it does not make sense to catch them all if they can be recognised by eye and a count made.

4.d. Equipment list for each site:

- Hand net (with extension handle for high vegetation)
- Killing jar and killing agent
- Datasheets
- Tape or pegs

5. General considerations

Sampling intensity: Five rounds of each method should made with at least one week between surveys. The surveys should cover the peak blooming period of crops or natural areas.

Site selection: The location of sites for pantrap and hand net surveys should be changed for each round of sampling (though the 1 ha plot for hand net surveys can be used for both 30 minute period within a day). Selecting different sites gives a better reflection of the overall pollinator community in a study habitat.

Weather: Surveys should only be done under typical weather conditions. So if it is raining heavily or very windy then the surveys should be delayed until the weather improves. Short showers are acceptable providing there are periods in between when pollinators are active. High winds may also disturb pantraps hanging from vegetation.

Additional methods: This protocol assumes that investigators already have at least a basic level of experience of using hand nets, killing jars, insect identification and insect pinning. Additional advice should be sought if the investigator is unsure about any of these.

Processing and storage of specimens and data entry and analysis will be dealt with elsewhere.