Agroforestry education and extension links in Malawi and Uganda

a pilot study of extension workers' experiences

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Preface

The ultimate purpose of agricultural and natural resource education and training is to improve and sustain land productivity while conserving natural resources. Graduates of colleges and universities teaching agricultural sciences are the main vehicle for disseminating new knowledge and skills to the farming community.

The African Network for Agroforestry Education (ANAFE) assists colleges and universities to strengthen the quality and availability of agroforestry education. To do this well, it is necessary for ANAFE to better understand the extension environment.

This pilot study was undertaken with the primary objective of developing educational and training programmes that are more responsive to extension needs. Furthermore, the study is a first attempt at linking educational programmes with extension. It is hoped that in the long run, we will identify mechanisms that can make education and extension interactive in land-use disciplines.

The authors of this report have pointed out the limitations of the study, particularly in terms of geographical coverage and development of survey methodology. Despite these limitations, many useful lessons have been learned, and the report forms a good base for a more detailed study in the future.

August Temu

Acknowledgements

Many individuals have contributed to the planning and implementation of this pilot study.

We are grateful for the positive reception we experienced in all offices we visited in Malawi and Uganda during the field work. We also thank the extension workers who spent valuable time filling in the questionnaires. It is not possible to mention all by name, but without them, this study would not have been completed.

We appreciate the logistic and administrative work carried out by staff at Bunda College of Agriculture, Malawi, and Nyabyeya Forestry College, Uganda. Their efforts to organize the distribution and collection of the questionnaires were essential.

The ICRAF teams in both Malawi and Uganda provided important support during the study. The design of the questionnaire involved a number of ICRAF staff members. At headquarters, Steve Franzel and Frank Place gave valuable advice during this process, and in Malawi, David Ngugi and Susan Minae helped fine-tune the questionnaire.

August B Temu, ICRAF, has been an important inspiration throughout this project, and we are grateful for his support. Finally, we also appreciate the work done to prepare the publication: Marie Kimenye for secretarial support, Kellen Kebaara for proofreading, and Helen van Houten for her editorial advice.

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Summary and conclusions

The aim of this study was to explore linkages between education—at technical and professional levels—and extension, with reference to agroforestry in Malawi and Uganda. The study has been a joint effort by the Education Programme of the International Centre for Research in Agroforestry (ICRAF), Bunda College of Agriculture in Malawi and Nyabyeya Forestry College in Uganda.

We carried out a questionnaire survey in 1996, which included 33 agriculture and forestry extension workers in Malawi and 50 in Uganda. As a result of identifying needs for agroforestry training and education for extension workers, we propose changes in curricula and teaching to address those needs. We also suggest further studies of the links between education and extension.

In both Malawi and Uganda, agroforestry has recently been included in curricula in technical and professional educational programmes. Extension workers in Malawi and Uganda who graduated before 1989 did not study agroforestry at all.

Of those surveyed in this study, only 15% of the workers in Malawi and 24% of those in Uganda had had formal training in agroforestry. Short courses had to some extent made up for this deficiency: 45% of the workers in Malawi and 36% of those in Uganda had participated in agroforestry short courses. Still, every 2nd extension worker (52% in Malawi and 44% in Uganda) had neither had formal training nor attended a short course in agroforestry (fig. 1).

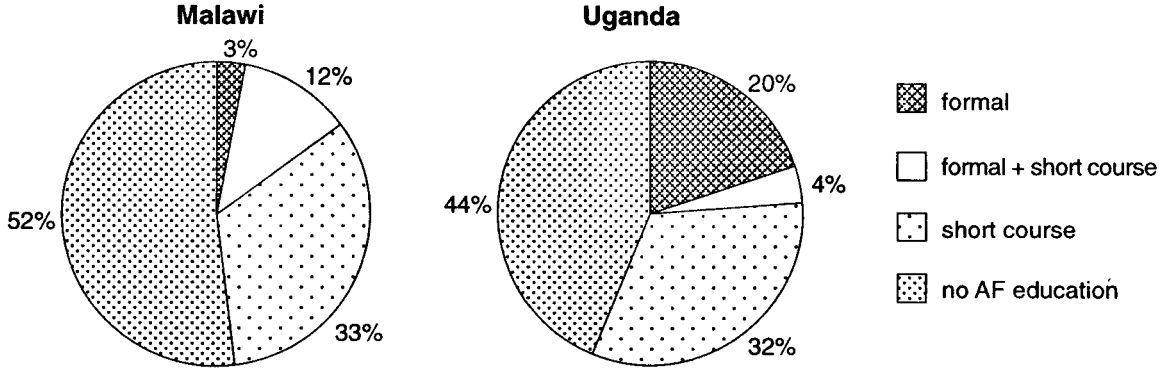

Figure 1. Agroforestry education among extension workers in Malawi and Uganda.

Agroforestry in extension

The lack of formal training in agroforestry among extension workers was striking when the needs were considered. In both countries, extension workers frequently discussed agroforestry with farmers (although 9 did not reply to this question). The average frequency of these discussions was 5–7 out of every 10 farmer visits. All extension workers who answered the question claimed that agroforestry is practised within their districts (8 did not reply to the question). In most districts, they said that farmers had adopted agroforestry practices, although the number of adopters varied. In Malawi, the adoption rate was slightly higher than in Uganda.

In ***Malawi***, the most popular agroforestry technologies were—

- alley cropping (84% of extension workers reported that farmers use it)
- interplanting, mostly with *Faidherbia albida* (73%)
- contour grass strips and hedgerow buffer strips (51%)

To a lesser extent, farmers use live fencing and boundary and homestead plantings; they plant agroforestry trees including fruit trees. Many extension workers also pointed out the interest in biomass transfer technology.

In ***Uganda,*** farmers in the extension districts used—

- scattered trees on cropland and pastureland (50% of the extension workers reported that farmers used this technology)
- boundary plantings (36%)
- windbreaks (26%)
- woodlots (26%)

They also used such technologies as homegardens, hedgerow intercropping, apiculture and the planting of fruit trees.

One striking observation was that extension workers in both countries must deal with a great variety of duties. They have to handle many issues that go far beyond their formal training. Although they have most likely been educated in a single discipline, extension workers face problems and situations across a range of disciplines in their everyday contacts with farmers. This fact should be considered as curriculum for technical colleges and universities is reviewed.

Formal agroforestry education

In both countries, extension workers pointed out that the time allocated for agroforestry in formal agroforestry education had been too little. Furthermore, the education had been principally theoretical, with major gaps existing in the practical aspects.

In ***Malawi,*** extension workers suggested that practical education be improved by increasing study time, making field attachments during holidays and establishing demonstration plots on campus. They recommended that study tours be emphasized. They also recommended improving the teaching of agroforestry technologies, such as soil enrichment through biomass transfer. Often mentioned as a priority was information on agroforestry trees and shrubs and their management, including establishing demonstration plots. The demand for books on agroforestry was also high. Related subjects such as soil and water conservation, environmental issues and extension also needed strengthening.

In ***Uganda,*** the picture was similar: extension workers wanted more time for agroforestry and stronger practical education. The practicals should use local examples and involve farmers to a large extent. The technologies should reflect the variation within the country and include social and economic implications. Pests and diseases, sericulture and apiculture were mentioned as topics to be considered in curricula. Teaching should take into account Uganda's unified extension system and should involve resource persons from the extension system as lecturers.

Short courses

The experiences in both countries were similar: those who had attended short courses had found them very useful in helping them to carry out their day-to-day work. On the negative side, they said that many courses were too short to cover their topics comprehensively, and little time in them was allocated to practicals and interaction with farmers.

Extension workers in ***Malawi*** suggested that to improve agroforestry short courses, a thorough background should be given on common agroforestry technologies, including alley cropping,

short-term fallows, woodlots and biomass application. The demand for knowledge on different agroforestry trees and shrubs was also high. All courses should emphasize practical education, and more handouts should be given in the courses. Establishing demonstration centres for agroforestry in all districts was suggested.

In ***Uganda*** as well, the demand was high for short courses in agroforestry. Study tours, farm visits and other practicals were particularly requested. Some of the topics mentioned were the role of agroforestry in farming systems, and how to establish and manage agroforestry technologies such as homegardens, alley cropping and contour bunds. Again, there was a big push to get teaching materials for agroforestry.

Other agroforestry projects

In Uganda, but even more so in Malawi, a number of other organizations were involved with agroforestry extension. In ***Uganda,*** 56% of the extension workers reported that there were other agroforestry activities in their districts, carried out by 14 different organizations. In ***Malawi,*** 85% of the workers reported on activities carried out by 5 organizations. The fact that so many organizations were involved in agroforestry indicates the need for coordination, and an opportunity for collaboration in conducting short courses.

Sources of information

In both countries, radio played the most important role in providing extension workers with agroforestry information: 42% of the Malawian and 52% of the Ugandan extension workers used this medium. Other important sources of information were, in Malawi, extension bulletins and study tours, and in Uganda, extension bulletins and NGO reports.

Recommendations

This study showed that agroforestry is important for most extension workers but that their competence in this multidisciplinary subject often is weak. Younger extension workers who have graduated during the last 5–7 years are better equipped to carry out agroforestry extension. In the last few years, curricula at both technical and university levels have been further improved in both countries. The impact of improved agroforestry education will show in years to come as graduates from these programmes complete their studies and go into the field.

However, the study suggests that educational institutions should take a closer look at their agroforestry curricula, particularly concerning how the practical education is carried out. Curricula should focus particularly on the technologies about which farmers ask extension workers for information. Education programmes should reflect the reality that extension workers face—that their work by its very nature will always be multidisciplinary.

Extension workers who have not yet had any agroforestry training—about 50% in this study—should be given the opportunity to attend short courses. A strong programme for upgrading the agroforestry knowledge among extension workers that graduated before 1989 should have particular priority. This is the fastest way to enhance agroforestry competence within the extension systems. We recommend that refresher courses in agroforestry be implemented by colleges and universities working with researchers. These courses should be coordinated with NGOs involved with agroforestry extension, who should participate and contribute funds and expertise.

Background and justification

Agroforestry is a relatively new subject in most educational programmes in forestry, agriculture and natural resources, having in most cases been included in curricula during the last 5–10 years. This evolution is important, since technical and professional education can benefit from the research and development of agroforestry technologies. University graduates embark on jobs in research or education or take on management positions in extension systems. College graduates often find work in the field in extension systems or in NGOs. Therefore, links between extension and education are vitally important in disseminating agroforestry technologies.

Do educational programmes respond by supplying the information that workers need to carry out their duties? Do short in-service training courses provide adequate knowledge and skills in agroforestry? Have recent changes in curricula started to have an impact in the extension systems? What adjustments in agroforestry education do extension workers demand so that what they learn better meshes with their day-to-day work? These and similar questions are what brought us to initiate this study on the links between agroforestry education and extension.

We identified 4 levels of agroforestry training among extension staff:

- no agroforestry training
- agroforestry training included in education programmes
- agroforestry training through short courses
- both formal training and short courses in agroforestry

The hypothesis was that since agroforestry education is a recent addition to most curricula, most extension workers still lack formal agroforestry training. Given the multidisciplinary nature of African small-scale farming, experienced extension workers should possess important information about agroforestry practices and needs on the farm. These experienced workers should also be well acquainted with the agroforestry agenda of the existing extension systems and the corresponding competence needed to implement that agenda. They should therefore be in a position to provide important feedback on educational issues. These experiences should be captured and used by technical colleges and universities and by those designing in-service training courses.

The 2nd hypothesis was that, at present, agroforestry information is not efficiently shared among farmers, extension organizations and educational institutions. This could be caused by—

- missing links in the communication chain between education, extension and farmers
- knowledge gaps among extension staff
- weak agroforestry curricula at educational institutions
- weak in-service training
- lack of incentives to motivate the exchange of information

Knowledge about the flow of agroforestry information would be useful in agroforestry dissemination.

Objectives

The overall objective of this study was to find ways to strengthen the education–extension nexus. Specific objectives were to—

- identify knowledge gaps in agroforestry among technical and professional staff in extension systems
- propose changes in educational and training curricula to address these possible gaps
- develop and test a tool for studying education and extension links

Expected outputs

The study was carried out to achieve the following outputs:

- an estimate of the level of agroforestry awareness among extension workers, and the sources of their knowledge
- an assessment of agroforestry activities at farmer level and the agroforestry duties among extension workers
- a pinpointing of the bottlenecks in the agroforestry information flow
- identification of knowledge gaps in agroforestry among extension workers
- guidelines on how to refine education and training programmes in agroforestry at colleges and universities
- a contribution toward the design of in-service training and short courses in agroforestry
- a methodology for studying links between agroforestry education and extension

Method

The study was carried out through a questionnaire distributed to staff at different levels of the extension systems in Malawi and Uganda. The main target group was extension staff in the field, although some centrally located staff members were included.

The study was carried out jointly by ICRAF, Bunda College of Agriculture, Malawi, and Nyabyeya Forestry College, Uganda. In each country, 1 week was spent on interviews and distributing the questionnaires, through visits mostly to district offices of the extension organizations but also to some NGOs. In ***Malawi*** data was collected in February 1996, mostly in the Lilongwe and Salima areas. In ***Uganda*** the work was carried out in July 1996, mainly in the Masindi area.

A 2nd source of data was information obtained from educational institutions in Malawi and Uganda, which provided details on the development of agroforestry education in those institutions. Since this was a pilot study, data were collected and the questionnaire was tested simultaneously. Using experiences from Malawi, we made minor changes in the questionnaire for the Uganda study.

The sampling in this study was not randomized. For practical reasons, we selected areas in the vicinity of Lilongwe and Salima in Malawi and Masindi in Uganda. In Malawi, the bias was towards agriculture extension, while in Uganda forestry dominated. For these reasons, the results might not be directly comparable and should be interpreted cautiously.

To analyse the results, we used the simple tool of a normal spreadsheet programme. The answers for the variables that had a free textual format were written down and systematized subjectively.

Our original intention was to ask questions on both agroforestry education and extension education, since both are needed for successful agroforestry extension work. The analysis of results showed, however, that the questions on agroforestry in principle covered extension aspects. The questions on extension are therefore not presented separately in this report.

Following is a look at the education and extension systems in the 2 countries.

Agroforestry education in Malawi

Background

In Malawi, agroforestry education started about 20 years ago in an informal way. Some aspects of agroforestry were taught indirectly, as part of the farming systems or land-use and management topics, at in-service training courses for field extension staff. The use of trees was considered a way of preventing soil erosion and protecting land on steep hill and mountain slopes and along river or stream banks. Very little was discussed about other roles of trees in farmers' fields. Farmers were discouraged from maintaining trees in their crop fields and were not informed about the value of some trees as fodder for livestock or as green manure for soil fertility improvement.

In recent years, however, a number of problems such as high human population, declining crop and livestock production, and increased demand for fuelwood have increased the pressure on land. Monocropping and cultivation of fragile lands such as hill and mountain slopes and river banks have intensified. These activities have led to severe degradation of the land and the environment. Research results obtained from agroforestry trials of the late 1970s and early 1980s showed some potential of agroforestry practices in alleviating problems of declined crop and livestock production and shortage of fuelwood. These benefits were achieved through improvement of soil fertility and through fodder and fuelwood production where selected agroforestry tree species were grown and properly managed with crops and livestock components. The tree foliage provided green manure and livestock feed, the boles were used as fuelwood for the household.

As a result of early agroforestry research results and the ever-increasing prices of farm inputs, interest in agroforestry began to grow as an alternative farming system for resource-poor farmers. Farmer adoption of agroforestry practices could improve and sustain production of crops, livestock and fuelwood. Therefore in the mid-1980s, Malawi felt that its field extension staff should be given enough knowledge of agroforestry to be able to pass it on to farmers. This development prompted 3 education institutions in Malawi to incorporate agroforestry courses in their curricula and syllabi: Bunda College of Agriculture (BCA), Malawi College of Forestry (MCF) and Natural Resources College (NRC). With the help of the African Network for Agroforestry Education (ANAFE), agroforestry education has been further strengthened, and agroforestry courses are now taught at postgraduate and undergraduate levels (BCA) and certificate and vocational levels (MCF and NRC).

Malawi extension system

The structure of the agricultural extension system in Malawi is described in figure 2. At higher levels in the organization there are specialists in livestock, forestry and other disciplines. At the front line, the same person covers different specialist areas, including agroforestry. Also forestry extension, although under a different ministry, uses the same frontline staff.

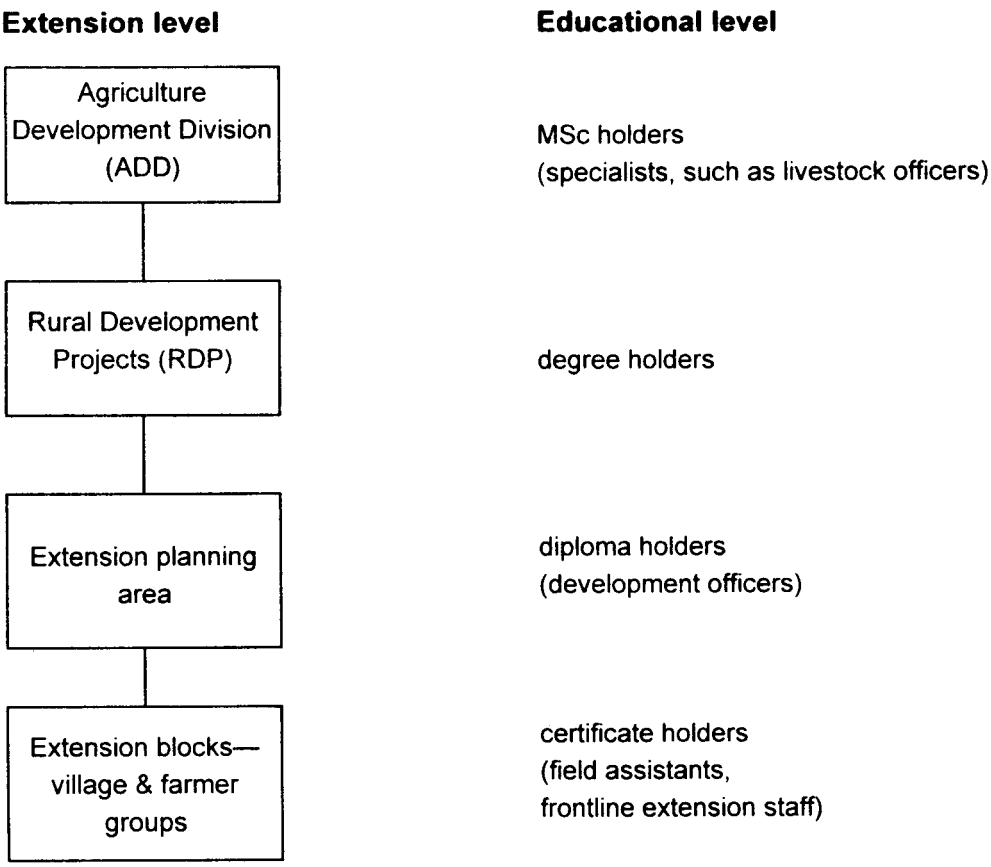

Figure 2. The extension system in Malawi.

Agroforestry education in Uganda

Background

In the late 1980s, the Ministry of Agriculture started to organize in-service agroforestry training courses at various district farm institutes for extension agents and farmer groups under the farming systems approach to land use.

Bukalasa Agricultural College (BAC) introduced formal agroforestry education in 1991. After that, 3 staff members participated in courses at ICRAF. The courses at BAC mainly covered concepts, traditional agroforestry, agroforestry systems, and so on, at both certificate and diploma levels. A curriculum review in 1995 made agroforestry feature very prominently.

In the forestry sector, agroforestry education started in the 1950s in an informal way through demonstrations about the taungya system in government forest plantations. Forestry extension staff did not get any organized training in agroforestry until the 1980s, when CARE International and the Forest Department started in-service courses.

Nyabyeya Forestry College started agroforestry education 1989. When the certificate curriculum was reviewed, agroforestry was incorporated as a production system under community forestry. In 1995, the diploma curriculum was revised and 90 contact hours were allocated to agroforestry. The curricula (at both certificate and diploma levels) comprise 60% practical skills and 40% theory. Graduates of both agriculture and forestry colleges (certificate and diploma) work as frontline extension agents in the agriculture and forestry sectors.

Uganda extension system

Agricultural sector

The structure of the unified agricultural extension system in Uganda is described in figure 3. At upper levels in the organization, specialists in crop husbandry, animal industry and fisheries work in the directorates of extension, information and training. At district level, there is a district agricultural officer or district fisheries officer. At county and subcounty levels, extension work, including agroforestry, is done by 1 person, who can be either a veterinary, an agricultural or a fisheries assistant.

Forestry sector

Forestry extension under the Ministry of Natural Resources is not included in the unified agricultural extension system. The Forest Department has extension officers in district forest offices. Forestry extension services are not well developed, and the ratio of extension agents to farmers is still very low. Every county is supposed to have an extension agent (diploma or certificate holder), but this goal has not yet been achieved.

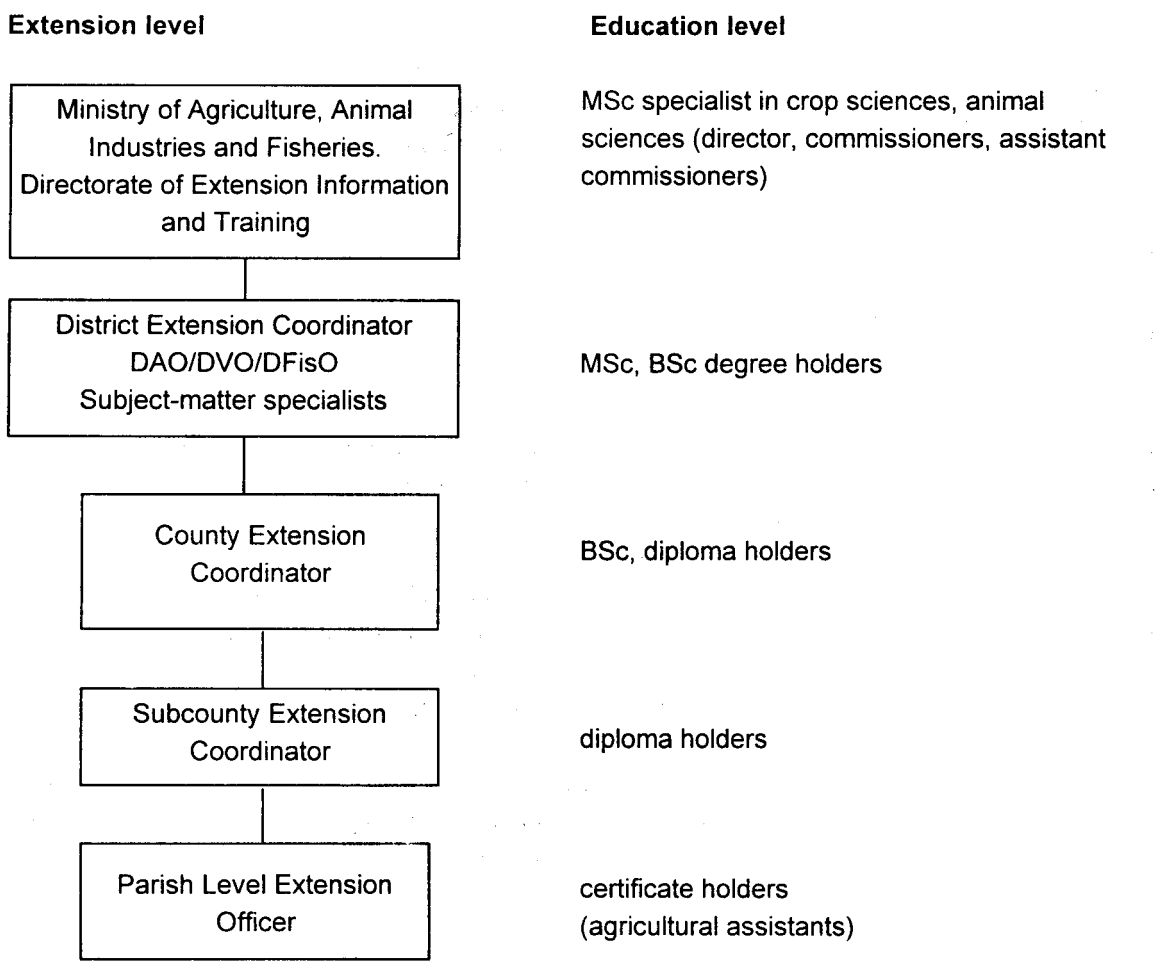

Figure 3. The agricultural extension system in Uganda (DAO—District Agricultural Officer; DVO—District Veterinary Officer; DFisO—District Fisheries Officer).

Results

Following, we present the results from the returned questionnaires, 33 from Malawi and 50 from Uganda. Although the results from the 2 countries are not fully comparable, because of differences in sample composition as well as the biophysical and socioeconomic environment, we have chosen to present the results alongside each other, to enable comparisons between the countries. Keeping in mind that this is a pilot study, the reader should interpret the results cautiously.

Educational background and job characteristics

The average age of extension workers in both countries was approximately 37 years. Only 5% were women. The average extension worker had at least 10 years of experience in the extension system (table 1).

In both countries, a certificate-level education dominated the sample. In Malawi, most of those sampled had an education in agriculture from the Natural Resources College or Colby College; in Uganda, forestry education from Nyabyeya College of Forestry dominated. This situation was also reflected in the job titles: in Malawi, field assistants were most common, while in Uganda almost 50% were forest rangers (tables 2–5).

Table 1. Age and working experience of extension workers

Country	Average age (range)	Sex	Years in organization (range)	Years in present job (range)
Malawi	37.5 (23–49)	32 male, 1 female	13.1 (0.5–25)	5.4 (0.5–17)
Uganda	36.6 (20–51)	47 male, 3 female	11.0 (0.5–27)	8.0 (0.5–27)

Table 2. Educational level

Degree	Malawi	Uganda
MSc	1	–
BSc		10
Diploma	5	11
Certificate	26	29
Unknown	1	–
Total	33	50

Table 3. Discipline of education

Discipline	Malawi	Uganda
Forestry		37
Agriculture	12	8
Extension	2	
Land husbandry	1	
Veterinary		1
Fisheries		1
Environment		1
Science		1
Education		1
Unknown	17	
Total	33	50

Table 4. Graduating institutions in Malawi and Uganda

Malawi		Uganda	
Institution	No.	Institution	No.
Bunda College of Agriculture	5	Arapai Agricultural college	1
Colby College	8	Bukalasa Agricultural College	4
Correspondence	1	Busitema	1
Natural Resources College	11	Cilulu High	1
University of Wales	1	Fisheries Training Institute	1
unknown	7	Makerere University	11
		NTC Masindi	1
		Nyabyeya College of Forestry	30
Total	33		50

Table 5. Title of extension workers in the sample

Malawi		Uganda	
Title	No.	Title	No.
Assistant Crops Officer	1	Assistant Agricultural Officer	2
Assistant Project Officer	1	Assistant Field Officer	4
Development Officer	1	Agroforester	1
Divisional Agricultural Officer	1	Agricultural Officer	1
Farm Home Assistant	1	Assistant Technician	1
Field Assistant	10	Deputy Principal Agricultural Officer	1
Land Husbandry Assistant	5	District Forestry Officer	2
Land Husbandry Field Assistant	3	District Agroforester	1
Land Husbandry Field Officer	2	Extension Officer	1
Project Officer	1	Field Officer	1
Senior Field Assistant	1	Forest Officer	2
Senior Field Officer	1	Forest Ranger	23
Senior Land Husbandry Assistant	3	Head, Environmental Education	1
Senior Land Husbandry Field Officer	1	In charge, Production	1
Technical Assistant	1	Nursery Attendant	2
		Officer in Charge, Agriculture Engineering Division	1
		Principal Agroforester	1
		Project Assistant	1
		Subject Matter Specialist, Aquaculture	1
		Veterinary Officer	1
		Woman Animator	1
Total	33		50

On-farm experiences of agroforestry

Extension workers must undertake a variety of duties in their daily contacts with farmers. This section describes workers' experiences and problems they are asked to deal with. It also describes what agroforestry technologies farmers use and what technologies extension workers promote. Note that all figures are estimates given by extension workers, and not by farmers. Visits to farmers were not part of this study.

Most times when extension workers in Malawi and Uganda visit farmers, they discuss agroforestry. This commonality of topic cuts across the diverse educational as well as professional backgrounds among the extension workers in the sample. In both countries,

farmers in a significant proportion of have adopted agroforestry technologies, according to the extension workers (table 6).

Table 6. Farm visits and agroforestry activities

	Malawi	Uganda
Frequency of farmer visits? 4 = 4–5 days per week 3 = 2–3 days per week 2 = 1–4 days per month 1 = < 1 day per month	3.0	2.8
Frequency of agroforestry discussions with farmers? 5 = every visit 4 = most visits 3 = often 2 = sometimes 1 = never	4.1	3.8
What proportion of farmers have adopted agroforestry technologies? 5 = 80–100% 4 = 50–70% 3 = 20–40% 2 = 10% 1 = none	3.0	3.3

Duties with farmers

We wanted to capture the variety of duties that extension agents face in their daily work with farmers. The results are displayed in table 7. From them, it is obvious that extension workers in both Malawi and Uganda work across disciplines. They deal with topics far beyond their formal education. Another observation is that, in both countries, agroforestry-related duties rank high on the list. However, the forestry bias in Uganda is reflected in the list of duties.

Agroforestry technologies

The extension workers were asked what agroforestry technologies farmers actually use and what technologies the extension workers promote. This indicated the degree of adoption of agroforestry among farmers, as well as the agroforestry agenda of the extension systems in Malawi and Uganda (tables 8–9).

In Malawi, 97% of the extension workers reported that farmers within their districts use agroforestry technologies. The figure for Uganda was 84%.

The differences in use of agroforestry technologies between the countries reflect differences in land pressure and extension tradition, but also the difference in sample composition, particularly with an agricultural bias in Malawi and a forestry bias in Uganda. It is interesting to note the predominance of alley cropping in Malawi, inherited from earlier efforts to promote this technology there.

A large number of farmers in Malawi were reported to be using agroforestry technologies. Alley cropping, interplanting with *Faidherbia albida,* and using contour and buffer strips with grass and agroforestry trees were very common. Live fences were also popular. These technologies were included in the extension agenda.

Table 7. Duties with farmers as reported by extension workers

Malawi		Uganda	
Duty or topic	Frequency (%)	Duty or topic	Frequency (%)
Alley cropping, hedgerow intercropping	45	Nursery practices	56
Pegging & alignment of farmers' fields	39	Tree planting	52
Compost manure	33	Agroforestry	46
Agroforestry	30	Tree management	34
Crop production	27	Soil & water conservation	32
Box ridging	24	Seed collection & treatment	32
Reafforestation & tree planting	24	Animal husbandry	20
Agroforestry seedling production	21	Diseases & pest management	20
Biomass storage & application	21	Crop husbandry	18
Livestock & animal husbandry	18	Aquaculture	12
Horticulture	15	Beekeeping	12
Seed multiplication, treatment, seedbank planting	15	Energy	12
Contour vegetation strips	12	Environmental protection	10
Women's programmes	12	Afforestation	8
Farm planning & management	12	Farm economics	8
Food & nutrition	12	Horticulture	8
Farm mechanization	12	Agronomy	6
Vertiver & napier grass management	12	Sericulture	6
Interplanting *Faidherbia albida*	9	Health & nutrition	6
Live fencing	9	Marketing	6
Intercropping	9	Nature conservation	4
Land husbandry	9	Reforestation	4
Training	9	Harvesting	4
Boundary planting	6	Tobacco agronomy	4
Gully reclamation	6	Mushroom production	4
Strip cropping	3	Woodlot plantation	4
Credit	3	Pasture improvement	4
Contour ridging	3	Food-storage processing	2
Beekeeping	3	Farm management	2
Irrigated crops	3	Forest protection	2
Public health	3	Utilization	2
Cookery	3	Environmental protection	2
Child & health care	3	Land-use planning	2
		Family life education	2
		Food security	2

In Uganda, a large number of agroforestry technologies were mentioned, the most common being scattered trees on farm- and pastureland, boundary planting, windbreaks and woodlots. Also in this case, farm activities as reported by the extension workers corresponded with the extension message.

Other agroforestry projects in the area

In Malawi, 85% of the extension workers reported that there are ongoing agroforestry projects in their area. These projects are supported by organizations such as—

Table 8. Farmers' use of agroforestry technologies

Malawi		Uganda	
Technology	Frequency (%)	Technology	Frequency (%)
Alley cropping, hedgerow planting	85	Scattered trees on crop- & pastureland	50
Systematic interplanting of *Faidherbia albida*	73	Boundary planting	36
Contour grass strips & hedgerows, buffer strips	52	Windbreaks	26
Live fencing	33	Woodlots	26
Boundary & homestead plantings	21	Homegardens	24
Agroforestry trees, including fruit trees	18	Hedgerow intercropping	20
Woodlots	15	Apiculture	14
Mixed cropping, intercropping	15	Alley cropping	14
Biomass transfer	12	Planting of fruit trees	14
Seed banks	9	Fodder banks	14
Fodder banks	6	Silvopastoral systems	12
Organic manure application	3	Taungya	12
Improved fallows	3	Planting of shade & ornamental trees	12
Gully reclamation using agroforestry	3	Plating of agroforestry trees	8
		Live fences	6
		Homestead planting	6
		Shifting cultivation	6
		Improved fallows	4
		Sericulture	4
		Afforestation	2
		Fish farming	2
		Contour bunds	2

- PAPPPA-Addfood
- USAID
- International Fund for Agriculture Development (IFAD)
- ICRAF
- the Maiawi agroforestry extension project

In Uganda, a large number of organizations are involved in agroforestry extension. Out of 50 extension workers, 28 (56%) mentioned other agroforestry projects in their area or district, carried out or supported by—

- ACCORD
- British American Tobacco (BAT), Uganda
- Canadian Physicians for Aid and Relief (CPAR)
- CARE International
- Community Action for Rural Development (CARD)
- Danish International Development Agency (DANIDA)
- Farm Forestry
- Forestry Research Institute/National Agricultural Research Organization (FORI/NARO)
- INTER-AID, under the United Nations High Commission for Refugees (UNHCR)

Table 9. Promotion of agroforestry technologies

Malawi		Uganda	
Technology	Frequency (%)	Technology	Frequency (%)
Alley cropping, hedgerow planting	94	Scattered trees on crop- & pastureland	38
Systematic interplanting (with *Faidherbia albida*)	70	Woodlots	34
Contour grass strip & hedgerows, buffer strips	64	Windbreaks	28
Live fencing	27	Boundary planting	26
Boundary & homestead plantings	24	Homegardens	26
Woodlots	18	Silvopastoral systems	20
Agroforestry trees, including fruit trees	15	Alley cropping	16
Biomass transfer	12	Taungya	12
Seed banks	6	Planting of fruit trees	10
Fodder banks	3	Planting of shade & ornamental trees	10
Mixed cropping, intercropping	3	Planting of agroforestry trees	10
Improved fallows	3	Hedgerow intercropping	8
Apiculture	3	Fodder banks	8
		Apiculture	6
		Live fences	6
		Fish farming	6
		Sericulture	6
		Improved fallows	4
		Afforestation	2
		Homestead planting	2
		Contour bunds	2
		Biomass transfer	2

- International Union for the Conservation of Nature (IUCN)
- Mt Elgon Conservation and Development Project
- Swedish International Development Agency (Sida)
- Tree Planting and Energy Conservation Project (TRENCOP)
- World Vision International

Sources of agroforestry information

Extension workers in both countries said that radio was the most important source of information on agroforestry—about 50% mentioned this medium. Also commonly mentioned as a source of information were extension bulletins (table 10).

Other sources mentioned in Malawi included technical messages from the agriculture development districts, colleagues and farmers. In Uganda, other sources of agroforestry information included the Forestry Department, TV, newspapers, the book *Agroforestry in Dryland Africa*, colleagues and farmers.

Table 10. Sources of agroforestry information

Source	Malawi (%)	Uganda (%)
Radio	42	52
Extension bulletins	36	41
Study tours	33	22
National research information	15	8
NGO reports	12	36
Agroforestry Systems (journal)	12	22
Agroforestry Today (magazine)	6	18

Agroforestry education

Educational background

MALAWI

Only 5 of the 33 extension workers (15%) had undergone formal training in agroforestry in their educational background. They were all graduates from the Natural Resources College in 1989 or later. The length of this education varied from only a few hours to 90 hours, depending on the individual's programme and year of graduation.

UGANDA

Eleven of the 50 extension workers (22%) had a formal education in agroforestry from Makerere University, Nyabyeya Forestry College, or Bukalasa Agricultural College. They had all graduated in 1989 or later. The courses had covered 10–40 hours of theory and 15–25 hours of practicals.

Weaknesses and suggestions for improvement

MALAWI

The main complaint that extension workers expressed was the fact that most (85%) had had no formal training in agroforestry. Agroforestry was a new subject for most field assistants, and their educational backgrounds had not provided them with the knowledge necessary to work effectively in it.

Those who had received some agroforestry training said that it had been relevant but mainly theoretical. They felt that there had been major gaps in their practical education, and they had not been able to see agroforestry practised in the field during their studies.

Practicals: Many of those questioned suggested improvements in practical agroforestry education. Specifically, they wanted increased time for practical activities, field attachments during holidays, and establishment of demonstration plots on campus. Others wanted study tours, exposure to agroforestry tree and shrub species that are found in the field, and methodologies on how to carry out practicals.

Technologies: Frequent suggestions emerged on specific technologies and topics to be included in curricula. The most important were alley cropping, interplanting of crops with trees, biomass usage and storage, contour strip cropping, fodder banks, and live fences.

Agroforestry trees and shrubs: There is a great demand for information on agroforestry trees and their management. This includes information on species selection, seed treatment and nursery practices, direct seeding, management from establishment to harvesting, including pruning, and use of products. A particular interest is the technology of agroforestry for soil enrichment by using tree biomass as manure. It is important to include information on harvesting and storage of such biomass in the curriculum. Species trials and demonstration plots for educational purposes are also greatly needed.

Other suggestions: Books on agroforestry and study tours are both needed to support the education. Students should be taken to areas where technologies are put into practice. Extension workers also demanded strengthened education in soil and water conservation and on environmental issues.

Extension education: Agroforestry education needs to be supported by extension education, including practicals. Problem identification and needs assessment are important, as well as methods for choosing and involving farmers.

UGANDA

For most extension agents, there had been no agroforestry in their school curriculum, or it had been allocated too little time. The emphasis had been on theory, while the practical content had been neglected. There had also been a lack of study tours and a lack of information from research centres.

Many suggested that more time be allocated to agroforestry and that practicals be emphasized. The practicals should include local examples of successes and failures, reflecting Ugandan conditions. Practicals should include agroforestry technologies applicable to different terrain and situations, and they should put social and economic implications into focus. The practicals should involve farmers to a greater extent, for instance, by having farmers participate in setting up and evaluating agroforestry trials or by arranging for students to make field visits to farmers who have adopted agroforestry. Students could carry out practicals with farmers during short holidays. Other practical aspects that should be considered are identification of indigenous trees, demonstration plots at colleges, tree nurseries and trips to research stations.

Theoretical aspects that should be included in curricula would cover pests and diseases, sericulture and apiculture. It is also important that literature—pamphlets and reference books and visual aids—be made available, and that institutions provide transport for study tours.

Further, the teaching of agroforestry should take into account Uganda's unified extension system. Resource persons from extension systems could be considered as lecturers.

Short courses in agroforestry

MALAWI

Fifteen persons (45%) had attended short courses in agroforestry, mostly in 1992 or later; 7 persons (21%) had participated in more than 1 course. The courses were provided by a number of organizations: USAID, ICRAF, PAPPPA-Addfood, and through internal courses within the extension system.

The average course length was 22 hours of theory (ranging from 8 to 90 hours), and 5 hours of practicals. The relevance of the theoretical part was estimated at 3.6 and of the practical part at 3.4, on a scale of 1 = not relevant, 2 = major gaps, 3 = minor gaps, 4 = relevant.

UGANDA
Eighteen persons (36%) had participated in short courses in agroforestry, the earliest ones in 1986; 6 had attended more than 1 course. The courses were offered by NGOs: CPAR, CARE, KERE DFI, ForrPortal; by international organizations such as Danida, FAO, AFRENA; or by FORI and governmental extension districts. The course length varied considerably from a few hours to 2 months. Most courses had 1–2 days of practical content.

The participants estimated the relevance of the theoretical coverage at 3.5, on a scale of 1 = not relevant, 2 = major gaps, 3 = minor gaps, 4 = relevant. The relevance of the practical aspects was rated slightly lower, at 3.3.

Strengths and weaknesses, suggestions for improvement

MALAWI
Those who had attended short courses were generally positive about their usefulness. They said that these courses had helped them in carrying out their day-to-day duties.

On the negative side, most thought that the time was too short to cover the material adequately. Little time was allocated for practicals. Trails and demonstrations were not complete.

Practicals: In all courses, it is important to carry out practicals that will facilitate later interaction with farmers. Visiting farmers who are practising agroforestry is also important, to get the farmers' perception of it. The practicals should include study tours wherever possible.

Technologies: Options in agroforestry interventions in Malawi should be taught thoroughly, including alley cropping, short-term fallows, woodlots, planting of gliricidia along ridges and biomass application.

Agroforestry trees and shrubs: There is a demand for knowledge on agroforestry species, their seeds and how to raise seedlings. Some extension workers wanted their skills to be strengthened in planting and managing trees, including their pruning, and wanted to learn the environmental requirements of different agroforestry tree species.

Soil and water conservation: The extension workers wanted to learn how to make use of simple tools in soil and water conservation, such as pegging soil conservation structures.

As a general observation, *all topics should be accompanied by fully illustrated manuals.*

UGANDA
In general, those who had attended short courses found them very useful. The courses had assisted them to improve their technical skills, and thus they could inform farmers both theoretically and practically on agroforestry.

However, the practical aspects were inadequate, with too little time allocated for them. The field tours were normally brief, and relevant handouts for field reference were not provided. During

some courses, participants did not even meet farmers in the field. Some courses were also rated as too short.

The demand was high for intensified agroforestry training through regular in-service courses (some suggested every 1–2 years). This training should include adequate time for practicals, including farm visits, particularly to progressive farmers who are adopters of agroforestry. Study tours are of paramount importance. Courses should include all categories of staff—and farmers.

Examples of topics that should be included are the role of agroforestry in farming systems, establishment and management of agroforestry in farming communities, and nursery practices. Other suggestions included studies of integrated pest and land management, communication skills, and technologies applicable in the participants' own region and in other regions.

Specific technologies that should be addressed are homegardens; alley cropping and contour bunds; tree planting, establishment and management; woodlot establishment; and intercropping. Courses should also include technical knowledge from related institutions, such as those in agriculture.

There is a great demand for teaching materials on agroforestry, such as bulletins and pamphlets, video and radio, and handouts of textbooks. Demonstration centres should be set up in all districts; tours must be encouraged. Local examples and case studies should be used as far as possible. The courses should also be supported by facilities such as transport and tools.

Appendix

Questionnaire

Agroforestry extension and education links

The importance of integrating trees into farmers' fields through agroforestry technologies is increasingly recognized in education, research and extension organizations. The level of agroforestry knowledge is gradually built up in these organizations, and this demand has in turn lead to the present situation, in which agroforestry is taught at educational institutions of different levels, particularly technical colleges and universities.

The objective of this questionnaire is to capture the status of agroforestry awareness in extension systems. The questionnaire deals with both formal training and short courses in agroforestry. It also seeks to gather data about agroforestry practices at the farmer's level.

The knowledge obtained through this study will provide important feedback to educational institutions in agriculture, forestry and natural resources. The results will guide the future development of their agroforestry curricula and teaching.

Your contribution is greatly appreciated.

Questionnaire

Agroforestry extension and education links

1. Personal data

1.1 Personal data

Name _____
Address _____
Tel _____
Age _____
Male ☐ Female ☐

1.2 Education

(Highest qualification only)
Level (tick) Certificate ☐ Diploma ☐
BSc ☐ MSc ☐
Other _____
Area _____
Institution _____
Graduation year _____
Duration of education _____

1.3 Job position

Position or title
_____
Duty station
_____
No. of years in the organization _____
No. of years in present position _____

2. Agroforestry practices

2.1 How often do you normally visit farmers?

4–5 days/week ☐
2–3 days/week ☐
1–4 days/month ☐
less than once a month ☐

2.2 How often do you normally discuss agroforestry when you visit farmers?

Every time ☐
Most times (3 times out of 4 visits) ☐
Often (once every 2–5 visits) ☐
Sometimes (once every 5–10 visits) ☐
Never ☐

2.3 What proportion of the farmers in your district have adopted agroforestry technologies?

8–10 of 10 ☐
5–7 of 10 ☐
2–4 of 10 ☐
1 of 10 ☐
None ☐

2.4 LIST ALL TOPICS YOU DEAL WITH IN YOUR CONTACT WITH FARMERS

1._____ 7._____
2._____ 8._____
3._____ 9._____
4._____ 10._____
5._____ 11._____
6._____ 12._____

2.5 WHAT AGROFORESTRY TECHNOLOGIES DO FARMERS IN YOUR AREA OR DISTRICT USE (in order of frequency)?

List relevant technologies:

1._____ 7._____
2._____ 8._____
3._____ 9._____
4._____ 10._____
5._____ 11._____
6._____ 12._____

2.6 WHAT AGROFORESTRY TECHNOLOGIES DO YOU PROMOTE IN YOUR AREA OR DISTRICT (in order of importance)?

List of relevant technologies:

1._____ 7._____
2._____ 8._____
3._____ 9._____
4._____ 10._____
5._____ 11._____
6._____ 12._____

2.7 WHAT QUESTION IS ASKED MOST FREQUENTLY BY FARMERS?

_____
_____
_____

2.9 HAVE THERE BEEN ANY MAJOR AGROFORESTRY PROJECTS IN THE AREA? BY WHICH ORGANIZATION?

_____
_____

3. Agroforestry education

3.1 AGROFORESTRY IN EDUCATIONAL PROGRAMME

Was agroforestry included in your formal education? Yes ☐ No ☐

If Yes, go to 3.2; if No, go to 3.4

3.2 DESCRIPTION OF AGROFORESTRY EDUCATION

Describe the agroforestry education you have participated in:

Institution _____

Programme _____

Name of agroforestry course _____

Year _____

Approximate duration of agroforestry course:

theory (contact hours) > 5 ☐ 6–20 ☐ 21–40 ☐ 41–80 ☐ 81–120 ☐ 120+ ☐

practicals (contact hours) > 5 ☐ 6–20 ☐ 21–40 ☐ 41–80 ☐ 81–120 ☐ 120+ ☐

If more than 2, continue below:

Institution _____

Programme _____

Name of agroforestry course _____

Year _____

Approximate duration of agroforestry course:

theory (contact hours) > 5 ☐ 6–20 ☐ 21–40 ☐ 41–80 ☐ 81–120 ☐ 120+ ☐

practicals (contact hours) > 5 ☐ 6–20 ☐ 21–40 ☐ 41–80 ☐ 81–120 ☐ 120+ ☐

3.3 RELEVANCE OF AGROFORESTRY EDUCATION

How do you evaluate your agroforestry education in relation to your current job?

Area	Relevant	Minor gaps	Major gaps	Not relevant
Agroforestry education—theory	☐	☐	☐	☐
Agroforestry education—practical	☐	☐	☐	☐

3.4 RELEVANCE OF EXTENSION EDUCATION

How do you evaluate your extension education in relation to your current job?

Area	Relevant	Minor gaps	Major gaps	Not relevant
Extension education—theory	☐	☐	☐	☐
Extension education—practical	☐	☐	☐	☐

3.4 STRENGTHS OF EDUCATIONAL PROGRAMME

In relation to your current job, what are the strengths of the agroforestry education in your educational background?

_____

_____

_____

_____

_____

3.5 WEAKNESSES IN YOUR EDUCATIONAL PROGRAMME

In relation to your current job, what are the weaknesses of the agroforestry education in your educational background?

_____

_____

_____

_____

3.6 SUGGESTIONS FOR IMPROVEMENT OF CURRICULUM AND TEACHING

From your experiences, how could the educational programme (curriculum and teaching) at your graduation institution be improved to better match your current duties?

Area	Suggestions for improvement
Agroforestry education—theory	
Agroforestry education—practicals	

4. Short courses in agroforestry

4.1 PARTICIPATION IN SHORT COURSES

Have you attended any short courses agroforestry? Yes ☐ No ☐

If yes, go to 4.2 , if no go to 4.6

4.2 DESCRIPTION OF SHORT COURSES

What in-short courses in agroforestry have you attended?
Institution or organization _____
Course _____ Year _____
Approximate duration of agroforestry short course:
theory (contact hours) > 5☐ 6–20☐ 21–40☐ 41–80☐ 81–120☐ 120+☐
practicals (contact hours) > 5☐ 6–20☐ 21–40☐ 41–80☐ 81–120☐ 120+☐

If more than one course:
Institution or organization _____
Course _____ Year _____
Approximate duration of agroforestry course:
theory (contact hours) > 5☐ 6–20☐ 21–40☐ 41–80☐ 81–120☐ 120+☐
practicals (contact hours) > 5☐ 6–20☐ 21–40☐ 41–80☐ 81–120☐ 120+☐

4.3 Relevance of agroforestry training through short courses

How do you evaluate the agroforestry short courses you have attended, in relation to your current job?

Area	Relevant	Minor gaps	Major gaps	Not relevant
Agroforestry training—theory	☐	☐	☐	☐
Agroforestry training—practical	☐	☐	☐	☐

4.4 Strength of short courses

What are the strengths of the agroforestry short courses you have attended, in relation to your current job?

_____

_____

_____

4.5 Weaknesses of short courses

What are the weaknesses of the agroforestry short courses you have attended, in relation to your current job?

_____

_____

_____

_____

4.6 Suggestions for improving curriculum and teaching of short courses in agroforestry

From your experiences, how could the curriculum and teaching of short courses in agroforestry and extension be improved to better match your duties?

Area	Suggestions for improvement
Agroforestry short courses—theory	
Agroforestry short courses—practicals	

4.7 What are your sources of agroforestry information, except for courses you have attended?

☐ *Agroforestry Today* (magazine)
☐ *Agroforestry Systems* (journal)
☐ national research annual reports
☐ reports from NGOs
☐ radio
☐ TV
☐ study tours
☐ extension bulletins and pamphlets

Other: _____

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