Conserving biodiversity in the modernising farmed landscapes of Uganda

Second Annual Report

April 2006 – March 2007

The project team and members of the Agro-biodiversity Working Group meeting farmers at Katwadde village, October 2006

Submitted by

British Trust for Ornithology

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Darwin Initiative Annual Report

Darwin Project Information

Project Ref Number	14-032
Project Title	Conserving biodiversity in the modernising farmed landscapes of Uganda
Country(ies)	Uganda, Denmark
UK Contract Holder Institution	British Trust For Ornithology
UK Partner Institution(s)	Royal Society for the Protection of Birds (RSPB), Bournemouth University, University of Reading (Centre for Agri-Environmental Research)
Host country Partner Institution(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);
Darwin Grant Value	£233,987 total (£58,131 this period)
Start/End dates of Project	Start June 2005; End December 2008
Reporting period (1 Apr 2006 to 31 Mar 2007) and annual report number (1,2,3..)	1 April 2006- 31 March 2007, Annual report number 2
Project Leader Name	Juliet Vickery
Project website	http://www.natureuganda.org/main.php?act=agro
Author(s), date	Phil Atkinson, David Mushabe, Olivia Nantaba & Juliet Vickery April 2007

1. 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.

2. Project Partnerships

Project partnerships:

This second year of the project has seen a real strengthening and enhancing of project partnerships with excellent collaboration between UK, Danish and & Ugandan project partners. This has been achieved through regular visits to Uganda by BTO staff (four visits), University of Reading staff (1 visit) and project partners in Denmark (1 visit). In addition, Professor Derek Pomeroy from Makerere University has made two trips to the UK. As in year one, these visits have been as part of other work Professor Pomeroy is involved with but they have provided the opportunity for 1-2 days of discussion in Cambridge on each occasion.

The link between this project and the Plan for Modernisation of Agriculture (PMA) has been greatly improved through a meeting with the Natural Resource Sub-Committee of the PMA and project staff including BTO staff (Juliet Vickery and Phil Atkinson) in November 2006. Presentations about the project were made by BTO, NU and UWS and detailed discussion has raised awareness and understanding on both sides. A strong link with PMA via this sub group will be crucial in using the results from fieldwork and research to inform policy. We will hold a second similar meeting in 2007.

Communication, both between each of the partners in Uganda and these partners and the UK and Denmark, has greatly improved in the 2nd project year. This was one of the issues raised in the assessment of the Year 1 report and has now been addressed (full details of our response can be found in Section 5 of this report). Regular management meetings now take place between partners. These are coordinated by UWS (Olivia Nantaba) and involve the Director of MUIENR, senior NU and UWS staff (or deputies). In addition UK and Uganda supervisors receive regular updates on fieldwork progress from students.

Other collaborations:

The Agrobiodiversity Working Group is now well established and has maintained links developed in year one with VI Agroforestry project in Masaka, Send a Cow, NARO Research Institutes and several departments at Makerere University. Within the UK, close collaboration with Dr Simon Potts (Reading University) has maintained 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”.

Field trips carried out to Masaka and Bujagali have strengthened links with the local farming community and also introduced the project to staff from a number of other organisations including the Forest Resources Research Institute (FORRI), Biotrade Uganda and the Uganda Export Promotion Board, Export Promotion of Organic Products from Africa as well as key partners such as National Environment Management Authority (NEMA), the National Agricultural Research Organisation (NARO) and NAADS.

3. Project Progress

The project log-frame is given in Annex 1 and 2. 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.

3.1 Progress in carrying out project activities

Progress towards training outputs (1A/B, 5, 6A/B, 7):

The two PhD students and field assistants have now completed the first year of data collection. This has involved systematic bird and insect surveys and sampling, and associated vegetation assessments at 26 1km x 1km sites in the banana coffee arc around Lake Victoria (see Figure 1). These sites have been visited five times between February 2006 and February 2007. In addition to the bird and insect sampling two project staff, David Mushabe (NU) assisted by Olivia Nantaba (UWS), have mapped habitat composition and land cover for the entire 1km x 1km square, at all 26 sites, and piloted a socio-economic questionnaire at two of these sites. The latter will be finalised, with Dr Simon Bolwig, during a study visit by David Mushabe to Danish Institute of International Studies (DIIS) in April 2007. The intention is to gather information on labour, inputs, yields and product value for a subset of farmers (five per site) in the following year. UK and Danish staff, as well as Makerere supervisors (Philip Nyeko and Derek Pomeroy), have accompanied the field team on a number of visits and provided first-hand input and advice throughout the fieldwork as well as back up via email and phone. This has been particularly important for the entomological student (Theodore Munyuli) and his field assistant Maurice Mutabezi. They both came to the project as skilled field entomologists but with limited training and understanding of standard sampling techniques and survey design. Dr Simon Potts spent two weeks in the field with them in June 2006 and has ensured that the approaches being followed are in line with those used elsewhere (e.g. as part of the ALARM project http://www.alarm-project.ufz.de/). The collection of this unique data set has afforded six project staff (two PhD students and assistants, one UWS and one NU member of staff) rigorous training in the planning of fieldwork, the design of sampling and survey methods and a range of field techniques.

Data entry, although slower than hoped mainly due to the problems of very intermittent power in Kampala, is progressing well. The two PhD students and David Mushabe are, at the time of writing, in the UK receiving one-to-one training in a range of data manipulation and analytical techniques. This training visit, the first of two, extends over four weeks (mid/late March to mid/late April 2007) and will be reported in full in the 3rd annual report. In the first part of this trip (i.e. March 2007, the period covered by this reporting year) Theodore Munyuli (entomological PhD) spent time at Reading University with the research group led by Dr Simon Potts. He received specialised training in techniques and approaches required to analyse data from butterfly bait traps and butterfly transects. He also spent four days at the Natural History Museum, London, identifying specimens, assisted by Dr David Notton (Collection manager, Hymenoptera).

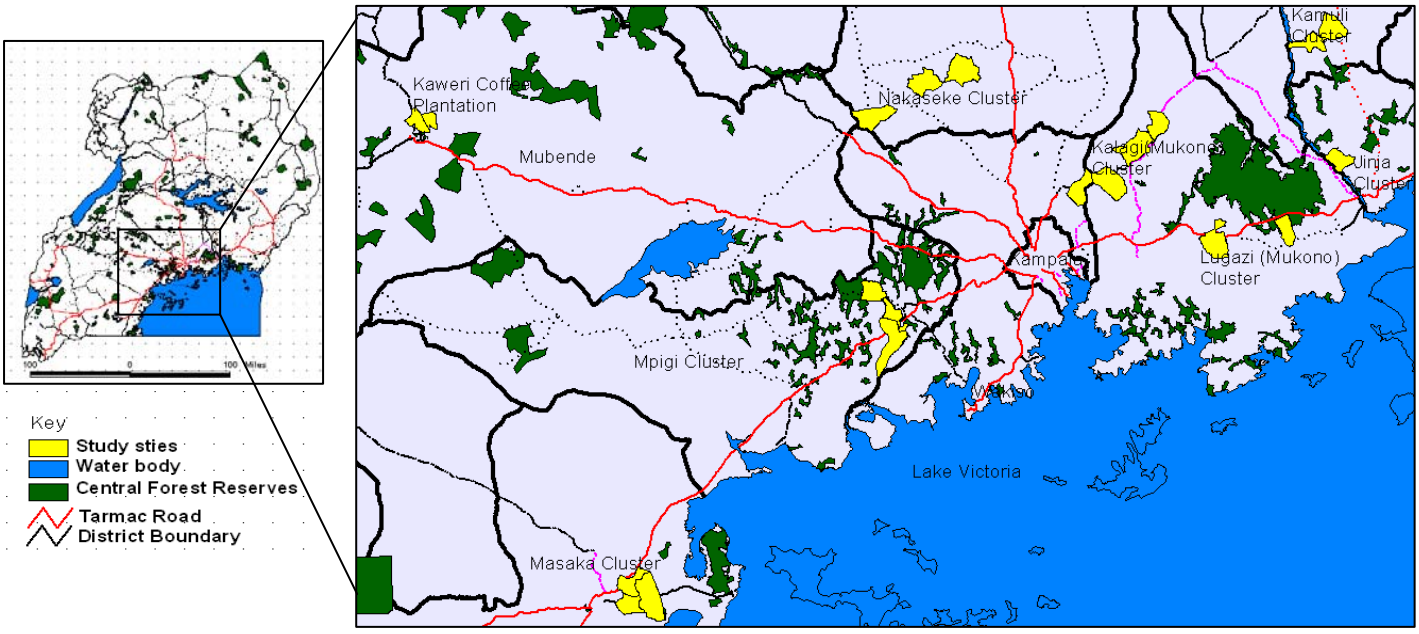

Figure 1. Locations where the 26 study sites are located. Sites were grouped into eight clusters and there were 2-4 sites per cluster. Each yellow polygon represents a parish.

During the visit the bird count data was analysed in a preliminary form and the students were introduced to and were able to carry out various statistical techniques such as General Linear Modelling, ordination techniques and logistic regression. A summary of the analysis of the bird and habitat data to date appears as Annex 3.

Between 27th and 29th March the students attended the Cambridge Student Conference on Conservation Science, based in the Zoology Department at the University of Cambridge. During three days of talks they heard talks by world experts in the field of conservation biology as well as PhD students from around the world. They also attended a number of workshops including 'How to design a research project' led by Professor Bill Sutherland, the Miriam Rothschild Professor of Conservation Biology (for details see http://www.sccs-cam.org/).

For the remainder of this trip all three project staff will receive GIS training at the University of Bournemouth (with Dr Adrian Newton). The two PhD students will spend further time analysing data under guidance at the BTO, whilst David Mushabe will go to Denmark for two weeks to finalise the socio-economic survey and analyse the land use data he has collected (measurable training outputs 5, 6A.B)

In addition to training these researchers and members of staff at UWS and NU the project is committed to training for agricultural extension service providers and smallholders in practical approaches to integrating biodiversity and agriculture. This will be achieved through a training manual, leaflets and demonstration farms. Draft training material was due to have been produced in February 2007 and trialled at a workshop. In this respect the project is behind schedule. The reasons for this have been twofold. First, the lead partner for this aspect of the project, UWS, has undergone a series of changes in senior staff with two changes in directorship in the last year. David Mutekanga, who was in post at the project inception, was replaced by Juliet Kintu who then left the post in early 2007 and has been replaced by Annet Nakyeyune. The agreement with UWS was that Olivia Nantaba would work 80% of the time on the project and the Director would work 20% of time on the project. This rapid turnover of personnel has caused a range of problems for UWS including delivering on this project. During our visit to Uganda in June/July 2007, we plan to spend a large proportion of our time with UWS staff and members of the Agro-Biodiversity Working Group to emphasise the need to 'make up ground' on this aspect of the work. The second cause of delay has been the change in the fieldwork structure in year one. The intention was for fieldwork to have been conducted in discreet field seasons with data entry and analysis being undertaken in the intervening periods. This has been replaced by one continuous year of fieldwork (see 1st annual report) with the

result that analysis has only just commenced. The result is that we cannot, as yet, identify best practices for biodiversity from these field data. This in turn has limited our ability to make 'evidence-based' recommendations for the handbook and/or leaflets for farmers. Analysis is now underway and we anticipate several outputs in the coming year that will provide the basis for both the handbook and a number of leaflets. However, UWS has been undertaking a literature search in order to collate and assess 'best practices' identified in studies elsewhere. We will use a number of these as the basis for the first leaflets for smallholders. These will allow us to develop a framework into which results from fieldwork in this project can be fed. Discussion forums have been held with local communities and smallholders (Agro-biodiversity working group field trips - see dissemination outputs)

Progress towards research outputs (8, 9, 10, 11B, 12A/B):

As outlined above under 'progress towards training outputs', there have been several visits by UK and Danish staff to Uganda to afford training and advice on the research programme in general and the fieldwork in particular. These have amounted to a total of ca 10 weeks in Uganda together with approx 20 weeks from Professor Pomeroy (measurable research output 8).

The annual report, along with a summary of the assessment of this report from the Darwin initiative was circulated to all project staff and stakeholders. The Agro-Biodiversity Working Group has identified two potential demonstration farms in Namizzi East and these may be the location of demonstration visits in the final year (measurable research output 9). The Agro-Biodiversity Working Group has drawn up a draft contents list for the training manual/handbook (see Annex 4 ; measurable research output 10)

The PhD students have both drawn up draft contents for their respective theses. These will take the form of manuscripts submitted for scientific journals with an introduction and discussion to draw the papers together (measurable research output 11B). The data collected in year one, relating to insects, birds, habitats will, in subsequent years, be integrated and stored as part of the National Biodiversity Databank NBDB (measurable research output 12/AB)

Progress towards dissemination outputs (14A/B, 15A/B/C, 17A, 19A/B):

In general dissemination outputs have been slightly delayed by the alteration in the field programme in year one (see training outputs) but with analysis now underway we anticipate several outputs in the coming year in the form of press releases, newsletter articles and talks.

The PhD students gave short presentations to BTO and Makerere staff during a BTO visit to Uganda in November 2006 and also gave presentations to two farmer fora which took place in 2006. In addition, their attendance at the Cambridge Student Conference on Conservation Science has also provided them with first hand experience of what is required in a scientific presentation. The intention is that both PhD students will give presentations at this conference next year and with this in mind we had discussions after the each day of the conference about 'lessons learned' with respect to what makes a good and a poor oral and poster presentation (dissemination output 14B). In addition to this the Ornithological PhD student (Dianah Nalwanga) attended the African Bird Club AGM whilst in the UK (31st March in Thetford).

Project staff were invited to participate in an EPOPA (Export Promotion of Organic Products from Africa) biodiversity project meeting in November 2006 as our project is very relevant to this initiative. The meeting was a follow up of a workshop held in May 2006 which EPOPA (http://www.grolink.se/epopa/) jointly held with the Darwin Agro-biodiversity Working Group at Makerere University. The meeting focused on how the EPOPA biodiversity project can document the status of biodiversity in organic projects, the factors that impact on this biodiversity, and how biodiversity can be enhanced by organic farmers.

One of the outcomes from this meeting was a decision to jointly identify farming practices that are both beneficial to biodiversity conservation as well as production. As this is the theme of our forthcoming farmer/extension agent handbook, this is a potentially very useful collaboration.

One press release has been issued in Uganda with the aim of raising awareness of the project and the value of biodiversity in cropped land (Annex 5, Measurable dissemination output 15A/B/C).

A newsletter will be produced for all project stakeholders and can be used as a basis for an article for publications produced by NU, UWS, Makerere University, BTO, RSPB and Bournemouth and Reading University by July 2007 (dissemination output 15A/B and 16A). A supplement relating to the project has been produced for the magazine *NatureUganda* (Measurable dissemination output 16A). The articles appear as Annex 6.

The Agro-Biodiversity Working Group has met four times, twice in Kampala and twice in the field in Masaka (Katwadde village October 2006, see front cover photo) and once in Bujagali (February 2007). The group has established its overall goal and purpose and these are given in Annex 7.

The project web site is now hosted at NatureUganda and is maintained by them (Measurable dissemination output 17A).

Two radio broadcasts have been made relating to the project. The first in October 2006 on Radio Uganda with four participants: Mr Mwandah Sam (Uganda Wildlife Authority), Mr Ayazika Waiswa (PMA Natural Resources Committee member), Mr. Okecho Geresom (NAADS), Achilles Byaruhanga (NU). The second went out in January 2007 on Central Broadcasting Service Radio with a representative from the Buganda Kingdom, where the majority of the field work is being conducted, represented. The main aim of these two programmes was to raise awareness (a) of the project as a whole (b) of the value of biodiversity on cropped land (i) in the form of ecosystem services and (ii) in terms of the conservation of biodiversity, in its own right, outside reserves (Measurable dissemination output 19A/B).

Dissemination within the project itself progresses through the web site, email updates and, more particularly, steering group meetings. The third project steering group meeting was held in NU Kampala November 2006 . In attendance were Juliet Vickery, Phil Atkinson, Achilles Byaruhanga (NU), Juliet Kintu (UWS), Derek Pomeroy (Makerere) Frank Kansiime (Makerere), Philip Nyeko sent his apologies.

Progress towards physical outputs (20, 21,22):

The majority of outputs under this section were either completed in the first project year (e.g. project vehicle, computers, field equipment etc totalling c. £20,000) or will be completed in the final year of the project (demonstration farms).

Progress towards financial outputs (23):

In this financial year UK partners (BTO and Reading) have contributed £14,995.

3.2 Progress towards project outputs

Overall progress towards project outputs in the 2nd year of the project has been extremely good with respect to the training and research of the PhD students and assistants, but progress has not been as good with respect to the production of the agro-biodiversity handbook and associated leaflets for farmers. In terms of training and research outputs, the research students, assistants and UWS and NU staff have received extensive training in research design and implementation, biodiversity survey methods (particularly for birds and insects) data management, manipulation and analysis. The training has involved direct academic supervision in Uganda and the UK by both Ugandan and UK staff. Work in subsequent years will build on these skills and develop a stronger focus on analysis and reporting of results in written and oral form. The information gathered in the first year of the work forms a unique data set relating to biodiversity in agricultural land in East Africa. This will form the basis of scientific papers (and hence also PhD theses) addressing patterns of abundance/diversity in relation to land use intensity and season as well as the possible causal mechanisms underlying these relationships. In addition the approaches used have provided methodological insights, for

example the efficacy of point counts and timed species counts in bird sampling in different habitats, and these will also be published as papers. The addition of socio-economic data for the sites surveyed will allow the integration of economic, social and biological data in a way rarely possible simply because these data are rarely collected at the same sites at the same time. The use of insect sampling in line with other international protocols (e.g. as part of the ALARM project http://www.alarm-project.ufz.de/) will allow these data to be integrated with those form elsewhere in the world. Ultimately these data will all be held in the National Biodiversity Data Bank (NBDB). The Agro-Biodiversity Working Group is now established and has met several times in Kampala and on field visits. This has laid the foundation for the training manual/handbook for agricultural extension service providers and information leaflets for small holders.

Dissemination outputs have been delayed for the reasons outlined in section 3.1 (Progress towards dissemination outputs). However, with analysis of field data from year one now progressing well we anticipate preliminary results will be available on which to base articles for newsletters etc in the near future. The web site is set up there have been two radio broadcasts and two posters produced and a supplement for the NatureUganda's magazine.

The one area where the project is behind is with respect to the production of the production of the agro-biodiversity hand book and associated leaflets for farmers. This has been a result of continuing staff changes at the main Ugandan partner organisation responsible for this aspect of the work and a change in the filed work programme in year one. We are confident we can address this issue and make good progress in year three.

3.3. Standard output measures

Table 1. Project Outputs (According to Standard Output Measures).

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 (person weeks)		14			
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			
9	Number of documents produced for host country		1			
10	Number of guides/training manuals produced					
11B	Number of scientific papers to be submitted					
12A	Number of data bases established					
14A/B	Number of conferences/seminars to		3			

	be organised or attended					
15ABC	Number of national press releases in Uganda,UK		1			
16ABC	Articles appear in BTO, NU and UWS newsletters		3			
17A	Agro-biodiversity Working Group established/meetings		4			
19A 19B	Number of national radio interviews or features in host country(ies) Number of national radio interviews/features in UK		2			
20	Estimated value (£'s) of physical assets to be handed over to host country(ies)		500			
23	Matched funding from UK organisations		£14995			

Table 2. Publications

Type * (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £ (if applicable)

3.4 Progress towards the project purpose and outcomes

The project purpose as stated in the application, 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.

In this 2nd year of the project three main activities have contributed towards the purpose and outcomes of the project.

First, 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.

Second, the establishment and progress of the Agro-biodiversity Working Group. This will ensure small holders and policy makers are aware of the project and its aims. It will also help to ensure 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. The hand book and associated leaflets, produced with the advice and guidance of this working group, will provide a key tool for small holders and agricultural extension service providers to promote

sustainable agriculture that will also maintain biodiversity. The field trips undertaken by this group already have begun a process by which information on best practice can be gathered, possible demonstration farms identified and communication and dissemination of the results of the project enhanced.

Third the meeting of the project staff with the Natural Resources Sub Committee of the PMA. This has developed a good channel of communication with policy makers and ensured they are aware of the aim and approach of the projects, the location and duration of the work. This link will be vital if the project is to influence policy and the response to the presentation made were extremely positive

3.5 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The generic DI refers to three goals (a) a change in state of biodiversity (reduction in species or habitat loss), (b) progress towards sustainable use and (c) a human community living with biodiversity has the costs reduced or the benefits increased stemming from the conservation or use of that biodiversity. In the 2nd years of this project we have made progress towards the (b) and (c) both of which will contribute to (a). Through a combination of the field data collected and the information gathered for the agro-biodiversity and leaflets we will identify and promote 'best practices' that maintain or enhance yield and conserve biodiversity. We will also raise awareness and increase the benefits that farmers and smallholders accrue from biodiversity conservation (e.g. pollinator services). Adoption of these 'best practices' will undoubtedly contribute to a reduction in the rate of species and habitat loss within agricultural lands.

4. Monitoring, Evaluation and Lessons

Monitoring and evaluation

Two relatively informal systems monitoring progress were implemented in year one and these have worked well throughout the second year. These comprise (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 (Produced by Olivia Nantaba at UWS). The student updates 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 Prof Frank Kansiime the Director of MUIENR.

To date the main output of the project is the data being collected by the field team. The rigour of data collection has been assessed through numerous field visits by UK (Simon Potts, Phil Atkinson and Juliet Vickery), Danish (Simon Bolwig) and Ugandan supervisors (Derek Pomeroy and Philip Nyeko). Students made presentations, based on these data, to a small supervisory committee in November 2006 (Frank Kansiime, Derek Pomeroy, Philip Nyeko, Phil Atkinson, Juliet Vickery). This was also used as an opportunity for us to ensure the field methodology is being applied rigorously. As part of the trip to the UK the students will be asked to produce a timetable of analyses and writing to ensure analyses are completed as efficiently as possible

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

The improvement in communication implemented following comments from the 1st annual report have greatly enhanced progress and the coherence of the work programme. The management structure, described in the half year report (and repeated below), is working well and there is good communication between partners.

Excerpt from the half-year report:

The last annual report asked for more clarification about the management structure within the project. During the implementation of the project, we have become aware that lack of a rigid management structure may become an issue. With the departure of David Mutekanga (Exec Secretary of Uganda Wildlife Society, UWS), this became a more pressing problem. As a result Olivia Nantaba was employed in his place and will be working full time on the project. A new Executive Secretary, Juliet Kintu, has replaced David Mutekanga.

The management structure is complex due to the number of organisations involved but there is a clear chain of command and division of responsibilities. In terms of the day-to-day management, David Mushabe (Nature Uganda) is the overall coordinator of the project. He does this, in addition to undertaking data collection in relation to the socio-economic and landuse part of the study. He deals with all the logistics and finance for the fieldwork and he has the authority to make rapid decisions on a day to day basis. The students and field assistants coordinate their work through him and if there are any problems or queries during the fieldwork, they will liaise with him first.

Olivia Nantaba (Uganda Wildlife Society) deals with external communications. This includes the Agro-biodiversity Working Group. UWS were brought into this project as communications and policy development are the main strength of that organisation. Nature Uganda has a more practical role in conservation and tends to be rather less involved in preparing policy briefs or lobbying government. Olivia liaises with David Mushabe and acts as a link between the field team and the Agro-biodiversity Working Group. Olivia also works in the field (part-time) with David and so is intimately involved with the project.

The project is overseen locally by senior staff in the Ugandan organisations. These are Achilles Byaruhanga (Executive Director, Nature Uganda), Prof. Frank Kansiime (Director, MUIENR), Prof Derek Pomeroy (Deputy Director, MUIENR), Juliet Kintu (Executive Secretary, UWS). Local management meetings are held every 2-3 months and David Mushabe and Olivia Nantaba present the work that has taken place since the last meeting. Any queries and problems are raised in these meetings and acted on. This ensures the project runs smoothly from day to day, but progress is reviewed every 2-3 months by senior staff. Students are reviewed every month as they produce a brief progress report for Prof Kansiime and their supervisors. Although informal, these email communications allow progress to be closely monitored.

More strategic decisions are made during Steering Group meetings. These are held every 6 months and a wide range of organisations are represented. During these meetings the students, David Mushabe and Olivia Nantaba present results from the recent fieldwork as a basis for discussion and future development of the work.

6. Other Comments on Progress Not Covered Elsewhere

In the first year of this project we reported that fieldwork was slightly behind schedule. In the second year we employed David Nkuutu on a two month contract to undertake extensive tree surveys of all 26 1km x 1 km sites. Mr Nkuutu has worked on a number of similar studies for organisations such as ICRAF and is a highly skilled field botanist. The purpose of this contract was to identify tree species within the sites at 20 25m radius plots within each 1km x 1km site (se Annex 8). This will give us a measure for each site of density of native and non native species. A preliminary report from this work (from 20 of 26 sites) is included in Annex 8.

7. Sustainability

The profile of the project has been enhanced in several ways and to a range of different audiences. At the general level this has been achieved through two radio interviews (Radio Uganda and Central Broadcasting Service Radio) and a press release. There has also been a supplement written for NatureUganda. The work has been promoted to the local farming communities through the production of a poster for smallholders and the two field visits made to Masaka (Katwadde village) and Bujagali (Namizzi East) by the Agro-Biodiversity Working Group. At the policy level the Agro-biodiversity Working Group includes members from a wide range of organisations and the project gave a series of formal presentations about the work to the Natural Resources Sub Committee of the PMA.

8. Dissemination

The activities that related to this section are reported above under sustainability as they are the main ways in which the profile of the project has been raised.

9. Project Expenditure

Table 1 Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March)

10. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

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

Initial analysis of the bird data has led to some exciting findings. Population density, our measure of farming intensity is strongly related to both the types of habitats and the bird communities in our study areas. Areas of high population density tend to have more maize and sugarcane and less banana. This has an impact on birds, with more forest dwelling species being found in areas of low intensity (higher population density). Although we are just starting the full analysis, the number of larger trees stands out as being important, especially for large frugivores such as Black and White Casqued Hornbill and Great Blue Turaco and we expect more relationships to become apparent as we fully analyse the data. Interestingly, the amount of fallow or the number of trees was not related to farming intensity. This is encouraging as it suggests that even in intensive farming areas the landscape could be modified to accommodate these large frugivores.

The second major achievement has been the establishment and development of the Agro-biodiversity Working Group. Made up from c.20 organisations, this has met four times during 2006 (twice with farmers in the field). There is real enthusiasm for this group to continue (at government and NGO level) and organising a joint workshop with EPOPA (promoting organic farming in Africa) was one of the high points in 2006/2007. The group have developed their own Terms of Reference and one of the major tasks in 2007/2008 is the development of the handbook for extension workers that will promote biodiversity- and farmer-friendly farming.

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2006/07

Project summary	Measurable Indicators	Progress and Achievements April 2006 - March 2007	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 constrained 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			*(do not fill not applicable)*
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.		
Output 1. Project management systems in place and effective communication across project partners established.	Activities on schedule, milestones met throughout the project. All project partners have access to all project outputs. Project partners are fully aware of roles and responsibilities and reporting dates and collaborating on all relevant project activities.	After the evaluation of the Year one report, the management structure of the project has been firmed up and there is now effective communications between partners and there has been strong integration with staff from all three Ugandan partners taking part in fieldwork, farmer meetings and meetings/conferences.	As much of the fieldwork was compressed into year one, the production of the handbook is behind schedule. We will concentrate on this in the first half of the Year 3 to being it back on track.
Output 2. Relationships between biodiversity and farming practices are understood and best practices	Effects of changing agricultural policies and practices on biodiversity can be predicted by	Fieldwork has been an outstanding success and the initial analyses of the data look very promising. The	Two main aspects: for the bird aspect of the study we will pick sites to test out the model

(including novel approaches) identified	year 4. Biodiversity indicators identified and best practices (including novel approaches) described and documented by year 4.	time spent in choosing sites carefully has paid off and the analyses show that we have captured a gradient of 'farming intensity' and the bird data shown some very strong patterns in relation to this gradient. We should be able to make some firm recommendations about beneficial farming practices once the data analysis has been completed.	prediction obtained from the data collected in the last year to determine whether they can be generally applied or are specific to our sites. The invertebrate part of the study will concentrate on the economic value of invertebrates by conducting pollination experiments and looking at the value of pollination services.
Output 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.	The farmer survey was drafted, field-tested in two sites and revised. This will quantify the labour, expenditure, yield and income which will give us a detailed breakdown of the main sources of income.	The fieldwork outlined in Output 2 above will determine the loss of yield if pollinators are excluded. The data from the questionnaire can be used to quantify the economic importance of pollination services to the farmer.
Output 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	In the last year we have concentrated on fieldwork and the training in biodiversity survey and census techniques has progressed well. The Agro-biodiversity Working Group has been a real success and the meetings and field visits have really strengthened the project's links with government and NGOs.	As we move the emphasis away form fieldwork to handbook production and training extension workers, we will establish demonstration farms and start the training of extension workers.
Output 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	During the past year we have held two farmer fora and disseminated information about the project and the economic value of biodiversity	The preliminary analysis of the bird data shows that agricultural practice does have an influence on the bird communities. As we (a) get further

	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	to them. These have been well received. We have also developed link with many NGOs, both in the field (i.e. working in similar areas) or through meetings and conferences, e.g. the organic farming conference held jointly with EPOPA and the project's Agrobiodiversity Working Group.	with analysis and (b) identify practices from the literature we will communicate this to farmers and extension workers.
Output 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.	This output will be completed towards the end of the project but during the last year of fieldwork, we have been documenting best practice identified by other organisations.	During the coming year we will combine the best practices identified over the last year and, together with the data we have been collecting, we will be in a position to determine those practices that provide a win-win scenario for farmers and biodiversity.
Output 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.	All the sites are now geo-referenced and once the data have been cleaned, they will be entered into the National Biodiversity Data Bank (NBDB) at Makerere University together with details of the methods used.	Over the next year we will be visiting other sites which are included in a long-term monitoring scheme organised by Makerere University to test out the species/habitat models built from the last year of fieldwork.
Output 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 established and is working well. Our relationship with the Plan for the Modernisation of Agriculture (PMA) is excellent.	During the next year, we will present results from last years fieldwork to the PMA and seek to identify cross-cutting themes from other initiatives. For example many of our recommendations may well be beneficial to, for example, soil and water conservation.

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
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.	Advisory materials, training workshop reports, policy documents, scientific papers.	
Outputs 1. Project management systems in place and effective communication across project partners established.	Activities on schedule, milestones met throughout the project. All project partners have access to all project outputs. Project partners are fully aware of roles and responsibilities and reporting dates and collaborating on all relevant project activities.	Annual and final Project reports. Bi-annual Steering Committee minutes. Distribution lists of all project partners, stakeholders and donors. Project web site established.	Project area remains safe to work in.
2. Relationships between biodiversity and farming practices are understood and best practices	Effects of changing agricultural policies and practices on biodiversity can be predicted by year 4. Biodiversity indicators identified and	At least 4 Scientific papers submitted to peer review journals on project completion. Annual and final project reports. Bi-annual supervisory and training visits to Uganda	Project area remains safe to work in. Farmers remain receptive to

(including novel approaches) identified.	best practices (including novel approaches) described and documented by year 4.	by UK staff. Two exchange visits to the UK by PhD students.	the project.
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.	At least 2 of the 4 scientific papers submitted to peer review journals will include consideration of economics. Annual and final & project reports. Two training visits by DIIS staff.	Project area remains safe to work in. Farmers remain receptive to the project
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 theses submitted and at least 4 scientific papers submitted. Training manual produced, trialled and distributed to agricultural extension service providers with leaflets and posters for farmers. At least 3 open days held for agricultural policy and extension service providers at demonstration farms, Articles produced for popular press and at least 2 radio broadcasts per year. Biodiversity issues integrated into existing and new Government policies.	Farmers Government and NGOs remain receptive and committed to the project
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	At least 2 demonstration farms established with at least three open days for all stakeholders including local communities. Annual discussion fora between NU/UWS and farmers. Leaflets and posters produced for farmers. Two workshops for NAADS agricultural extension service providers. Increased knowledge and understanding of how to integrate the	Farmers remain receptive to the project

	by year 4. At least 50 NAADS agricultural extension service providers trained	needs of biodiversity with sustainable agricultural practices supported by a manual of best practices.	
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.	Annual and final project reports. Bi-annual reports from all Steering Committee meetings and two workshops. One training manual produced and advisory leaflets and posters for farmers. Demonstration plots established. At least 2 grant applications submitted. At least 3 national press releases in Uganda and one in the UK in each project year. At least two radio interviews/broadcasts each project year for national and local radio stations	Relevant government authorities maintain their support for the project.
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.	Data entered into the NBDB and at least one article written for an NBDB report. Field and analytical protocols documented in the final report, relevant scientific publications and on the web site Baseline data is fed into the NBDB, study sites geo referenced and protocols and indicators established for future monitoring.	Relevant government, NGO and other stakeholders maintain their support for the project.

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.	At least two project funding documents submitted. Agricultural biodiversity working group in place.	Relevant government, NGO and other stakeholders maintain their support for the project.

Activities	Activity Milestones (Summary of Project Implementation Timetable) Note this project runs for 3.5 years
Project management	Yr 1: BTO project manager to establish project management systems and structure and formalising (through MOUs) the roles and responsibilities of each organisation. Establish Project Steering Committee, International PhD Supervisory Committee and project web site (2 months). Recruit NU/UWS project staff and external experts, PhD students and research assistants. First Steering Committee meeting (1 day September 2005), first meeting with government (1 day, February 2006) and local communities (September 2005). Establish regular liaison meetings between researchers, advocates, policy makers, national and local (district) governments and farmers in years 2 - 3.5. Set up information sharing mechanisms between Steering Committee members. Yrs 2 - 3.5 at least two steering committee meetings per year, one discussion forum with local communities and one meeting with government.
Research and monitoring	Yr 1: Establish study sites based on agricultural statistics and National Biodiversity Database. Trial and verify fieldwork methods. Undertake first year data collection on different taxa (birds, invertebrates, bats and agricultural land use. Input data and analyse to refine data collection methods. Yr 2: Refine and test methods in response to Yr 1 results as necessary. Undertake second full year of data collection. Input and analyse data. Feed results into strategy and documentation for providing advice to farmers, identifying best practices for biodiversity and novel management approaches. Yr 3: undertake third and final full year of data collection. Input data and start final analysis. Update provision of advice. Yr 3.5: complete analysis of full data set and write up results for publication. Synthesise results from all studies to identify best practice. Use results to fully update advocacy process. All data entered into National Biodiversity Database, identify indicator species and establish and document protocol for future monitoring system designed. Project proposal for continued monitoring produced.

Training	Yr 1 and 2: Supervisory training visits made by UK staff to Uganda to provide training in study design, field skills and data collection, for researchers (September 2005 November 2006). Yr 1, 2, 3 and 4: 2 training and supervisory visits per year made by BTO/RSPB/DIIS experts. Yr 2 and 3: training visits by key Ugandan research staff to UK. Research staff attend international scientific conference and two GIS training courses at Bournemouth University. Training in biodiversity assessment for NAADS advisors, agricultural service providers and NU/UWS staff. Yr 3 and 4 establish 2 demonstration plots and hold at least 3 open days. Yr 3.5: 2 PhD studies completed
Advocacy and PR	Yrs 1 - 3.5 Annual discussion forums to (a) assess needs and (b) deliver project outcome to extension service providers. Annual meetings with other stakeholders through Steering Committee meetings and discussions with Government. Yr 2 and 3 Production and distribution of advocacy materials including training manual for agricultural extension service providers, leaflets and posters for farmers and radio programmes to access a wider audience. Project proposals produced to ensure sustainability of integration of biodiversity issues into agricultural policy and practice (e.g. developing and expanding the use of participatory methods for biodiversity-friendly technology development amongst smallholders). Agricultural working group established to ensure biodiversity issues are integrated into new and existing relevant government plans and strategies

Annex 3 Initial results from the bird and habitat surveys

Introduction

During the first three rounds of fieldwork, 30 point counts and 30 ten minute counts (ten per round) were undertaken at 24 sites. In round three an extra two sites were added at Kaweri coffee plantation. Each site was one square kilometre grouped into eight clusters (2-4 sites per cluster) and ten points were identified with each site. During the surveys, 21,665 records of 194 species were noted. At each point 4 transects of 25m were walked from the point (these were standardised to run north, south, east and west from the point) and the amount of different habitat types/crops were recorded. This was expressed as the number of metres on which each habitat/crop was recorded in the transect and was amalgamated to give an overall cover measurement.

With only 26 sites, the original site selection procedure (see first annual report) was crucial to identify a series of sites that were representative of the both the farming systems and the intensity gradient in the banana coffee arc of Uganda. The final site selection was based around the use of population density as a surrogate of farming intensity. We hypothesised that the higher the density, the greater relative use of the land area for farming compared with areas of lower population density. These were grouped into five different classes.

One of the aim's of Dianah Nalwanga's visit to the UK in March/April 2007 was to validate the data and undertake training in appropriate analyses. The bird and habitat data were first cleaned and standard species names and site codes were applied to the field data.

Data analysis and results

Ordination analysis

The first analysis performed was to determine whether there were any gradients that could be identified within both the bird communities and habitat found at each site. For this analysis we excluded the plantation sites (tea, sugarcane and coffee) as they had a very large influence on the results as we were mostly interested in the small-holder farming system. We undertook a detrended correspondence analysis (DCA) for both datasets (Figure 1) and correlated axis 1 and 2 scores with the habitat data, the intensity score for each site and the number of the different functional groups of birds recorded in the sites.

For the habitat data several gradients were identified. Axis 1 represented a gradient from a large number/amount of small trees, young fallow, potatoes and homesteads to larger areas of coffee and maize. Axis 2 was a gradient from larger amounts of maize and sugarcane to larger areas of banana. Sites within a cluster tended to be closer together in the plot indicating that sites within a cluster tended to show less variation than sites outside. Axis 2 was strongly correlated with our initial intensity measure and when correlated with the number of the different functional groups of birds showed a positive relationship with the number of forest generalist species (more in lower 'intensity' sites) and a negative relationship with the number of waterbird species. This relationship between the number of forest species and our intensity measure was robust (Fig 2) and indicates that the bird community is associated with population density/intensity.

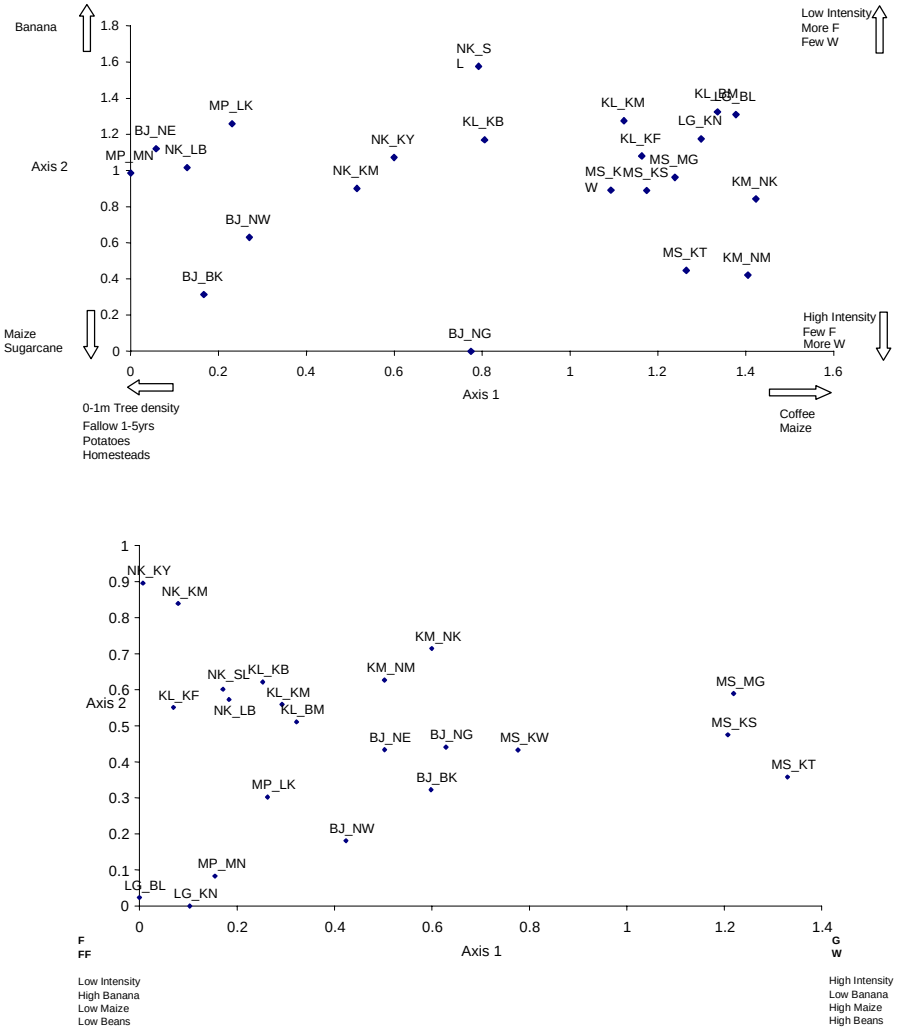

Figure 1. DCA plot of habitat variables (top plot) and bird species data amalgamated at the site level (lower plot). The variables which were significantly correlated with each axis are shown along with the direction of that relationship. The functional groups of birds are also overlaid where significantly correlated with an axis (F = forest generalists; FF = forest specialists; W = wetland species; G = grassland species).

The ordination diagram for birds showed a similar picture. The sites at Masaka (cluster MS) stand out as having bird communities that are different from the other small scale agricultural sites. Axis 1 was correlated with intensity and going from sites with large amount of bananas to sites with higher amounts of maize and beans. The axis also describes a gradient from Forest specialists (FF) and forest generalists (F) to species associated with grassland (G) and wetlands (W).

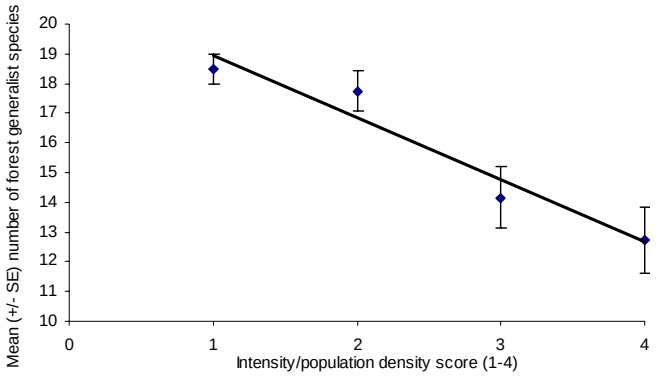

Figure 2. The relationship between the number of forest generalist species and the population density/intensity score for the 22 smallholder agricultural sites. The population density ranges from low (1) to high (4).

Relationship between functional groups and habitat variables

The data were then analysed by functional group in relation to habitat variables. These confirmed the DCA analysis above and again showed that the number of forest species declined with increasing intensity and were positively related to banana and semi-natural forest (Table 1). More wetland species occurred at higher intensities and also where rice farming was present.

Few grassland species were recorded and it is probably due to this that few significant relationships were found. A positive relationship with beans was the only significant result obtained.

Table 1. Significant regression results between habitat variables and the bird functional groups.

Functional Group	Variable	R^2	P	Relationship
Forest specialists (FF)	Intensity	23.2	0.023	-
	Banana	23.9	0.021	+
	Semi natural Forest	34.0	0.004	+
Forest generalists (F)	Banana	34.5	0.004	+
	Intensity	54.8	0.000	-
	Fallow < 1-3m	19.8	0.038	-
Wetland species (W)	Intensity	64.0	0.000	+
	Banana	24.4	0.020	-
	Rice	18.8	0.044	+
Grassland species (G)	Beans	19.4	0.040	+

Relationship of individual species to habitat variables

The next stage of analysis was to look at key species and their relationship with habitat variables. For this we again took data amalgamated at the site level and, for example, used logistic regression to look at the relationship of the presence of Great Blue Turacos (expressed as the number of surveys in which it was present/total number of surveys) in relation to two key variables, total tree density and density of trees 3-8m tall. Both variables were significant and showed that the probability of occurrence of a turaco in a point rapidly increased as the density of trees increased. The birds seemed to respond quicker to the presence of trees 3-8m tall which is reassuring as the total tree density contained small trees and tall shrubs that are unlikely to be suitable for turacos.

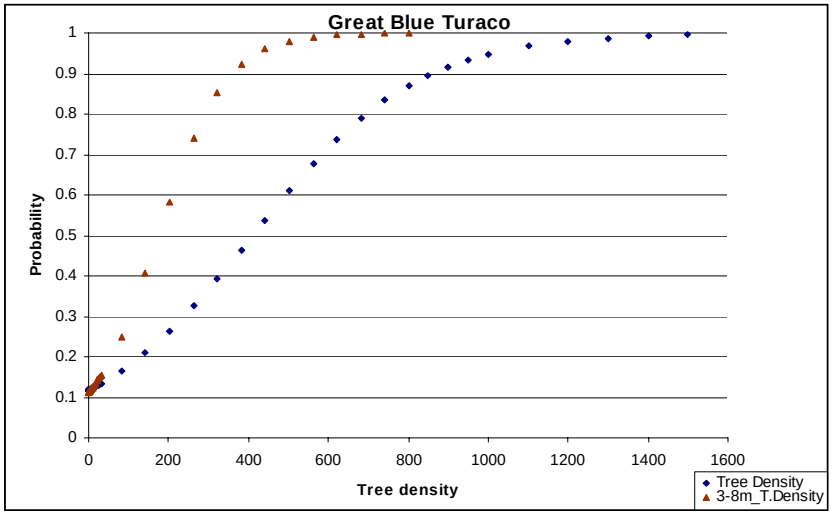

Figure 3. The relationship between total tree density and trees 3-8m high and the probability of a Great Blue Turaco being recorded in a point. The line shows the fitted relationship obtained from the logistic regression analysis.

The way forward

During the visit to BTO, Dianah learnt how to sort out her field data, check it for inconsistencies and clean up any problems. During her time at BTO we concentrated on looking at data at the site level and use three main types of analysis – correspondence analysis for identifying gradients in the species and habitat data, general linear models for analysing count data and logistic regression for analysing presence/absence data.

Dianah will now concentrate on checking and cleaning the data for the 4th & 5th rounds and rerun the analyses at two different scales – site and point. As well as using her own habitat data, the land use mapping data and woody vegetation survey will be available soon and can be incorporated in her analysis. Once these have been done she will concentrate on performing the analysis for two chapters of her thesis and aim to have drafts complete by the autumn. For the second field season (latter part of 2007) she will select more sites at random to test the generality of the bird habitat models obtained from the first years fieldwork.

Annex 4 Draft outline for the Agro-biodiversity handbook produced by the Agro-biodiversity Working Group

Outline

Acknowledgements

Acronyms

1. Introduction

1.1 Uganda's Biodiversity

1.2 Agro-biodiversity

1.3 Why the Handbook

1.4 How to use the Handbook

2. Agricultural landscapes

2.1 In context to biodiversity Conservation

2.2 In context to other conservation areas

2.3 In relation to the National Biodiversity Strategic Action Plan

3. Agriculture and soil, water and Biodiversity

3.1 Role of Agro-biodiversity in agricultural development

- Traditional
- Modern

3.2 Impacts of Agricultural practices on biodiversity

4. Managing Biodiversity in Agricultural landscapes

4.1 Management needs and challenges (soil, water and biodiversity)

At the farm level (e.g. crop rotations, livestock practice)

At the field level (e.g. specific crop types, fallow land, use of shade crops etc)

Non crop habitats (e.g. ponds, rivers, woodland, tree lines and trees)

4.2 Management options and strategies (soil, water and biodiversity)

At the farm level (e.g. crop rotations, livestock practice)

At the field level (e.g. specific crop types, fallow land, use of shade crops etc)

Non crop habitats (e.g. ponds, rivers, woodland, tree lines and trees)

5. Tools and methodologies for managing biodiversity in agricultural landscapes

Rotations, fallow

Planting, cultivating, ploughing, harvesting,

Weed management, fertiliser practice

Grazing regime and livestock management

6. Conclusion

7. References.

Annex 5 Press release

Bees, Birds and Bumper Crops

Bees, Birds and Crops on the farm are important in regard to biodiversity conservation.

Biodiversity refers to the diversity of life. Biodiversity includes among others crops on the farms, birds, insects, mammals, reptiles and trees. Biodiversity on farmland is important because it is beneficial to crop production. Retaining biodiversity on the farm leads to high yields. How? Trees help in soil and water conservation, insects (e.g. bees) and birds pollinate plants and therefore help in production of fruits. Insects and micro-organisms like earthworms, dung beetles decompose waste leading to increased soil fertility. Fertile soils lead to increased crop yields. Economically, biodiversity is a resource for daily life to all humans. Directly, biodiversity can be economically important for, food, medicine, recreation and Ecotourism.

The Agro biodiversity (wildlife on farmland) project is an entirely new initiative, but builds on a pilot project recently led by the International Food Policy Research Institute (IFPRI). It targets the banana/coffee arc around Lake Victoria, which is one of the major farming systems in Uganda. The project sites are **Kamuli, Jinja, Lugazi, Mukono, Masaka, Mpigi, Mubende and Nakaseke**. The project seeks to identify best practices for the long-term conservation of biodiversity on farms without compromising crop yields.

The project is funded by the Darwin Initiative through the British Trust for Ornithology. It is implemented by Uganda Wildlife Society, NatureUganda and Makerere University Institute of Environment and Natural Resources, in collaboration with Makerere University Department of Forest Biology and Ecosystems Management, Plan for Modernization of Agriculture (PMA), National Advisory Services (NAADS), National Environment Management Authority, and Department of Development Research, Danish Institute for International Studies (Copenhagen).

To learn more about agro-biodiversity and how to conserve it please contact The Executive Officer, NatureUganda, The East Africa Natural History Society Plot 83, Tufnel Drive, Kamwokya, Kampala; P. O. Box 27034, Kampala, Uganda. Tel: 256 41 540719, Fax: 256 41 533528 Email: nature@natureuganda.org or Uganda Wildlife Society P.O Box 7422 Kampala Uganda Plot 51 Kanjokya Street Kamwokya Tel: 256-41-530891 fax 256-41-530264 email: uws@uws.or.ug

Annex 6 Supplement to The Naturalist, Nature Uganda's Newsletter

Draft articles which will make up the supplement for the Naturalist Newsletter

CONSERVING BIODIVERSITY IN THE MODERNISING FARMED LANDSCAPES OF UGANDA

Introduction

Sustainability is based upon a balance between productive agricultural land and the retention of natural resources. Throughout much of rural Africa, and Uganda in particular, unregulated agricultural expansion has been a major cause of biodiversity loss in recent decades, through the reduction and degradation of terrestrial habitats involving reduced soil fertility, increased soil erosion and loss of most or all natural vegetation. The intensification and expansion of crop and livestock production is the most important influence on land use, land cover and biodiversity in Uganda.

Purpose

The purpose of the project therefore, 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 incomes.

It is expected that the project will raise the profile of biodiversity in agricultural and environmental policies by building the capacity and knowledge of central and local governments, farmers and civil society to develop and promote land management approaches that integrate agricultural productivity and biodiversity conservation; with the ultimate aim of integrating biodiversity needs into relevant existing and new government policies, plans and strategies.

Outputs

In order to achieve the project aim, some of the project outputs will include:

- Relationships between biodiversity and farming practices are understood and best practices identified.
- Economic importance of on-farm biodiversity will be identified and quantified.
- Best practices and approaches translated into practical advice for farmers
- Capacity in agricultural biodiversity relationship for local officials and farmers will be enhanced
- Policy and relevant technical advice developed and made available to strategic partners and stakeholders.

The results of the project will be widely disseminated to popular, political and scientific audiences, including stakeholders and donors. This will be done through various discussion forums including the formation of an Agro-Biodiversity Working Group, meetings with stakeholders, radio programmes, and the development of funding proposals to encourage the sustainability of integrating biodiversity issues into agricultural policy and practice.

Partners

The Darwin Initiative funds this project, and it is collaboration between various partners in the UK and Uganda:

- British Trust for Ornithology (BTO-UK); implementing partner.
- Makerere University (Institute of Environment and Natural Resources and Department of Forest Biology and Ecosystems Management); implementing partner.
- Nature Uganda (NU), The East African Natural History Society; implementing partner.
- Uganda Wildlife Society (UWS); implementing partner.
- Department of Development Research, Danish Institute for International Studies, Copenhagen.
- Plan for Modernization of Agriculture (PMA).
- National Agricultural Advisory Development Service (NAADS).
- National Environment Management Authority (NEMA).
- Royal Society for the Protection of Birds (RSPB – UK).

Pollinators in agricultural economics

A pollinator is the biotic agent that moves pollen from the male anthers of the flower to the female stigma of a flower to accomplish fertilization or syngamy of the female gamete in the ovule of the flower by the male gamete from the pollen grain. The most recognized pollinators are the various species of bees, which are plainly adapted to pollination. Insects have pollen carrying structures like the “the pollen basket” in honeybees and bumblebees. These features help pollen to adhere to the bodies of bees and thus carrying it from the anther to the stigma.

Honeybees for example gather nectar, a concentrated energy source, and pollen, a high protein food, to nurture their young, and in the process transfer some among the flowers as they are working. However, bees are not the only pollinators as many people think. Butterflies and moths, although not major pollinators of our food crops, are important for wild flowers. Wasps are important pollinators of some plants. Beetles and ants can also pollinate flowers. Green bottle or carrion flies are important for some flowers, usually ones that exude a fetid odor. In addition, there also some vertebrate pollinators including Bats, which are important pollinators of tropical flowers, Birds, particularly hummingbirds, honeyeaters and sunbirds which also accomplish pollination especially of deep-throated flowers. Monkeys, lizards and rodents have also been recorded as pollinators.

All plants have characteristics that reflect the type of pollinator attracted. These include among others, their size, the depth of the corolla, the colour and patterns (nectar guides visible only in ultraviolet light) the scent, composition of nectar and amount of nectar. For instance, birds visit red flowers with long narrow tubes and lots of nectar but are not strongly attracted to wide flowers with little nectar, which are more attractive to beetles. In agricultural economics, humans have also turned into hand pollinators in vegetable gardens as they must keep the yields high in the absence of sufficient pollinators. This can involve using a small brush or cotton swab to move pollen or to simply tap or shake tomato blossoms to release the pollen for the self pollinating flowers. In addition to that, many kinds of pollinators are cultured and sold for managed pollination. At times hives of honeybees are contracted out as pollinators by beekeepers.

Pollination is a branch of horticulture that seeks to protect and enhance present pollinators and often involves the culture and addition of pollinators in monoculture situations, such as commercial fruit orchards. Bees and butterflies are one of the major pollinators cultured in commercial plantings in Uganda. The ecological set-up and vicinity of a forest or wild grasslands near agricultural crops such as coffee can improve their yield by about 20%. In which case, flower owners may demand payment for their part in the improved results. This is an example of economic value of ecological services. Pollination of food crops has become an environmental issue due to the trend of shifting from mixed cropping to monoculture, which

means concentration of pollinators at bloom time in an area with little or no habitat for the pollinator population. The other trend of concern is the decline in pollinator population due to loss of suitable habitat as a result of clear-cut logging, over-use or miss-use of pesticides, new diseases and parasites of pollinators, removal of hedges and other habitat from farms and public paranoia about pollinators among others. This calls for sensitization of the farming communities about the importance of maintaining a pollinator-friendly environment for the benefit of their crops as well as their own being.

We should all remember that farming is the main source of income for most the largest population in Uganda. It is thus important for farmers to keep pollinator populations high in order to maintain better crop yields for a better standard of living.

The poster and why it was produced (the COBA poster will be attached)

The Poster was produced to raise awareness about the Agro Biodiversity Project. It was intended for farmers to understand the importance of conserving biodiversity on their farms through illustrations for example by retaining and planting tall and indigenous trees and plants which are good habitats for biodiversity (e.g. birds and insects), which eventually result in increased agricultural productivity. Farmers can get fuel wood, medicine, fruits and even timber, if they conserve biological diversity on their farms. The poster shows the farmers that integrating biodiversity conservation and agricultural productivity leads to improved live hoods and therefore economic growth.

NAADS Perspective on the likely Agricultural changes and how they will affect bio-diversity on farms

The National Agricultural Advisory Services (NAADS) is a body corporate established by an Act of Parliament in June 2001. The NAADS mandate targets empowering the smallholder subsistence farmers organized in common commodity interest groups to select enterprises *(that include crops, livestock, fisheries and apiculture)* for development and promotion. Based on the constraints which may either require advisory service training and/or adopting improved technologies to increase productivity and profitability, the farmers tender out contracts for technical advisory service to private-based service providers.

The two key guiding principles of NAADS are: farmer empowerment to demand and control the delivery of agricultural advisory services; and natural resource management and sustainability implying managing the agro-ecology in a sustainable manner. Awareness creation on the importance of bio-diversity on farms and guided planning become crucial in this demand approach to advisory service delivery. The prevailing socio-economic situation in rural areas dictate that survival and increased productivity and profitability are at the centre of the farmers' goal, regardless of any negative impact of the agricultural activity on bio-diversity. Farmers' indigenous knowledge on the value of useful animals, insects or plants to soil fertility conservation and pollination of plants becomes secondary to the profitability and survival instincts. Sustainable utilization of forests for rainfall catchments compares less against

purported gains from encroaching forests for extensive cultivation and source of fuel *(mainly charcoal burning)* to derive meagre additional incomes.

Fully aware of the likely effect of increased utilization of production enhancement technologies *(such as: improved planting and stocking materials, labour-saving technologies e.g. herbicides, and insecticides)* leading to transforming subsistence farming to farming as a business, the NAADS Natural Resource Strategy emphasizes awareness creation right from the participatory planning/enterprise selection stage. In addition, the strategy targets household levels as focal points for implementing recommended management practices. It similarly encourages the cultivation and promotion of tree crops (farm forestry) such as citrus, mangoes and temperate fruits (apples). Other enterprises such as beekeeping to promote afforest ration have become wide spread in many NAADS participating districts. The use of organic manure and mulching are among the technologies promoted under NAADS aimed at conserving the flora and fauna on farms

In conclusion, the conservation of bio-diversity calls for collective effort of all key players who include but not limited to: policy makers, community/Faith-based organizations and NGOs, farmers and technocrats. Single handedly, the task becomes insurmountable. Sustainability as a strategy has to be unpacked to household level and incentive mechanism for good performance should be the engine to propel conservation of bio-diversity.

Outcomes of the project

High levels of biodiversity may be good or bad for farmers and by the end of the project, we will have a much better understanding on how important Uganda's farmland is for birds and insects as well as the value of this biodiversity for farmers.

We aim to identify a series of management practices that benefit the farmer and maintain or increases biodiversity on the farm, i.e. Win-win situations. An example of this could be growing coffee under shade trees. The shade trees are good for birds and insect pollinators and thus the farmer gets full fertilization of the crop and a better price as shade coffee is often a better quality than that grown in full sun. Other win-win scenarios might include protection of water courses by planting trees and maintaining small patches of forest and fallows for wild bees.

The students and staff at MUIENR, NU and UWS will be collecting a very large amount of unique data and this will serve as a baseline so that, in future, their sites can be visited again and trends in the health of the agricultural environment can be described. All the data will be stored in the National Biodiversity Databank (NBDB) at MUIENR. This work is breaking new ground in Uganda and another major aspect of the project has been capacity building both in terms of training people but also increasing the expertise of organizations such as NU and UWS to work in the wider countryside. Their analyses of the data will be published and we envisage this work will make major contributions to the scientific literature.

Of course, projects such as this need to continue to ensure that the findings are put into practice. We have therefore forged links between project staff and government organizations such as the PMA, NAADS and NARO and non-governmental organizations such as VI and Send a Cow to ensure a lasting legacy. To make sure the results are made available, we will work closely with these organizations and produce a handbook describing these management practices. Demonstration farms will also be established and farmers encouraged to visit them to show that what is good for biodiversity may also be good agricultural practice. We have also established an Agro-biodiversity Working Group that has representatives of over 20 organizations. They are actively discussing issues related to this topic, organizing workshops and looking to develop into a self-sustaining body that continues to take this subject forward after the project has finished.

With an increasing trend of intensification of crops, a landscape empty of trees and associated birds and insects is a distinct possibility and this is will not be good for farmers and for biodiversity. This work will identify management practices that result in both profitable farming as well as high levels of biodiversity.

Annex 7 Terms of reference for the Agro-biodiversity Working Group

PROJECT STATUS REPORT

By Uganda Wildlife Society as on 22/02/2007

Project Title: **Conserving agro-biodiversity on modernizing farmed landscapes of Uganda**

Project Objectives

1. Establishing an agricultural biodiversity-working group to raise the profile of biodiversity issues in agricultural and environmental policies and to offer advice in relation to integrating biodiversity needs into existing and new policies.
2. To develop and print educational materials including a manual for agricultural extension service providers and leaflets and posters for farmers.
3. To publicize the project findings on local and national radio.

The Agrobiodiversity Working Group

The Agro-biodiversity working group was established and its mission, overall goal and purpose are:

Mission

Taking into account the pillars on which the Poverty Eradication Action Plan is based**:**

Contribute to development and promotion of agricultural technologies that conserve biodiversity, which will directly increase the ability of the poor to raise their incomes and hence improved quality of life.

Overall Goal

The overall goal of the working group is, to use shared experiences and knowledge of working group member organizations to develop biodiversity-conserving methodologies on farmed landscapes of Uganda.

Purpose

Building on the shared experiences and knowledge of member organizations, to devise and promote good agricultural management practices, which also directly increase the ability of the poor to raise their incomes and hence improve their quality of life in a sustainable way.

Current activities of the working group are participating in sensitization initiatives through radio talk shows and during field trips in forums with farmers

Annex 8 Summary of the tree survey carried out by David Nkuutu

Summary of tree survey & data

Overall objective of the survey was to assess the abundance, diversity and spatial distribution of native and exotic woody plants at the 26 project biodiversity monitoring sites, including estimates of canopy cover and replacement/regeneration. The results summarised below are from 21 out of the total 26 project biodiversity monitoring sites.

Methods

Circular plots of 20 m radius measured by a string stretched from the centre were used in this survey. The plots were Geo-referenced and identified on computer Using Map-source program before uploading them on the GPS at intervals of 200m along the transects. These plots were then located on the site using the predetermined geographical positions and the centre point found there after measurements made to assess the woody plant diversity.

Tree data of all the species were captured from the 20 m radius plots and recorded in diameter classes. All young plants identified as trees were recorded as saplings if their diameters where less than 2.5 cm at breast height (dbh). All woody plants above 2.5 cm dbh were recorded in classes of 2.5-4.9 cm, 5-9.9 cm, 10-29.9 cm, 30-49.9cm and >50 cm. Along the trails as these points where being traced, we also recorded the individuals encountered as opportunistic records. For the large scale farm (Sugar cane and Tea) a complete enumeration of the plants within $1km^2$ was done. These were easier to have the complete count as there fewer trees and easy to the access the whole kilometre as they were either completely clean or under crop cover like the sugar estate that no other plant was encountered.

Canopy cover estimated from all individuals encountered in the plots seen to create any shade above food crops m height of 2.5m to have uniformity at all sites, arms length it is believed that that there was uniformity in this measure at all site to eliminate any expected errors since the researchers arm when fully stretched the reach is 2m. The canopy cover of all the trees is to be used in the estimation of canopy cover for each site to have a relative estimate of how the woody cover within the farming systems both large scale and small scale farming practices and also have a comparison of the indigenous and exotic tree canopy cover within the farming systems.

Lianas whose diameters were greater than 1 cm at 1 meter from the ground were recorded as present or absent whenever encountered in the plot. All climbing plants, woody or herbaceous, were recorded as lianas whenever they were seen to climb, entangle, or scramble on other plants within the plot.

Summary of Key Results

Table 2.1 Total number of plant species recorded from study sites

Life form	By Origin		Total
	Exotic	Indigenous	
Palms	0	2	**2**
Shrub	27	72	**99**
Tree	29	96	**125**
Woody lianas		9	**9**
Total	56	179	235

Table 2.2. Number of species of woody plants recorded at each site

			By Origin		By growth form				
Category	**District**	**Site**	**Exotic**	**Indigenous**	**Lians**	**Palms**	**Shrub**	**Tree**	Total
Extensive scale	Mubende	Kaweri	13	145	8	2	72	76	158
	Mukono	Kasaku	2	2	-	-	-	4	4
		Lugazi sugar	2	1	-	-	2	1	3
Smallholder farms	Jinja	Namizi East	15	19	-	1	9	24	34
	Kamuli	Kisozi	22	33	-	1	23	31	55
	Masaka	Bulayi	10	42	-	1	17	34	52
		Kasaala	10	29	-	-	19	20	39
		Katyabye	15	12	-	-	7	20	27
		Samaliya	11	13	-	-	8	16	24
	Mpigi	Lukalu	14	34	-	-	19	29	48
	Mukono	Bamusuta	13	24	-	-	11	26	37
		Kifu	14	64	-	-	27	51	78
		Kimwanyi	26	64	-	-	30	60	90
		Kinoni	12	28	-	-	7	33	40
		Mabira	13	28	-	-	11	30	41
		Kiwebwa	17	49	1	2	26	37	66
	Nakasekе	Kimuli	15	41	-	1	20	35	56
		Kyetume	10	48	-	1	18	39	58
		Rukumbi	14	39	-	1	18	34	53
		Ssegalye	10	32	-	-	13	29	42

Figure 2.1 Canopy cover of both indigenous and exotics in M^2

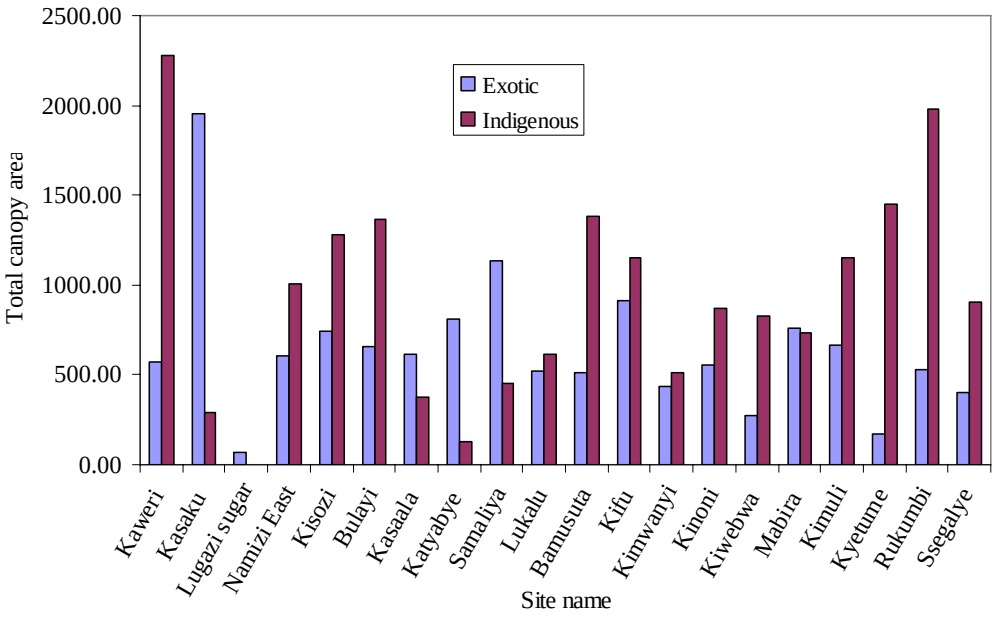

Table 2.3 Count of stems of *exotic* species, by stem diameter

Category	District	Site	Sapling	2.5-4.9cm	5-9.9cm	10-19.9cm	20-29.9cm	30-49.9cm	>50cm
Extensive scale	Mubende	Kaweri	3	1		17	14	2	3
	Mukono	Kasaku			64				27
		Lugazi sugar	10	5					4
Smallholder farms	Jinja	Namizi East	49	6	36	23	21	14	4
	Kamuli	Kisozi	76	75	64	6	4	5	1
	Masaka	Bulayi	5	14	35	80	5	2	2
		Kasaala	72	82	30	8	6	1	6
		Katyabye	72	47	30	6	5	4	4
		Samaliya	38	13	13	18	8	3	6
	Mpigi	Lukalu	33	66	16	24	8	7	3
	Mukono	Bamusuta	24	73	100	40	1	1	2
		Kifu	54	62	128	88	16	6	3
		Kimwanyi	82	57	51	22	10	7	1
		Kinoni	11	24	19	19	12	9	2
		Kiwebwa	38	43	39	27	12	4	7
		Mabira	31	55	33	17	8	8	4
	Nakaseke	Kimuli	38	18	54	24	14	8	6
		Kyetume	11	26	21	18	5	3	
		Rukumbi	9	47	90	21	11	10	3
		Ssegalye	2	3	27	16	8	2	2

Table 2.4 Number of uses of woody plant species in each site, by type of use

Category	District	Site	Timber	Medicines	Fruits	Pole /firewood	Ornamental	Shade	Agro
Extensive scale	Mubende	Kaweri	48	46	13	142	50	34	25
	Mukono	Kasaku	4	3		4	4	4	3
		Lugazi sugar	1	1		2	3	1	
Smallholder	Jinja	Namizi East	13	15	8	28	22	11	16
	Kamuli	Kisozi	17	25	12	40	36	16	18
	Masaka	Bulayi	24	17	10	47	27	13	12
		Kasaala	13	17	8	32	17	10	13
		Katyabye	11	13	7	20	20	9	12
		Samaliya	10	11	7	19	18	7	10
	Mpigi	Lukalu	15	21	11	39	28	16	13
	Mukono	Bamusuta	17	15	8	31	20	9	14
		Kifu	33	29	12	67	38	18	22
		Kimwanyi	35	31	11	74	49	20	26
		Kinoni	21	18	9	34	24	13	20

		Mabira	16	16	8	36	21	13	14
		Kiwebwa	25	26	11	53	33	12	17
	Nakasek e	Kimuli	21	25	13	45	35	17	18
		Kyetume	26	20	11	53	25	13	16
		Rukumbi	18	24	12	44	29	15	16
		Ssegalye	16	18	9	37	18	16	18

Checklist for submission

	Check
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Have you completed the Project Expenditure table?	
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