

Full Length Research paper

Agroforestry training at postgraduate level in sub-Saharan Africa: Solutions to challenges in curriculum delivery

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In 2005, the African Network for Agriculture, Agroforestry and Natural Resources Education (ANAFE) supported a survey of postgraduate programmes in Agroforestry (AF) at 20 selected universities in sub-Saharan Africa. The objective was to assess the AF content and delivery challenges, and work out strategic solutions with stakeholders. We surveyed five, six, three and six universities in Southern Africa, East and Central Africa, Sahel and Africa Humid Tropics, respectively. Questionnaire data were complemented by analysis of available publications about the universities and interviews with relevant faculty. A total of 160 lecturers, 36 key university administrators, 136 students and 50 potential employers were interviewed. The results showed that 80% of the institutions surveyed offer AF related MSc programmes with a two-year duration. Most programmes draw on faculty from different departments. The programmes range from stand alone AF courses to AF incorporated into other degree programmes, in all cases the thesis research topic is on AF. The overall teaching quality was good, with a caveat regarding experience of faculty. Student assessments were through coursework, examinations, seminars, and thesis write-up. Employers recognise that students trained in AF have a holistic view to smallholder farming problems. Challenges being faced include limited equipment and scholarship support and a slow pace in the inclusion of AF into national agricultural policies. The potential for expanding AF postgraduate education is good but more work is needed to improve the quality of delivery of programmes. Further support is necessary in expanding options for experiential learning; faculty skills upgrading; and further learning materials development.

Key words: Agroforestry, postgraduate, curriculum delivery, sub-Saharan Africa.

INTRODUCTION

For a long time, the mainstream forestry and agricultural education programmes failed to appreciate that a significant number of farmers were mixing trees, crops and livestock in their production systems, thereby actually practising Agroforestry. Rudebjer et al. (2005) noted that correction of this omission in educational institutions started in the early 1970s, albeit at a slow pace. The pace quickened as deforestation and land and soil degradation

marked a decline in natural capital in many countries and agroforestry came to be seen as a means of combining production with resource conservation. Governments, donors, researchers and NGOs joined forces to understand, develop and promote agroforestry systems. It was noted that agroforestry could contribute directly to food security, health and nutrition through improvement of land productivity and services. As a result, the number of educational institutions that provided agroforestry education and training increased very rapidly during the 1980s and especially in the 1990s.

The World Agroforestry Centre (formally known as the International Centre for Research in Agroforestry-ICRAF)

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assisted in the creation of the African Network for Agroforestry Education (ANAFE) in 1993. The original goal of ANAFE was to promote the institutionalisation of Agroforestry (AF) in education programmes in universities and technical colleges in sub-Saharan Africa (SSA) and to produce graduates capable of developing, disseminating and implementing AF practices suitable for smallholder farmers and addressing natural resources management in a holistic manner (ANAFE, 2006). The major thrust was through promoting and supporting multidisciplinary approaches in the teaching of agriculture and natural resource management, with a special focus on agroforestry at technical and undergraduate levels.

For the development of graduate education in AF, ANAFE supported the development of curricula, training of lecturers in andragogy and AF, and providing thesis research fellowships to graduate students (ANAFE, 1994; 2004; Chivinge, 2006). The ANAFE mandate was revised in 2003, to encompass Agriculture and Natural Resources Education. The name was changed to African Network for Agriculture, Agroforestry and Natural Resources Education but retained the same acronym, ANAFE.

As of 2009, the network has 131 member institutions in 35 African countries. The process used by ANAFE is to institutionalise the adoption of integrated education programmes in Agriculture, Forestry, Environment and Natural Resources at African colleges and universities. These activities are implemented within existing institutional frameworks and in a collaborative mode. Some colleges and universities have developed separate AF programmes, while others have incorporated AF into existing postgraduate programmes. A few have chosen to only allow thesis research in AF without any coursework in the subject-matter area. In all these arrangements, AF is growing as a science and as an area of specialisation.

This study is based on a survey conducted by ANAFE in selected institutions which the network has supported to assess the content of AF in postgraduate programmes offered and evaluate its content and delivery.

The specific objectives were to:

- i) Establish the current state of AF education in postgraduate programmes at each institution and assess the effectiveness of its delivery,
- ii) Assess the teaching capacity and quality management measures,
- iii) Document the current popularity and demand for AF programmes and project future needs.
- iv) Make recommendations on future actions by concerned Universities, ANAFE and other stakeholders.

METHODOLOGY

Universities surveyed

Twenty universities in Southern Africa (SA), East and Central Africa

(EA), Africa Humid Tropics (AHT) and Sahel having AF and/or Natural Resource Management (NRM) content were selected for the study and surveyed during July and August, 2005. The institutions surveyed were:

- i) In Southern Africa: Bunda College of Agriculture and Chancellor College, both in the University of Malawi; the University of Kwazulu-Natal in South Africa; the University of Zambia and University of Zimbabwe.
- ii) In East and Central Africa: Egerton University, Moi University, Kenyatta University, and Nairobi University all in Kenya; Makerere University in Uganda; and Sokoine University of Agriculture in Tanzania.
- iii) In the Sahel: Institut du Developpement Rural of Bobo-Dioulasso University in Burkina Faso; Universite Cheikh Anta Diop in Senegal and University Abdou Moumouni of Niamey, Niger.
- iv) In Africa Humid Tropics: University of Abomey-Calavi in Benin; University of Yaoundé 1 in Cameroon; Federal University of Technology, Akure and University of Abeokuta in Nigeria; Kwame Nkrumah University of Science and Technology and University of Ghana Legon in Ghana.

Data collection

Questionnaire data were collected on general information about the institutions, AF curricula, teaching capacity and quality management measures, current popularity and demand for AF and projected future needs.

The relevant information was obtained through interviews of 160 lecturers responsible for teaching and supervising postgraduate AF student projects and 136 students. Thirty-six key administrators of the universities involved in strategic planning and policy development for the institutions were also interviewed. These included deans and Heads of Departments. Data were also collected from prospectuses and brochures. Other stakeholders interviewed included 48 potential employers of AF postgraduates including Ministries, Private Sector companies and NGOs. Comparisons were made on responses obtained across institutions. General trends were derived based on the responses obtained and distilling of lessons learnt.

RESULTS

The results are presented in the order: 1.) Current state of AF postgraduate training, 2.) Quality of faculty, adequacy of teaching facilities and assessment and 3.) Objectives of choosing AF, its popularity, current constraints and scope for expansion.

Current state of agroforestry postgraduate training

Table 1 presents the current state of AF postgraduate training in the institutions surveyed.

Postgraduate education in AF is taught either as a Master of Science/Master of Philosophy degree programme or at a higher level as PhD. In 50% of the universities surveyed, it is taught as a subject or topic in another degree programme, that is, MSc in Natural Resources Management (NRM). In such cases, other post-graduate students in other departments within the institution, for

Table 1. Structure and duration of MSc programmes.

Item	Category	Number of institutions in category	Percentage of institutions in category
MSc Name	MSc Agroforestry	6	30
	MPhil	2	10
	MSc in other NRM programmes	12	60
Duration of Programme	2 yrs	16	80
	Less than 2 years	4	20
Delivery method	Course work plus Research	16	80
	Research only	2	10
	Both options (Research only and course work + research)	2	10
Research Period	> 12 months	2	10
	12 months	14	70
	< 12 months	4	20
Number of MSc Agroforestry courses	None	2*	10
	≤ Five	6	30
	6-10	6	30
	> 10	6	30
Number of theses completed between 2001 and 2005	≤ 5	3**	30
	6-10	1	10
	11-20	1	10
	>20	5	50

NRM, Natural Resource Management

*For research only programmes

**Ten institutions did not provide the relevant data

instance Animal Production, Agricultural Education and Agricultural Extension departments also take up AF as a course taught from the department of NRM. Thirty per cent of the institutions surveyed have an MSc programme solely in AF.

Eighty per cent of the surveyed institutions integrate course work and research while ten per cent of the institutions offer AF training specifically by research only. In ten per cent of the institutions surveyed, in addition to offering the training by course work and research, also offer the AF Research as a separate component.

The duration of the MSc programme in 80% of the institutions surveyed is two years. In the other 20% of the institutions, the duration ranges between 1 - 1.5 years. The research period is dependent on the duration of the programme. The research period for those institutions offering a taught component of 1 year is 12 months, while those offering research only is 24 months. Those institutions offering a one year course and research offer a research period ranging from 4 - 10 months. Thesis research areas have mainly been in the field of soil science, followed by tree science, social science, AF protection and lastly farming systems analysis.

For the taught component, the postgraduate programme

at Yaounde 1, Abomey-Calavi, Kwame Nkrumah University of Science and Technology, University of Zambia, Kenyatta University, Makerere University and Bunda College of Agriculture are very comprehensive. These comprehensive programmes offer a balanced coverage of both the theoretical and applied courses so that the students are well-grounded in the scope of agroforestry science and application. Some of the programmes in many other institutions need further development.

The majority of students are self-sponsored while very few students get sponsorship from government ministries of Environment, Natural Resources or Agriculture. Universities have obtained support from ANAFE in terms of research fellowships, library books, electronic equipment, short training courses for lecturers, data analysis, curriculum development, financial support towards teaching manual preparation and field demonstration sites development (Temu et al., 2001). All these efforts were mainly funded through a grant from the Swedish International Development Cooperation Agency (Sida). Other supporting agencies that worked with ANAFE include the Rockefeller Foundation, Legume Research Network, Norwegian Agency for Development Cooperation (NORAD) and African Academy of Sciences (AAS).

Table 2. Teaching capacity and quality measures.

Item	Category	Number of institutions in category	Percentage of institutions in category
Faculty qualifications*	≤ 5 PhD holders	9	45
	> 5 PhD holders	11	55
Availability of facilities	Adequate libraries, laboratories, computer facilities and demonstration plots available	14	70
	Inadequate laboratories and computer facilities	6	30
Condition of laboratories	Satisfactory, Standard equipment in functional state	12	60
	Unsatisfactory; Equipment needs upgrading	8	40
Teaching and learning process**	Good curriculum also balanced for theory and practicum***	10	56
	Curriculum needs upgrading to incorporate current elements of agroforestry	8	44
Assessment method	Rigorous; Involving internal and external examiners, written exams and thesis defence	12	60
	Internal examination, written exams and thesis defence	8	40

*In five (5) of the institutions, MSc holders were involved in teaching agroforestry and also supervising student projects

**Two of the institutions offer degree programmes by research only

***Five of these institutions involve also use of guest lecturers

Quality of faculty, adequacy of teaching facilities and assessment

Table 2 gives information on quality of faculty, adequacy of teaching facilities and assessment for the surveyed institutions.

The quality of faculty involved in teaching MSc courses and supervising post-graduate research projects varies between institutions. Forty per cent of the institutions had at least 7 PhD holders each participating in the teaching of AF while the least had two PhD holders each. Twenty-five per cent of the surveyed institutions currently have MSc holders participating in the teaching of postgraduate AF course. On average, there are 6 PhD holders per institution. However, in all the institutions surveyed, few members of staff have PhD qualifications in AF. Female representation within faculty in each institution was less than 10%.

Almost all the institutions had soil and plant analytical laboratories. Access to demonstration plots and farmers' fields was good all round. However, Internet facilities and germplasm/seed laboratories were not adequate.

The teaching process in general incorporates in few instances (25% of the institutions surveyed), invitation of guest lecturers. Otherwise in 75% of the institutions surveyed, the training is carried out through standard chalk and board teaching, seminar presentations, students' practical work, assignments and field visits.

In the Anglophone countries, the examination process involves written and oral examinations and thesis defence. External examiners are involved in the assessment. Most external research supervisors and examiners in AF came from international organizations, especially

ICRAF. The system of external examiners has not been widely adopted in the Francophone countries.

In almost all institutions surveyed, the government funding to University research is minimal. The lecturers indicate that there is limited time to conduct research.

Objectives of choosing agroforestry, its popularity, current constraints and scope for expansion

Agroforestry is seen by faculty and employers as an important subject to finding solutions to food security in Africa. Students readily see its relevance in the context of the smallholder farming conditions. This included the ability of AF to maintain and improve environmental conservation; entrepreneurship possibilities; and improving farm productivity.

About 80% of the students coming into postgraduate AF programme is from the young unemployed graduates, workers from ministries of agriculture, Tea companies, NGOs, Private companies, ministries of environment and natural resources, forestry research institutes and from in-service research and extension services.

The demand for AF is currently overwhelming, a perspective shared by faculty and employers. The potential for expansion of AF as envisaged by faculty, employers and students was seen to be high.

DISCUSSION

Post-graduate training in agroforestry in SSA has recently been gathering momentum. In the current study, it was found that besides MSc training; only 10% of the surveyed

institutions were offering MPhil and PhD studies. The potential for developing AF at these levels is enormous. Both lecturers and employers envisage that AF plays an important role in addressing agricultural problems encountered in the smallholder sector of SSA. They also contended that the demand for cadres trained in AF would continue to rise to meet the high demand from research, education and extension systems and from the NGOs.

In general AF was being offered through coursework and research. Rudebjer et al. (2005) recommended that curriculum reviews should endeavour to focus on a balance between theory and practical and a feedback from employers on graduate performance should be an important input in the review process. Currently, "experiential learning" with communities by students is missing from the curricula. "Experiential learning" has been seen as the best way to prepare young graduates to enter the workforce (Sherrard, 2003; Muir-Leresche and Scull-Carvalho, 2006; Gregorian, 2007). Institutions should endeavour to seek funds to embark on this mode of training.

In 80% of the institutions surveyed, the MSc being offered covers two years of study (1 year each of course work and research). This appears to be the ideal length of an MSc AF programme to maintain.

Across the four regions the numbers of students opting for AF specialised courses was still limited. Only 30% of the Universities surveyed have developed fulltime MSc courses in AF. This could be a reflection of University systems not adequately recognising the role AF plays in integrating land use disciplines. There is a need to ensure that AF is mainstreamed into land use sectors and development processes in all countries. Funding agencies should also be sensitised to support and fund innovative research topics in AF. There is a need to improve the national profile of AF through effecting relevant policy changes in government departments and demonstrate immediate AF benefits to smallholder farmers.

It might be important that those universities with full-fledged MSc programmes in AF share their experiences with their peers in the sub-region. Sharing opportunities include the use of guest lecturers, faculty exchange programme, sharing equipment and facilities, student exchange programmes and sharing of learning resources (Temu, 2004). These aspects need coordination for them to be meaningful. In Francophone institutions, coordination of efforts to harmonize and share resources has started with the creation of the REESAO network (Reseau d'Excellence de l'Enseignement Superieur en Afrique de l'Ouest).

The major focus of student thesis has been on biophysical aspects of AF technologies. Students have generally not ventured into innovative and problem solving aspects of AF. Research work should also delve into newer areas of AF. It is critical that graduating students have a good grasp of how to systematically solved pro-

blems, including the application of social science.

A number of foundations, bilateral aid agencies and International research institutions have been supporting AF postgraduate education. The enthusiasm might be indicative of the potential role envisaged by these aid agencies regarding what AF could deliver in improving agricultural production. The major areas, which have attracted funding, have been in scholarships, research funds and equipment. There is a need to continue working with interested development partners to expand AF programmes given the current high levels of interest. Key needs are in faculty training and development of contextualized learning materials.

Of those institutions offering postgraduate AF training, the majority (> 80%) of the lecturers have PhDs. This might imply that the expertise is available to handle various aspects of AF. From the survey, however, it was not specific, how many of these lecturers actually have PhDs in different areas of Agriculture and Forestry. The distribution of expertise is also not even across institutions. Those institutions offering specialised MSc courses in AF have the majority of the expertise. To fill the gap in expertise, some Universities invite guest lecturers. This is a very good idea that needs to be expanded in all universities in the region to enhance better utilization of existing capacity. There is a general need to offer faculty development fellowships for students to pursue PhD studies in AF and mechanisms should be put in place on how to retain the trained personnel in the Universities. There is also a need to have faculty exchange programmes in areas that are deficient.

In some Universities, a number of lecturers from departments not hosting AF do not participate in its teaching. Coordinators of AF programmes need to reach out to different departments in the universities and encourage them to participate in the teaching of AF. In instances where this cannot be institutionalised, the teaching of AF can easily be incorporated in the teaching of other applied and social sciences. Curricula need to be reviewed to ensure that the incorporated substance makes reasonable sense to enable the understanding of the concepts and practice of AF.

In some universities, lecturers with MSc qualifications and with minimal relevant experience are being allowed to teach postgraduate courses in AF and even supervise students undertaking research at MSc level. This should only be allowed in cases where these lecturers have relevant experience in the field. Relevant PhD holders working in National and International Research Institutes within the countries where universities are offering the AF programme should be encouraged to co-supervise the students. Some universities have made progress in terms of getting such institutions to participate in their teaching activities.

In terms of student assessment, there seems to be uniformity in thesis examination involving internal and ex-

ternal examiners and an oral exam. This should help to maintain standards across universities since most of the universities try to ensure that the external examiner is preferably from a different country. It would therefore make more sense if the curriculum in the region is standardised. These aspects should be encouraged so that qualifications will be recognised regionally and internationally.

Most of the institutions have good soil analysis laboratories. This could be the reason why substantial amount of the research has focused on soil fertility studies. Although available in some universities, seed/germplasm laboratories are in need of revamping to boost their operational efficacy. A few of the institutions are quite advanced and possess mist tunnels, green-houses, tissue culture labs, plant protection laboratories and general analytical laboratories. This is an aspect where if a database is compiled of facilities available at institutions in the region, would allow for sharing of scarce resources in the subcontinent. Students coming from countries where equipment is limiting can, in the pursuit of a particular topic, seek assistance from institutions who will be having specialised equipment they might want to use in their studies. Universities should therefore encourage not only faculty exchange, but also students 'exchange' and facility sharing.

Library facilities are available in all institutions, but students should also be enabled to access current literature through e-journals. Other relevant AF literature is generally scarce in most of the institutions surveyed. There is a need to invest in information and communication technology (ICT) to boost availability of relevant literature accessible by students.

Demonstration fields are available and farming communities are within reach of most of these institutions. Conditions are therefore favourable for conducting relevant AF research by students and also incorporating "experiential learning with farmers".

The demand for AF programmes was from former undergraduate students, graduates working in Ministries of Agriculture (MoA), Ministries of Environment and Natural Resources (MENR), Fisheries, NGOs and from the region. The demand was felt to be great and is likely to be so into the future. The employers felt that they needed a graduate who has a holistic view of issues. Training in AF at MSc level equips students with this appreciation. However, the demand was also significant in research and extension systems, where the employers were looking for persons who had Masters Level training to tackle research in AF.

The faculty generally agreed that the important issue in Africa currently is to find solutions to food security and environmental degradation. In many institutions, students generally perceived employment opportunities as low. The students felt that there is a need for the institutions to market the concept of AF more aggressively to policy-

makers and employment agencies. They also felt the future was on enterprises and self-employment and AF can offer them these opportunities.

Conclusion

The need for post-graduate agroforestry training in sub-Saharan Africa is appreciated by students; lecturers; university administrators and potential employers of the graduates. There is a need to standardise curricula regionally and explore other innovative ways of curricula delivery including staff and student exchange and continue with policy advocacy for the need to integrate agroforestry training in tertiary agricultural institutions in Sub-Saharan Africa.

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