A report prepared for the project

Lessons Learnt on Sustainable Forest Management in Africa

THE STATE OF FOREST EDUCATION IN SUB-SAHARAN AFRICA

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The state of Forest Education in Sub-Saharan Africa

by

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1.0 INTRODUCTION

As Africa enters the 21st century, many developmental challenges are encountered across the continent. Among them, the goal of achieving sustainable use of natural resources – especially forests - must remain in sharp focus and be addressed in a multi-prong approach. To better capture the role of forestry education and training on the continent, four key elements must be underpinned. First, the current status and future developments of the forestry profession must be placed in a historical context, traced back to early colonial influences, which, out of necessity, learnt and draw heavily on experiences from temperate region forestry. The consequence of a temperate region orientation of forestry training in Africa was a rather "narrow-scope" view of forestry adopted by colleges and universities. Arising from historical factors, the second aspect is that, with time, a largely public sector job market for which forestry education was targeted, shrunk and hence caused panic and "a diminished regard" of forestry as a profession among young potential foresters. The diminished job market in the forest sector has engendered an urgent need to re-engineer innovative means to make forestry attractive. This has called for many possible options: some forward-looking and others rather drastic. In some cases, forestry schools within countries or regions have used curriculum reforms to diversify or refocus their training programmes and, in other cases, funding to forestry education institutions has suffered major cut-backs which have seriously affected student enrolments. The dynamism between the apparent low public investment in forest education and declining numbers of students due to poor job markets creates a rather complex web making it difficult to pin-point the precise factors responsible for and/or driving actual status and future direction of forestry education in Sub-Saharan Africa.

Thirdly, the past two decades saw a fundamental global paradigm shift in which empowerment of local populations in relation to management of natural resources – including forests – emerged as a dominant theme. Forests are seen in terms of broad multiple values and contributing directly to rural livelihood systems, and also seen as an integral component of land use and tenure regimes. It is this socio-economic mix of land resources that characterises the unique features of forestry in Sub-Saharan Africa. In addition, impacts of globalisation and trade liberalisation, the existence or lack of local and international markets for forest products, poverty and impacts of the devastating HIV/AIDS pandemic, all affect management of forests and other natural resources in the African landscape. Therefore, current forestry education and training must respond sufficiently to these emerging issues – not merely in a narrow sectoral manner, but rather through an integrated training approach of natural resources management disciplines. This calls for well fashioned and innovative approaches to forestry training curricula vis-à-vis that for other land use disciplines. We must seek to ensure that training approaches used lead to adoption of technologies in the larger agricultural sector that have beneficial impacts on Africa's rural populations – it is imperative that tertiary training institutions produce agents of this change. Until recently, forestry training has remained largely traditional but there is now evidence of change taking place within institutions. This trend would need to be advanced and aggressively pursued so that forestry education on the continent is strategically placed in terms of producing adequately trained manpower for increasingly challenging tasks towards sustainable forest management. The primary goal is having a breed of foresters with skills and positive attitudes to transform livelihoods at the farmer level. We need to move beyond impacts derived only from those associated with logging and industrial forestry (thought this is not to say we abandon this function of forestry) to enhancing positive impacts at farm level. It also means ensuring that technology transfer to farmers is made affordable and practical, hence better and closer interaction between training, research and implementation.

Fourthly, national institutional reforms – especially in the area of policy - have often lagged behind and yet no meaningful advancement can be anticipated in a policy vacuum. Some parts of Africa (or countries) are worse off than others in this respect. Of major concern is the obvious lack of connection between national forestry manpower requirements and training of foresters. Whereas there is a concern that most countries are abandoning the training of forest certificate and diploma holders in preference for professional level training (B.Sc. holders), there is an even bigger worry that with liberalised university admissions, unpopular and so-called low job market programmes, such as forestry, will be cut off all together. It means that the importance of forestry education and that of other natural resource management disciplines must be demonstrated beyond market demands and this is where national policies and international support for the forest sector become critical. One way of enhancing and improving the forestry profile, is by forming regional networks and forging collaboration among forestry training institutions, with the twin objective of creating centres of excellence in specialised areas of forestry and natural resource management; while at the same time promoting faculty and student exchange programmes. It is only better networked faculty and forestry professionals who can address issues pertinent to a given region and provide leadership and direction in terms of programme reforms and developments. The role of bilateral and multilateral agencies is crucial in providing support

funding for such networks. A focused proactive approach is needed if forestry education is to make a meaningful contribution to sustainable forest management in Africa in coming decades.

1.1 Terms of reference and study scope

Organised within the broader project objectives of *"Lessons Learnt on Sustainable Forest Management in Africa"* - an initiative of the Royal Swedish Academy of Agriculture and Forestry, in collaboration with FAO and the African Forestry Research Network (AFORNET)/African Academy of Sciences - this study looked specifically at issues of forestry education in sub-Saharan Africa. Like in all the other studies undertaken within the project frame conditions, the main objectives guiding this study were to:

- Analyse and establish what lessons have been learnt from positive and negative experiences of various initiatives, projects and programmes aiming at sustainable management; use and conservation of forests in sub-Saharan Africa;
- Analyse and establish what the ecological, economic, social and other pre-requisites are necessary for extending positive lessons to wider use (more people, larger areas, other countries etc) and
- Based on the outcome of the above analyses, to identify the most urgent issues and concerns for Africa to draw the attention of the international process.

Specifically, the study sought to identify and analyse key trends (both in a historical and present context) that have shaped and are significant in informing the future direction of forestry education on the continent. Overall, the study was underpinned by clearly defined and specific terms of reference.

1.2 Method

The analysis utilised a variety of data sources to achieve deliverables as set out in the terms of reference. The author conducted a detailed literature search dating back to the early 1960s when forestry training institutions were started in Africa and traced developments to date. The study also relied heavily on empirical data obtained in a survey conducted of over 20 forestry and agricultural institutions taken from various regions of Africa covering both Anglo- and Francophone Africa through funding support from ICRAF and FAO in 2002. The availability of this data eliminated the necessity to include several case studies – as indeed many important generalisations and lessons could already be drawn from the analysis of data. Nevertheless, the inability of the author to visit or obtain information to document a case study (forestry training institution) from Francophone Africa is a limitation in the study.

Although there was a very interesting debate with many thoughts and ideas expressed on the direction of forestry education in Africa at the inception of programmes in the 1960s and 1970s, this did not continue, i.e. not much happened in terms of dialogue within professional circles and documenting (in form of published reports) how programmes developed once they were established. Hence, a conspicuous data gap exists spanning much of the 1980s and 1990s. The emerging interest in Agroforestry in the 1980s did trigger an interest but only in as far as incorporating it (agroforestry) into main stream forestry training programmes. It was a challenge trying to bridge the early beginnings of forestry education and the present in the absence of documented evidence (period 1975-2000) of key trends within institutions and across regions. However, the survey data of 2002 does, to a considerable extent, shed light on key indicators of change in forestry education. The study also entailed holding informal discussions with experts and experienced forestry faculty and professionals, both within the East African region and by visiting the FAO office in Rome for consultation and literature searches. The workshop held on February 9-13, 2004, in Nairobi, with key stakeholders from all over Africa and other parts of the world provided critical comments and valuable suggestions which were incorporated in the final report. Beyond a critical review of literature and of views obtained from these various sources, as well as boundaries imposed by the terms of reference for the study, the author also drew from his personal experiences as a university lecturer of forestry for over 12 years, and based on personal convictions about the future direction of forestry education.

2.0 STATE OF FORESTRY EDUCATION IN SUB-SAHARAN AFRICAN

2.1 Evolution of forestry education in Africa: early influences

Forestry as a profession in African can be traced back to setting up of national forestry departments in the colonial era in the 1920-1930s. The independence wave that swept through the continent in the early 1960s led to a need to find national staff to replace expatriate staff leaving the public service including forestry. The Food and Agricultural Organisation of the United Nations, FAO, spearheaded expert and consultative meetings on education of foresters (*FAO, 1962*). The inception of forestry education in Sub-Saharan African was largely patterned and shaped after models that were already in place in Europe and North America. *Shirley (1964)* sketches the development of forestry education from early organisations in a global context. Much of the literature on the subject in the 1960s, (e.g. *FAO, 1962; Shirley, 1964; Sisam, 1964*) underpinned forestry's contribution to enhancing societal and environmental values. Forestry and foresters were seen as having a direct role in reversing diminishing world forest resources in the face of rising human populations - forestry seeks to aid man to live successfully with forests. As pressure on land increased, this goal becomes progressively more difficult to achieve. Forestry was conceptually seen in terms of multiple values and serving critical environmental functions. Therefore, forestry education was envisaged to embrace the field of liberal arts - to give students entering the forestry profession a firm grasp of society and its aspirations, hopes and fears, its longings and yearnings, etc (*Shirley, 1964*), and breadth of knowledge expected of foresters was of considerable scope. Thus, forestry schools were expected to demonstrate competence in general education in addition to technical forestry training. Foresters required breadth of knowledge about the biologic nature of the trees and other life forms that make up the forest: basic knowledge of living plants, their environment and capacity for genetic variation, and of soils, not just as source of moisture and nutrients but also as a medium of biological activity.

In terms of practical training, forestry curricula as proposed by *Sisam (1964)* deviated considerably from the broad goals earlier envisioned, and took a rather narrow perspective, i.e. such curricula borrowed largely from forestry schools established in North America. These put much emphasis on biophysical aspects of timber production as the main end product of forest management and did not reflect on the broader values expected of the profession. In this sense, forestry education could be likened to a three-legged stool having biological, technical and social legs, with greater emphasis placed on the biological and technical and much less on the social leg. A key point to note about forestry thinking in the 1960s was the pervading view of the high esteem with which the profession was regarded – a situation that has regrettably diminished considerably over time. The debate was not only about the "scope" and forestry identity but also about where forestry training schools should be placed – whether as part of the national forest service or university. Beginning with the German "master schools" idea (*Shirley, 1964*) – training based on apprenticeship, i.e. learning under a master, giving rise to forestry schools where more formal education could be given. Forestry school is a generic term often used to include colleges of forestry, faculties of forestry, sections or divisions of forestry, or other disciplines in combination with forestry. Practitioner-operated forestry schools tended to give way to university forestry schools. Historical and current practice in many parts of the world strongly supports establishing a forestry school within the university. The main rationale for this is that a Forestry Faculty within a university set can benefit from the rigorous intellectual environment and also because science and social science courses offered to forestry students can often be sourced from other faculties. Hence, forestry Departments, Faculties and Schools in Africa have followed this path. The drawback is that there is a tendency at universities to be too theoretical and there is often limited exposure to field experience.

On the whole, the evolution of forestry education in Africa has been considerably influenced by temperate region forestry. This influence was exerted in two fundamental ways: early training of forestry professionals from Africa took place in Europe and North America and these are the people who later occupied positions in national forest service as well as teaching and leadership positions in forestry schools. Secondly, the establishment of forestry faculties and departments in some African countries was driven from a narrow pool of expertise and again with forestry experience from the north. Although these two influences were beneficial in their own right in ensuring a faster development of forestry manpower in Africa, as well as ensuring that forestry as a profession took off, key attributes of the African ecological and socio-economic landscape were not taken into consideration. Training programmes and forestry practice did not mirror the myriad of land use systems and rural livelihoods characteristic of developing countries of Africa - in addition to objectives of timber production. Furthermore, the dependence on donor support for national forestry programmes hindered any meaningful evaluation and re-engineering of the programmes to better reflect local realities and broader concerns.

Initially, it seemed that the main goal of establishing forestry schools on the continent was to train foresters for the national forest service (*Wyatt-Smith, 1970*), absorbed in a hierarchical structure. Professional foresters and other specialist degree holders (usually called forest officers or forest conservators) at the top, technical staff (diploma and certificate holders in the middle), sub-technical (forest guards, forest rangers, field staff, etc) and forest workers (with no formal forest training) at the bottom of the pyramid. The training period recommended ranged from 2-3 years (certificate and diploma level) and 3-4 years for Bachelors level training. Influenced by the romanticised and rather idealistic view of forestry and forest research, was to some extent responsible (in some cases) for unworkable recommendations being offered by some authors. For example, *Richardson (1967)* recommended an inordinately long time of training for forestry researchers: "adequate training for effective research in forestry requires, in general, a minimum of nine years at a university (four years of forestry, two years of specialist training, three years of research training)….". From an initial few regional schools (e.g. the College of Forestry in Monrovia 1955, the Department of Forestry at Ibadan University in Nigeria, 1963, Makerere University, Uganda, 1970, and at Dar es Salaam, 1973) in the 1960s to early 1970s, expansion of forestry education in Africa grew phenomenally from the late 1970s through to the early 1990s. Implication of this growth on quality and future direction of forestry education in Africa are analysed in this report.

2.2 Key indicators of change in state of forestry education

Recognising the heavy capital costs of starting new faculties, and the human resources constraints in running them, encouraged a regional approach to the establishment of forestry schools in Africa. Given the manpower requirements and projections, proposals were put forward to establish a few well run schools on a region basis (*Williamson, 1964*; *Hilmi, 1971*). The Department of Forestry established at the Ibadan University in 1963 and the College of Forestry in Monrovia were to serve the western Africa region. Forestry schools to be established in Congo-Kinshasa and Cameroon would meet personnel needs for Francophone Africa and one at Makerere University for East Africa. Due to differences in political ideologies and national ambitions, many countries abandoned the regional approach and started their own forestry programmes although these were largely similar. Therefore, beginning with only a couple of faculties in the 1960-70s, the number of institutions grew to the current number offering certificate, diploma, BSc and postgraduate diploma in forestry. Of the more than 125 members of the African Network for Agroforestry Education (ANAFE), at least two thirds have forestry training. The expansion of forestry training programmes on the continent between the 1970s and 1990s coincided with considerable international interest in forestry and hence bilateral funding support to various governments. Being country driven, many of these institutions were not necessarily established on the basis of regional considerations, but rather on national interests and largely on an *ad hoc* basis. The donor funding mainly helped in the establishment of infrastructure and building of capacity in terms of scholarships through staff development programmes. One of the difficulties in evaluating the development and success of forestry education in Africa is the lack of published information on the expansion process. The earlier philosophical discourse on the 1960s –70s (*Shirley, 1964; Williamson, 1964*) and FAO's analyses of manpower requirements (*Lafond, 1969; Hilmi, 1966/1971; Roche and Cooper. 1980*), were not followed with studies on how various programmes and institutions actually evolved. The period between 1980 and 2000 is notoriously conspicuous for its silence on forestry education.

Technical forestry education (offering certificate and diploma level training) has a much longer history than professional education. *Hilmi (1971)* gives an overview of the development of these institutions and their regional spread. Many of them were established as early as the1930s through the 1950s (e.g. Nyabyeya Forestry College in Uganda, 1931; Olmotonyi Forestry Training School in Tanzania, 1936; Ivory Coast Forestry School, 1938; and the Technical Forestry School in Cameroon, 1949). The basic logic then was that lower cadre of staff - technicians and forest rangers - would be produced by these colleges and the need for professional foresters met by expatriate staff. This colonial era hierarchical structure was inherited by post colonial Africa without addressing the inherent disparity that existed between the professional and technical staff categories in terms of actual contributions to the forestry sector. Although the day to day running of forestry activities is in the hands of forest technicians and below, this is not reflected in remuneration packages. Furthermore, there is usually little public investment in increasing skills of this category of staff through training. A report (*Hilmi, 1971*) gives details of manpower projections based on capacity of established institutions and anticipated manpower requirements on a regional basis. This data is extremely valuable in assessing the current situation.

Information on forestry training institutions established from the late 1970s to the present is sketchy and largely unavailable as most would be found in unpublished country reports. However, a recent survey (*Temu, 2002*) reveals

interesting trends. *Annexes 1 and 2* summarise pertinent data from the study for 19 of the surveyed institutions spread across all the regions of the continent. Most of the institutions surveyed offer training at B.Sc. level, a few only at certificate or diploma levels. Irrespective of the type of training offered, one key feature of all the institutions listed in *Annex 1*, is that they have low numbers of graduating students each year (on average 10-30). Except for a few schools that showed consistent numbers in the past decade (e.g. Stellenbosch University in South Africa, Makerere University in Uganda and Sokoine University of Agriculture in Tanzania), the number of students graduating fluctuates highly with some years without anybody graduating and other years producing twice the average number. The low numbers are generally attributed to declining numbers of students joining forestry whereas the fluctuation in numbers graduating per year is more due to disruption of university programmes through frequent university closures in some countries, or funding shortfalls. Postgraduate training is still at a fairly low level in terms of student enrolment although in some universities, e.g. the Department of Forestry at Ibadan University, postgraduate training appears to be more stable than undergraduate training. Given the heavy investment of overseas graduate training that took place in the 1980s and 90s, some forest schools have fairly well established capacities in terms of manpower to mount effective postgraduate programmes, yet this capacity is largely underutilised. For example, the Faculty of Forestry at Sokoine, Ibadan University and Moi University have strong faculties and yet only Ibadan seems to have a good population of graduate students. The main reason for this could be lack of funding for postgraduate programmes or preference by forestry professionals to get their graduate training overseas. In almost all cases, institutional capacity is limited or severely constrained by lack of infrastructure and/or teaching staff (see *Annex 1*). Most institutions reported very limited funding at present although most mentioned that they received some form of donor support into the early 1990s. Decline in forestry education funding in the later part of the 1990s into the 2000s is not surprising as most donors appeared to have lost interest in main stream forestry and diverted funds to biodiversity conservation and the general area of natural resource management. Overall, from the report by *Temu (2002)*, the following key trends regarding forestry education in Africa can be extracted:

- There was a sharp decline in training of forest technicians especially in mid 1990s, in many countries partly linked to Structural Adjustment Programmes (SAPs) – the responses of many governments was either to close down these institutes or drastically reduce the numbers of enrolled students. The impact of structural programmes is comprehensively elaborated in *Mrema (1995)*. He argues that overall, the agricultural sector (including forestry) in SSA in coming decades will be more impacted by macro-economic factors. Thus, the role of governments in agricultural (and forestry) production and provision of services to the sector will be greatly reduced and hence employment opportunities for graduates will also be drastically reduced. Therefore, there is a need for current training programmes, which were tailor-made to produce personnel for public sector employment, to be fundamentally reformed to cope with changing realities. The most immediate impact of SAPs in the forest sector is already evidenced by retrenchments and unemployment of graduates resulting in serious staff shortages and severe decline in the quality of plantation forestry in most countries. It is suggested that more entrepreneurial skills and a broader natural resource management (NRM) and rural development orientation may be the way to make graduates more attractive to the job market and reduce dependency on public sector employment.

- Student enrolments in forestry is generally low compared to related disciplines such as agriculture and numbers graduating each year is not at all consistent: some schools record no graduation in certain years and then suddenly large numbers in a given year. Based on a sample of 20 forestry training institutions the annual number of students graduating with a B.Sc. degree in forestry ranged from 11-57 (*annex 1*). These are low numbers and do not seem to justify the heavy investment already made in terms of staff and infrastructure. Most forestry schools got scholarship support in the 1980s and 1990s that enabled some of their best graduating students to study in overseas universities for M.Sc. and Ph.D. Many have since returned to the universities and colleges only to find that they are underutilised. The ratio of female to male students taking forestry is alarmingly low and seems to have been a consistent trend over the years. Changes in donor support to forestry training institutions have contributed to fluctuation in student numbers as well as overall stability of the programmes. Institutions that enjoyed a reasonable level of external funding support showed consistent enrolment levels.

- The unpredictable fluctuation in student enrolment and graduation hampers any meaningful planning and implementation of forestry programmes, especially declining numbers in technical level training. Current trend for certificate holders to register for diploma and diploma holders for B.Sc. without corresponding admissions into certificate level training is of concern and an important policy issue to consider. The trend is eroding the vocational and technical cadre in forestry, thus creating a vacuum in practical supervision of forestry work. The

result is declining quality of forest management as the professional cadre (largely managers) is left to deal with forest workers directly.

- There has been a fairly modest increase in the number of students obtaining a B.Sc. forestry degree in the 1980s -1990s faced with an increasingly shrinking forestry market, this regardless of the high actual need for trained foresters. Most forestry graduates now have to contend with finding jobs in the NGO sector, often completely unrelated to their training.

- There is a need to develop further the capacity for postgraduate training: although there is merit in students going out to study at foreign universities, this should be encouraged to take place more in a regional and African context as the socio-economic, ecological and environmental settings would be more relevant. *Griffin (1982)* questions the logic of graduate training of personnel from developing countries in developed countries where students are exposed to sophisticated equipment and experimental conditions that are beyond what is available to them when they return home. Thus, although there is need for rigorous exposure to research tools and methodologies, care must be taken to ensure the relevance of such training.

2.3 Trends in investment in forestry education (last 10-20 years)

Investment in education has varied considerably from country to country and over different time periods. *Persson (2003)* sketches phases of forestry assistance in the past four decades: focusing on industrial forestry (predominant in the late 1960s and 70s), social forestry (1980s), environmental forestry (1980s-90s) and, more recently, on natural resource management. In most cases, funding to forestry educational institutions mirrored the interest in the forest sector, both at the national and international levels. For example, the interest in fuelwood in the 1980s led to considerable interest in donor supported establishment of woodlots and concomitantly an interest in social forestry training orientation in forestry schools. The global interest in biodiversity following the 1992 Rio Summit shifted the interest from production forestry more to conservation of natural forests – especially forest ecosystems considered as "biodiversity hot spots" and channelling of donor funding through non-governmental and community-based organisations (CBOs). Generally, national support to forestry educational programmes has been demonstratively inadequate (*annex 1*), as is the case indeed with overall funding of university programmes. To help examine the extent of and trends in funding forestry education, we must consider the main sources of funding. Forestry education has traditionally received support from four major sources:

- National support for technical and professional level training institutions largely goes into paying salaries for staff working at the institutions, and small amounts for infrastructure development and maintenance. In the absence of other funding sources, national funding is grossly inadequate and in most cases barely enough for the institution to survive. This partly explains the sharp decline in enrolment or collapse of technical forestry colleges. National funding support to forestry educational institutions is pegged to the number of students enrolled in any given faculty/institute. Given the low numbers of students admitted to forestry faculties/departments, funding allocation is correspondingly low. In terms of investment, faculties or training programmes in agriculture get substantially much more support than forestry – which is obviously linked to the undisputed bigger importance of agriculture in the national economies of most SSA countries.

- Massive bilateral donor financing, especially during programme inception. A good example was the FAO/UNDP support to establish the Department of Forestry in Ibadan, and NORAD funding first to Makerere University and then to Sokoine University of Agriculture in Tanzania. Such funding will usually involve establishing physical infrastructure (class-rooms, laboratories, computers, labs, field stations, vehicles, etc.) and paying salaries for expatriate faculty for a defined time during which national staff capacity is developed. Like other time limited funding support the way the institutions run after funding is withdrawn depends on local capacity and sustainability mechanisms created during the life of the project. Most forestry educational institutions have been established with funding support usually coming from bilateral donors. The interest in forestry issues saw much funding being received by institutions in the 1980s and into the early 1990s. Based on survey data (*annex 1*), this kind of support has declined substantially in the recent past. One reason is that university education is often perceived by donors to be too theoretical and of little practical utility in improving livelihoods, and the strong emergence of NGOs in rural development and natural resource management has resulted in massive re-channelling of funding (that could have gone to universities) to programmes where results and impacts are more immediate.

- The third type of support is money attracted by faculty through joint or collaborative research projects with other universities, especially from developed countries, leading to initiatives to write proposals for funding to Foundations and other international organisations (e.g. the Rockefeller Foundation, GEF small grants projects, International Foundation for Science (IFS) and AFORNET grants, etc.). This kind of funding is usually limited and used strictly for research and for limited equipment support to the researchers' institutions. The amount of funding of this type coming to any institution depends on institutional leadership, creativity of individual lecturers in the institution, as well as institutional policy in managing grants. For example, Makerere and Sokoine Universities currently enjoy considerable funding support for research from a variety of sources because they have developed internal mechanisms for reviewing proposals and ensuring efficient delivery of project results – hence endearing themselves to funding agencies. The extent of research funding support to forestry schools has been influenced by the general negative perception of forestry as being anti-conservation and hence donor funding is tending to go to institutions doing development oriented research or directly to NGOs implementing rapid participatory research.
- A fourth type of funding support comes from interactions between universities and industry. In many developing countries the linkage between Universities and industry is generally weak and especially so in the area of natural resource management (*Falvey, 1996*). Thus, industrial funding support to forestry training is very little or non-existent. The Department of Forestry at Moi University used to receive some funding for a prize for "best graduating student in B.Sc. Forestry" from Pan Africa Paper Mills Ltd. – a large paper making company in the region. More recently, Total International Oil Company, through its subsidiary branch (Total Kenya), has started an initiative to support afforestation in the country and entering partnership with the Department of Forestry at Moi University in which the Forestry Department gives technical leadership to the project. It is too early to report any progress on this initiative but it demonstrates a potential that has not been exploited in the past, a link that forestry training institutions should now forge.

In a recent consultative expert meeting held in Rabat, Morocco (*FAO, 2001*), participants affirmed that the capacity of institutions for all levels of forestry education is low and that programmes needed strengthening and updating, especially in developing countries. Concern was expressed that donor support to forestry education was declining, partly because of the decrease in hiring by public service and NGOs, and partly because of increasing numbers of non-traditional foresters taking on forestry related jobs and responsibilities. International organisations that have supported university education (not necessarily just in the field of forestry) include NORAD, Sida both SAREC and the Natural Resources Division), NUFFIC, DANIDA, IDRC, GTZ, plus various other Foundations and international forestry research organisations.

Overall, investment in forestry education may seem to be in decline in the past one decade in terms of pure, large-scale forestry projects. However, the international support in the field of natural resource management (forestry being a critical component) means that funding might actually be increasing depending on how the faculties are networked. But it can be stated that because of declining enrolments in some cases and national budgetary constraints, public support to forestry has been reduced considerably in the past two decades in most countries and this is reflected in unemployment of forestry graduates and retrenchment of those in the service.

2.4 Curriculum content (disciplines /subjects dealt with by forestry educational institutions)

Fundamentally, the curriculum content in most forestry schools developed from the historical bias of forestry as a biological science and of the end product being timber and utility wood. *Sisam (1964)* proposed a curriculum for forestry training comprised of two main parts: the first two years of a B.Sc. course would include basic science courses (Physics, Chemistry, Botany, Zoology, Geology and Soils, Mathematics, etc.) and the last two year are taken up by "core" forestry courses, including silviculture, forest ecology, surveying, forest engineering, tree morphology and physiology, mensuration, inventory and statistical methods, economics, pathology and entomology, forest management, wood technology and utilisation, forest policy and administration, forest fire control, etc. These courses are found in forestry training curricula to varying degrees depending on background and subject bias of faculty. *Richardson (1969)* criticised classical forestry training offered in North American and many other parts of the world schools for having a biological bias and being weak in industrial economics and business management. In spite of the programmes being timber production oriented, curricula were not well suited and adequate for the wood industry. Wood science is often offered as an option within a forestry degree or courses, in other cases as part of the engineering faculty and only in rare cases is a B.Sc. course in wood science and technology given as a stand alone

programme. On average, B.Sc. forestry takes 3-4 years, with the first 1-2 years devoted to basic sciences and introductory courses. According to *Roche (1975)*, a basic minimum expertise will be required in Africa in all aspects of silviculture and management of large industrial plantations, in management of remnant natural forest ecosystems, in wood utilisation, forest economics and forest engineering, and hence be reflected in training curricula. At the certificate level, the same courses are offered but with greater bias towards practical field work. More emphasis is placed on forest techniques (nursery operations, spacing, pruning and thinning etc) than on managerial skills at the technical level.

As far as the development of forestry curricula in Africa is concerned, four key issues must be underscored. First, because of the temperate region forestry influence, concepts developed may not apply to tropical forestry situations. Basic forestry text books used in Africa set forth illustrations and principles from temperate regions and this often requires vastly experienced faculty (with considerable field experience) to make appropriate adjustments of principles to these systems. The need for basic textbooks in silviculture, mensuration, management, and other disciplines written specifically for use under tropical conditions has long been recognised. The strong temperate forestry bias has placed considerable emphasis on production forestry, particularly plantation forestry at the expense of multiple value forestry in training. Criticism levelled against forest training in the past decade could be attributed to this rather narrow perspective.

The second issue has to do with scope and breadth of curricula content in relation to institutional setup. Forestry programmes are variously found as Departments in faculties of agriculture, natural resources and environment, or as a stand alone Faculty/Department of forestry. Where the forestry programme is linked to related disciplines (agriculture or natural resource management), the curriculum content tends to reflect elements of the other disciplines. On the other hand, a stand alone forestry faculty or department tends to have a predominance of "pure" forestry courses. There is also a difference between a forestry programme mounted by a Department as opposed to a fully-fledged forestry faculty with various departments. There is, of course, more flexibility - a wider variety of courses and options offered to students in a faculty than in a department within the same time period. But this advantage must be weighed against the cost of running a full faculty as opposed to a department. It seems to make more sense to have a faculty if there is an intention to offer several degree programmes and might be more efficient to house the programme in a department for one degree course. Both these situations are found within various forestry institutions in Africa. There also seems to be a relationship between the institutional set up and funding support available. Where a university has received reasonable and consistent funding support, development of a faculty has often resulted. At the lower level, technical colleges offer both certificate and diploma courses – with more shift in emphasis towards diploma courses.

A third issue that comes out of a review of literature is that most forestry education and training institutions in Africa seemed to have evolved in isolation of personnel requirements at the national level. There seems to be a visible lack of connection between training institutions and the main employment sectors. A considerable proportion of job opportunities for foresters are in the public sector. This derives from the historical construction where forestry as a land use practice was distinctly separated through gazettement of a national forest estate from the larger agricultural sector and especially from the small-scale farmers, and the management and protection of this estate being the responsibility of the forest service. The consequence of this is the perception that foresters are trained for public forest service and their mandate ends there. Furthermore, this type of public sector driven training fails to address the broad spectrum of land use issues and interrelationships with rural livelihoods in SSA. Therefore, fundamental institutional improvements, in particular in the national public forest administration, have to be undertaken in order to take full advantage of the growing number of professionals and technicians (*Schmithüsen, 1983*). At the same time, forestry curricula must be reformed to respond to a shrinking public and "expanding" non-public sector job market. Indeed, thinking that is increasingly gaining currency is that tertiary education in the larger agricultural and natural resource management sector must seek to produce graduates with entrepreneurial skills and capacity for generating self-employment.

International interest in agroforestry in the 1980s also led to a debate (e.g. *von Maydell, 1981; Huxley, 1987; Asare, 1990; York, 1990; MacDicken and Lantican, 1990; and Zulberti, 1993*) on strategies for agroforestry education. Questions were asked on how agroforestry education could be offered as a postgraduate diploma or a professional degree - focusing on better understanding and analysis of land use systems. There was a strong feeling that neither agriculture nor forestry as disciplines responded adequately to land production systems of small scale farmers in the developing world and that there was a need to re-orient forestry training in this direction. The mantle of agroforestry education was spearheaded by the International Centre for Research in Agroforestry (now World Agroforestry Centre) through the African Network for Agroforestry Education (ANAFE). Perhaps the greatest single contribution

of ANAFE to advancing agroforestry in SSA is the role it has played in facilitating reviews of and/or incorporation of agroforestry in training curricula in all land use disciplines. For the period 1993-2002, ANAFE supported 67 education and training institutions in Africa to incorporate multi-disciplinary approaches to natural resource management in their curricula. *Table 1* and *annex 3* summarise institutions involved in this process and programmes affected. Based on a recent survey report (*Temu, 2002*), it is evident that forestry institutions are responding to curriculum change and embracing shifting paradigms in forest management (*Annex 2*). Aspects such as extension and participatory forest management, non-timber forest values, biodiversity conservation, etc., are now finding their way into mainstream forestry training curricula.

All these are positive steps but a few pertinent questions need to be asked. To what extent are the observed curricula changes informed by clear national policies and visions and not merely responses to donor-driven processes? How is tertiary agricultural/forestry education academia proactively involved in broad based institutional reform in NRM? Colleges and universities all over the world are notoriously known for rigidity to change. Even when a few far-sighted faculty members are available to champion such change, they often face stiff opposition and scepticism from "conservative", mainstream academics who see changes as a threat to their profession or long established positions. This situation is worsened when training institutions develop in isolation and there is limited intellectual interaction in terms of regional meetings and through scholarly journals. These conditions are clearly prevalent in SSA and must be addressed if envisaged curricula reforms are to reflect current realities in a more meaningful way. As a partial response to this, ANAFE organised a symposium on quality and relevance of agricultural and natural resources (forestry) education in Africa in 2003. The highly intensive interactions and debates that emerged led to a very concrete declaration, strategy and action plan to improve quality and relevance (*Temu et al., 2003*). The linking of all land use disciplines in a common forum and network as ANAFE helps to elaborate the strong relationships that must be nurtured in educational programmes, and the need to contextualise teaching and learning in the development and well being of people. Thus, the teaching of agroforestry is helping to bring experts of land use programmes closer together.

The collaborative approach that ANAFE has used to work with institutions (in terms of cost sharing and using local/regional expertise) is greatly applauded – African forestry and NRM professionals must increasingly provide leadership to reverse earlier trends where forestry development on the continent was guided by outside experts.

Table 1: Number of institutions (and programmes) that reviewed curricula with ANAFE support in 1993-2002: summary statistics.

	Level of educational/training programmes offered by institutions				
Discipline/field	**Certificate**	**Diploma**	**1st Degree**	**Postgraduate**	**Total**
Agriculture	2	4	15	2	**23**
Forestry	7	8	6	2	**23**
Other (rural development, horticulture, NRM)	1	2	3	0	**6**
New Agroforestry programmes	0	4	5	6	**15**
Total	**10**	**18**	**29**	**10**	**67**

Data source: ANAFE office, World Agroforestry Centre, Nairobi.

2.5 Forestry education in comparison with other professional fields

Forestry has traditionally been regarded as a sub-sector of agriculture and Forestry Departments at universities are often housed within faculties of agriculture. Although forestry scholars in the sixties and seventies saw this as a strategic and more efficient way of using scarce resources in developing countries, they cautioned that it was necessary for forestry not to lose its identity. Contrary to the romanticised view of forestry by these early thinkers (forestry put at par with professions such as law and medicine (*Shirley, 1964*)), professional training in forestry or agriculture has never come close to these professions either in terms of student admission or employment after

graduation. One can almost generalise that student admission into agriculture and forestry courses is not nearly as competitive as it is, say, for medicine or engineering. In some cases, university admission criteria are deliberately lowered to lure students into courses of agriculture, forestry and NRM fields. There may be differences from country to country and among different universities but the general trend is the same. For example, in a survey of public universities in Mozambique in 2000, 230 students sought admission to Agronomy and Forestry against 100 available positions (ratio of 2.3), 228 to computer science against 37 available positions (ratio of 6.2), medicine 277 against 90 (3.1), economics and management 486 against 75 (6.5), and law 1062 against 100 places (10.6). In Kenya, public universities in the recent past have introduced privately sponsored courses (the so-called parallel degree programmes – becoming a common trend also in many other African countries) in various fields (mainly attractive courses such as medicine, law, commerce and business management, etc.). As a result, it is becoming increasingly difficult to get students admitted to courses of "2nd or 3rd" choice if they can afford to get their 1st choices under privately sponsored programmes.

Basic science courses and those related to earth sciences (agriculture, forestry, wildlife management, botany, zoology, and geology) are not as attractive because of their limited job market. In a Makerere University report (*Musisi and Muwanga, 2001*) the number of students within various faculties in 1999 showed that the Faculty of Forestry had the lowest number of students at 157. This was in fact lower than those registered for continuing education (211), and considerably less than the 539 for Agriculture, 665 for medicine and 971 in law, although reasonably comparable to 211 doing veterinary medicine. It was possible to attract students to degree programmes in agriculture and forestry as long as public sector employment was guaranteed – not anymore! The low enrolments and popularity of agriculture, forestry and other NRM degree courses is not just one of perception and a shrinking job market but also a case of limited international and national support to tertiary education in these fields and non-empowering policies. For instance, *Temu et al. (2003)* report that out of the World Bank support of US $4.8 billion to the agriculture/forest/NRM sector between 1987 and 1997, 51.5% went to agricultural research, 46.3% to extension and only 2.3% to tertiary education. This low support for tertiary agricultural education arises in part from the rather narrow perception of education as not contributing to the production chain of the economy, or at least only passively, and hence the low priority. Even within the broad agriculture sector shifts in institutional interests is largely discordant and difficult to underpin. On the one hand there is the school of thought in favour of more technological advancement within disciplines (forestry, agronomy, horticulture, etc.) and on the other there is the school that supports an integrated approach to land use disciplines. Sources and extent of funding depends on current biases and priorities between those two extremes of the pendulum.

The recent symposium on "Building Agricultural and Natural Resources Education in Africa: Quality and Relevance of Tertiary Education" (*Temu et al., 2003*) questioned the effectiveness of the current training programmes in reversing land degradation and improving livelihoods of small-scale farmers. They strongly advocated integrated teaching of agriculture, forestry, livestock and other NRM disciplines in educational programmes, and advanced the view of producing graduates that are radically better to improve agriculture in terms of production efficiency and technology, and the need for small-scale farmers to shift from diversified, subsistence-oriented production to more specialised production with appropriate marketing systems. The symposium called for radical institutional reforms and responsiveness to socio-political and economic realities of the day. Universities and colleges are urged to abandon a 'patch-up' approach to programme changes – but rather invest seriously in strategic thinking on the roles of educational institutions in social and economic development. Building and strengthening education for agricultural and forestry entrepreneurship is strongly encouraged to overcome dwindling public sector employment. Such a change in tertiary agricultural education is to be anchored on a solid policy framework fashioning integration as opposed to sector approaches in land use related disciplines.

There are three key points to be underscored regarding needed reforms in forestry education. One, considerable synergy is building in terms of reforms of higher education in Africa. Partly because of declining national funding to colleges and universities, and partly because of external initiatives (e.g. the multi-donor Partnership for Higher Education in Africa initiative), institutions are embracing phenomenal reforms hitherto thought impossible to remain relevant and to more effectively contribute to social, economic and political development. Forestry faculties and departments should boldly take advantage of university-wide reforms. Secondly, the field of natural resource management is broad and can be used loosely to mean different things and there is need for academia to focus and sharpen the idea of integration of land use related disciplines to allow relevance and coherence in proposed programme delivery. Thirdly, evolution of these ideas cannot be left to institutions alone – heavy international funding funnelled through national institutions backed by strong and experienced think-tank teams (agriculture, forestry and other NRM disciplines) is needed to avoid overlaps or duplication of efforts. It is critical that this kind

of change is brought about through national institutions to ensure ownership and wider consensus and not just pushed by well funded international organisations.

2.6 Linkages between research and educational institutions

It is difficult to ascertain precisely the kind and extent of linkages that exist among forestry research and education institutions on a regional basis, within countries or between institutions. According to a study by *Spilsbury et al. (1999)* on capacity for forestry research in selected countries of west and central Africa, developing countries account for only 12% of total investment in forestry research worldwide. In addition, the volume of forestry research is only one tenth of agricultural research. In Sub-Saharan Africa, universities represent only 14% of the forestry-related research institutes. The study showed that of the institutions surveyed, 66% reported that they derive moderate benefits from interacting with national forestry and related institutions, while 34% perceived such interactions to be very beneficial. Beneficial aspects of interactions include: sharing of resources and facilities such as laboratories, collaborative research activities and concomitant manpower development/training, exchange of publications and information, transfer of research results, participation in conferences and seminars, and facilitation of acquisition of funding.

In order to obtain insights into the interaction of forestry research institutions, we should ask a more basic question: *what exactly is the role of national forestry or agricultural research institutes vis-à-vis universities?* A Vice-Chancellor of a Kenyan public university recently questioned the need for such research institutes and proposed that these should be merged with universities to enhance more efficient use of resources. In developed countries, most research is undertaken in universities and experimental research stations within the national forest service or department of agriculture. Arguing for or against the contribution of separate national agriculture and forestry research institutes to sustainable agriculture or forestry is likely to lead nowhere at this point in time. Perhaps what should concern us most is how increased research collaboration between universities and research institutes, and findings of such research, feed into and are utilised by relevant implementing agencies. Several pertinent issues need to be addressed in order to enhance research value among institutions in a collaborative sense. Key constraints (*Falvey, 1996*) include: a lack of coherent national research policy that often leads to disparate research ventures among scientists that contributes neither to extension nor to forest management actions. Differences in scientific strengths between staff at universities and research institutes – universities usually have more staff with postgraduate education (M.Sc. and Ph.D. degrees). There is also the issue of excessive staff turnover related to poor remuneration both in the universities and research institutes. Brain drain tends to cream off the senior and accomplished staff, jeopardising leadership and continuity.

Difference in research motivation: faculty's primary motivation for research is to produce publications in peer-reviewed journals and it matters less if the findings have immediate practical applications or if they are of a more basic nature. A sense of self-dependence and working in isolation is characteristic of most universities – because of their qualifications and an active graduate student population, university faculty find it less attractive to seek collaboration with research institutes. On the negative side, donors are less inclined to channel funds to support university research as research here is perceived to have no or limited impact on development. Research institutes on the other hand invest more in strategic and problem-oriented research.

A more fundamental problem is the lack of formal links between universities, national research institutions, extension services and farmers. The dual function of a university as a teaching and research institution has been greatly affected by decline in donor funding to the disadvantage of research. The survey data (*annex 1*) clearly established the inadequacy of national and donor funding support across various forestry institutions. In most cases, whatever little funding support is available, goes to support the teaching programme and not research. Therefore, in absence of donor projects, research in universities is greatly hampered in most Sub-Saharan African countries. In some cases, faculty is so overloaded with teaching leaving hardly any time for research.

The net effect of the situation is that forestry research and educational institutions are not able to take full advantage of available physical and manpower resources to enhance quality research and delivery of results to end users, or to build synergy in training by backing theory with field experiences. Collaborative research ventures will help to set and focus national research priorities and hence advance technological innovation in the field of agriculture and natural resource development. Unless forestry education, training and research are directly linked to reformed national forest services and the broad spectrum of stakeholders, especially small-scale farmers, they are likely to remain irrelevant to the rapidly evolving natural resource management practices. *Falvey (1996)* argues that

mechanisms to integrate universities concerned with agricultural and natural resource education and research may be facilitated by the bringing of faculty, national research institute and extension personnel together with private sector agro-industry personnel through the governing bodies of each other's institutions. National workshops can be organised to vision research agendas and partnerships between institutions. But more fundamentally, policy directions must be set and underpinned in national development plans and strategy papers.

2.7 Regional and sub-regional collaboration

Elsewhere in this paper, the problem of forestry educational institutions working in isolation has been pointed out. Indeed, forestry education in Africa was envisaged to take a regional approach, but in reality it never happened. In view of the high expectations placed on forestry professionals and the broader mandates advocated, there is now a need, more than before, to push for regional and sub-regional collaboration. Although development of national forestry institutions will remain the prerogative of every country, it is possible through review of curricula and development of specialised postgraduate programmes, as well as launching of collaborative research and staff exchange, to encourage regional integration. The Rabat expert consultative meeting (*FAO, 2001*) identified regional networking and inter-institutional exchange of knowledge and experience as one concrete way of supporting and strengthening forestry education. One such initiative is the RIFFEAC (Reseau des institutions de Formation Forestiere et Environnementale d'Afrique Centrale) network. This was created by 8 forestry schools and research institutions in October 2001 with a view of improving the quality of training to respond to the needs of sustainable management of forest ecosystems in the Congo Basin. Among other objectives, the network seeks to promote exchanges between the members, particularly in teaching and research. The facilitation of IUCN helps RIFFEAC to build strong collaboration among its members and develop synergies with other regional initiatives.

The emerging geo-political and economic blocks provide a possible basis for collaboration of training and research institutions. For instance, within the framework of the Economic Commission for West African States (ECOWAS), forestry schools in West Africa could take advantage of the economic and political cooperation to forge similar linkages as RIFFEAC. The three East African States (Kenya, Tanzania and Uganda), are once gain reviving the spirit of the collapsed East African Community and this opens up avenues for collaborative ventures in sustainable forest management including networking in forestry training and research. A regional workshop was recently (2002) held at Makerere University among the forestry faculties of the three countries to explore possible collaboration ventures with facilitation by FAO and ANAFE. The Inter-University Council for East Africa is currently developing and implementing mechanisms for student exchange among East African Universities with at least 40 students from each country receiving university education in the sister countries. Already, there are joint research projects being coordinated in the region by this body. How much forestry schools will be part of the equation will depend on how proactive forestry academics are within the universities. More than ever before, there is an urgent need for forestry education to be profiled at the regional level and for a much more active scholastic engagement and redirecting of programmes to make them relevant in a rapidly changing job market. It is critical that the forestry academia plays an active role and help to focus the debate on the direction of forestry education vis-à-vis related disciplines in natural resource management. Collaboration should seek to ensure that institutional special capacities are fully utilised to enhance complementarity and diversity, as well as quality of programme delivery, nationally and within regions.

2.8 Continuing education

Beyond the demands for more responsive formal technical and professional training in forestry, is continuing education. No amount of curriculum review will adequately cater for emerging issues and myriad of forest/land resource clientele. For example, *FAO (2003)* advocates that curricula at all levels must be updated to include such topics as the role of trees outside forests, collaborative management, gender equity, access and benefit sharing, the potential impact of certification schemes on forest practices and participatory learning. Although it would be nice to have a curriculum that addresses all these and other aspects of forestry (including "traditional core forestry" courses), in reality such a programme will be impossible to implement as it is likely to be amorphous and lead to no definable competence.

The multidisciplinary nature of land resource management requires that, in addition to core disciplines (forestry, agriculture, wildlife management, range management, etc.), graduates in these disciplines are additionally and continuously exposed to paradigm shifts in resource management systems. In past decades, inadequacies of forestry

education have been addressed through short courses addressing specific aspects. For example, in the past ICRAF held several in house training courses on various aspects of agroforestry. The International Training Centre (ITC) based in the Netherlands has mounted several short courses in aspects of social forestry, participatory forest management and natural resource management in which forest managers, extension workers, and those teaching in forestry schools have benefited. The Oxford Forestry Institutes also used to give this type of courses. Several universities in Africa offer short courses in agroforestry, social forestry, community forestry and some aspects of mainstream forestry subjects. However, in most cases, the efforts are anecdotal and highly dependent on external support. For example, in 1995-96, a GEF funded biodiversity project made it possible for university academic staff from Kenya, Uganda and Tanzania to attend intensive field course on biodiversity resources assessment techniques, including use of participatory methods.

Short courses on ethno-botany have been supported by WWF, UNESCO, KEW Royal Botanical Gardens, and CIFOR, in addition to regular publication of "People and Plants" Handbook. The Tropical Biology Association has supported young graduates to attend a field course based at Makerere University. Training workshops related to the formulation and project management have also become a common phenomenon especially among NGOs and for many donor-funded projects. Egerton University (Kenya) is well known for expertise in and short courses on Participatory Rural Appraisal (PRA), a participatory approach used in all sectors of rural development, including in the field of natural resources. All these are critical aspects of continuing education and it can be correctly argued that much of the professional awareness created in emerging issues of tree and forest resource management has been achieved through issue-specific and targeted short courses obtained from a variety of institutional setups. Despite these noble efforts and successes, there is a need to ensure that there is collaboration and coordination among the education and training institutions to deepen and sustain the efforts. A mechanism for capturing and reviewing the needs of stakeholders in this respect is essential.

One of the concluding statements from the XII World Forestry Congress in Quebec Canada made the following observations: "It noted that the forestry profession does not reflect the diversity of stakeholders involved in forests. Education needs to adapt to new elements in forestry practice, including social sciences and communication skills. But funding for forestry education is declining in many parts of the world, and training institutions often operate in isolation. Continuing education and professional accreditation are being implemented in many developed countries to maintain public confidence in the forestry profession" (*Congress Report, 2003*).

From the foregoing, and based on empirical evidence, the following pertinent issues can be raised regarding continuing education in forestry and natural resource management:

It serves as a vehicle for public engagement in forestry and natural resource management issues. The public perception is critical for successful implementation of natural resource initiatives and where these resources were historically managed on restricted narrow domains of officialdom. Despite the considerable gains made in the past two decades on natural resource devolution processes, the general pubic is, in reality, still only marginally involved in agricultural development and natural resource management policy formulation. Hence, the rather negative attitude by the public towards government officials' role in the management of these resources. In developed countries, it is common for universities to have continuing education departments that hold regular lectures to which members of the general public can register and in which respected academics are invited to expound on key issues of national importance. This aspect is severely constrained in many Sub-Saharan African countries where normal teaching programmes are themselves not fully developed.

Continuing education should serve as a means to provide refresher courses and specialised training on emerging technologies and advancement in the field of natural resource. Curriculum reviews notwithstanding, normal university degree programmes will always have a core element of theory and resource constrain will remain a limiting factor in adequate exposure to field practice. This problem can be alleviated to some extent by carefully designed short-courses (2 weeks, 1-3 months) where field practitioners can be exposed to the latest. Such courses could be designed to maximise the use of interactive learning tools where participants receive as much as possible of each others experiences. In any case, the traditional black board/chalk method of teaching and material delivery is becoming obsolete and largely ineffective. This kind of continuing education caters for emerging forestry issues that those managing forest resources should be responding to. More fundamentally, under formal training we can bi-or trifurcate programmes to create options (e.g., B.Sc. Community Forestry, Industrial Forestry, Wood Science and Technology, etc.).

International support can be channelled through collaborative arrangements between national and international institutions. In some cases, it might be advantageous if these courses are offered by a reputable body (usually well

funded, international organisations) but there is an added advantage of building national and/or regional capacities if the courses are implemented through national institutions. There has to be a deliberate move to 'house' these courses within national institutions that have that mandate, i.e. colleges and universities. The idea of, say, research institutions (national or international) taking over training functions must be discouraged although this should not mean that research scientists in these institutions cannot collaborate with colleagues within training institutions to mount short courses. In fact this would be a positive way of efficient resource utilisation and actively fostering links between teaching, research and NRM implementing institutions.

3.0 DEMAND FOR FORESTRY PROFESSIONALS

3.1 Needs of the forest sector including changing nature of tasks

The needs of the forest sector can be evaluated in two major respects. First, in terms of traditional forest management where training of forestry personnel was targeted to a narrow range of functions oriented towards timber production. Although a much broader perspective has always been implied in forestry manpower projections, in reality the overriding goal has been to provide sufficient manpower to manage national forest estates, i.e. public sector employment. For example, early projections (*FAO, 1968; Hilmi, 1971*) were derived on the basis of a regional training approach. For the period 1971-1985, Anglophone countries in west and east Africa were expected to produce 960 professional foresters (64 graduates/yr), and 4950 technical staff (330 technicians/yr). In the case of Francophone countries, professional foresters projected were 870 (58 graduates/yr) and technical staff 4620 (308/yr). The regional approach was preferred to reduce high cost of producing foresters. According to *FAO (1968)*, the cost of producing a forestry graduate in Africa (following a 3-year course) was estimated at US $ 8000-11000. *Richardson (1969)* argued that this was an underestimate and that increasing the above estimate by 50 percent would be more realistic. The costs of producing graduates in the areas of forest industries and technology – because of more elaborate and expensive facilities required - would be even higher, estimated at US $15,000-20,000. Whichever way one looks at it, these costs are considerable and it is doubtful that various forestry schools on the continent are able to invest such amounts in forestry education. From a cost standpoint, forestry training is extremely expensive and if this is not matched by a vibrant job market after graduation, it raises fundamental questions as to the sustainability of most of the programmes.

Another study on manpower requirements (*Roche and Cooper, 1980*) made projections for the period between 1980 and 2000 for seven countries (Ethiopia, Kenya, Malawi, Somalia, Sudan,

Tanzania and Zambia). The projections were made on the basis of manpower requirements for: production forestry (plantation establishment, management of plantations and natural forests), multiple use forestry, forestry for community development, research and training, and industrial wood supply (logs and other industrial wood). In all cases, the ratio of professional to technical foresters is 1:5, i.e. five technical foresters for every professional forester. In reality, far more professional foresters have been produced in the past decades in these countries. To demonstrate this, three of the countries (Sudan, Kenya and Tanzania) included in the survey, were also part of the recent survey by *Temu (2002)* (see *Table 2*). Based strictly on institutions that responded to the 2002 survey, it is very evident that the number of graduates from these institutions alone in 1993-2002 is already much higher than the Roche and Cooper projections said they would be by 2000. For example, from the three institutions listed in the Sudan as offering a B.Sc. forestry degree, and based on average number of graduates per year, at least 590 graduates were produced in 1993-2002 compared to the total projected requirement of 164 by the year 2000. The trend is the same for the other two countries used as examples in *table 2*. Note that these figures would be much higher if those graduating in the 1980s were included.

Unlike professional training, the trend in technical training, with very few exceptions, is the opposite. According to the 2002 survey (*Temu et al., 2003*), there is a sharp decline in certificate and diploma level training in Africa – in some cases, certificate level training has been wiped out altogether. For instance, at the Department of Forestry in Ibadan certificate and diploma training commenced in 1965/66 and was phased out in 1977/78. The Kenya Forestry College phased out the certificate level training in 1998 and now only sporadically admits diploma students, with high yearly fluctuations. However, a few encouraging examples include the Nyabyeya Forestry College in Uganda (which now offers a diploma course in agroforestry), Centre de Formation Pratique Forestier (CFPF) in Mali which consistently produced 25 diploma holders per year in the period between 1993 and 2002. CFPF has recently

encouraged and actively promoted admissions of female students by reserving five places for women out of the 25. The Zimbabwe Forestry College has graduated approximately 20 students per year between 1993 and 2002. The key reasons attributed to low enrolments in certificate and diploma level is declining public support (associated in part to Structural Adjustment Programmes). *Temu et al. (2003)* point out and decry this trend of diminishing numbers of forestry technicians - who are in fact the real practitioners in forestry. This situation is exacerbated by the fact that those already in service are opting for mature entry admissions into degree programmes. The net effect is that if these trends continue we shall soon have a flooded market of forestry professionals without a matching backup of technical level staff, and this is extremely worrying for forestry and natural resource management in Sub-Saharan Africa.

Table 2: Projected versus actual man-power needs for forestry professionals: the examples of Sudan, Kenya and Tanzania.

Country	Requirements 1980	Projected requirements 2000	Actual No. graduated 1993-2002
Sudan	**98**	**164**	**(>590)**
Faculty of Natural Resources, Univ. of Kordofan	-	-	187
Faculty of Forestry, Univ. of Khartoum	-	-	268
College of Natural Resources	-	-	135
Kenya	**102**	**156**	**(>226)**
Department of Forestry, Moi University	-	-	226
Tanzania	**76**	**129**	**325**
Faculty of Forestry and Nature Conservation, Sokoine Univ.	-	-	325

Note: Numbers given for 1980 and 2000 are based on estimates by *Roche and Cooper (1980)* and those for the period 1993-2002 are based on forestry institutions survey data by Temu, A. (*ICRAF/FAO, 2002*). A professional in this case refers to a university graduate who has completed a minimum of three years full-time study or its equivalent in forestry of related discipline.

The second issue that needs to be considered in evaluating forestry manpower requirements relates to new tasks for and demands on foresters. It has already been demonstrated in the foregoing sections of this chapter that forestry has undergone phenomenal changes as a profession, in terms of broadening of mandates and management approaches. It is a paradox that despite the expansion of issues and increased demands on the forestry profession, this has not been matched by increased job openings for forestry graduates – in fact, the reverse has happened. There are several possible explanations for this. First, foresters were historically trained for the public sector job market and therefore our assessment of the current situation is more in relation to this sector. Second is the perception that foresters are focussed only on forest management for timber production and are less inclined to change – hence other stakeholders become the main drivers of change rather than forestry professional themselves. Implicit in this presumption is the idea that because of rigidity to change, foresters are less qualified to occupy the "new positions". Thirdly, and perhaps more importantly, the broadening of mandates – emerging issues in forestry are yet to coalesce into a "definable professional entity" with an institutional home. The difficulty arises because new concepts in land management span various traditional disciplines (soil science, livestock husbandry, crop science, range management, wildlife management, forestry, etc.) and now also embrace the fields of sociology and anthropology, communication skills, rural development, etc. How then is the new perception of forestry underpinned?

3.2 Emerging roles of the private sector and NGOs and demand for forestry professionals

The current thrust of many (albeit often donor driven) Sub-Saharan African countries is decentralisation and/or privatisation of public sector service delivery. In terms of natural resource management, the concept of "devolution" has become mainstreamed and community based groups or entities are increasingly taking up management responsibilities and policing of natural resources. Forests are central to this devolution process. *Anyonge et al., (2001)* illustrate a multi-stakeholder (private sector, NGOs, CBOs, and conventional service providers – Forest Department and Agricultural Extension Service) participatory agroforestry extension project in Kenya that achieved considerable tree planting impact. The *Miti Mingi Mashambani* (many trees on farms) Project implemented in Nakuru and Nyandarua districts of Kenya demonstrated several key principles worth considering in forestry schools and general NRM training. Various issues affecting farm productivity were addressed in an integrated cross-sectoral manner and local capacity in terms of training (in an interactive fashion) was created. The integration aspect is crucial and must influence future reforms in forestry.

The emerging role of private and collective sector organisations has a potential to influence forestry professionals and/or forestry education and training in the following ways:

- The active role and involvement of non-public sector organisations in rural development and all aspects of NRM creates a new job market for forestry graduates and there is already evidence that this is happening. Almost all the institutions in the *Temu (2002)* study mentioned that their graduates got jobs with various NGOs. This opening can be greatly enhanced if university and forestry training colleges sought to build collaboration with local and international NGOs especially those dealing with NRM. The broadening scope of forestry coupled with curriculum reforms will open a much larger and more diversified job market for forestry professionals.
- There is synergy build when practicing forestry professionals collaborate with development NGOs. Local level training in NRM is effectively conducted using various participatory techniques. All these interactive methods offer a much needed boost to forestry and other land management professionals who may not have received adequate exposure and field skills during formal college or university training.
- Linkages between colleges and universities and private/collective sector organisations that seek to improve livelihoods of rural communities, and are involved in NRM, can be mutually beneficial. Training institutions obtain avenues for hands-on practical experience that will strengthen and enhance the quality of their programme delivery. The private sector and NGOs can access and reap benefits from an injection of intellectual capital and rigor brought into their processes and development or NRM actions by academia.

3.3 Expertise required and capacity of educational institutions to meet the needs

The urgency with which most forestry institutions are now seeking to review their educational curricula is in recognition of the inadequacy of the traditional forestry training and the need to incorporate emerging issues. Considerable discussion in this chapter has been devoted to this aspect and recap of the issues will suffice here. The broadening scope of forestry requires increased expertise in, or orientation towards:

- ability to apply knowledge in larger fields of natural resource management
- capacity for information synthesis and evaluating complex situations
- recognition that forestry goes beyond the domain of traditional timber management
- basic understanding of ecological processes and functioning of tropical forest ecosystems and of socio-economic factors influencing them
- participatory methodologies and interactive learning skills
- driving forces of agrarian and natural resource production systems
- enterprise education and communication skills
- topology of tree formations (in-and-outside forests): agroforestry, farm forestry etc
- collaborative management models and institutional analysis in NRM

- gender equity, access to and natural resource benefit sharing
- understanding the impacts of HIV/AIDS on natural resources management
- resource and land tenure regimes
- potential impact of forest certification schemes
- criteria and indicators for sustainable forest management
- impacts of globalisation, climate change, biotechnology, etc.

These aspects were not (or at least not adequately) covered in traditional forestry training curricula but expertise and competence in them are imperative for foresters of the 21st century. Although considerable progress has been made in the past two decades to incorporate some of the issues in forestry training curricula, it is evident from the analysis of forestry institutions (*annex 1* and *2)* that the capacity of the institutions is greatly lacking. This must be addressed in three ways. Faculty are normally lacking adequate exposure to these emerging issues, despite the heavy international discourse and publications from international research organisations and development agencies. The lack of adequate exposure is partly because many forestry institutions operate in isolation and have no active networks using efficient and up-to-date communication technologies as means for information exchange. This situation can be easily ameliorated through collaborative ventures and forming regional networks.

The second aspect is on curriculum reform and this is constrained by three key factors:

- the rigidity of university senates to programme changes often requiring push and persuasion to get new programmes approved,
- costs of reviewing curriculum, and,
- the policy vacuum linking education to other national institutions.

This calls for urgent policy and institutional reforms as advocated by *Temu et al. (2003)*.

Third is the weak delivery capacity – almost all institutions surveyed (*annex 1*) responded that they lacked or have extremely inadequate infra-structural capacity (lecture halls, labs, field stations, teaching equipment). Educational institutions in Sub-Saharan Africa must radically shift to adopt information and communication technologies as a way of doing business if they are to remain relevant in the 21st century. If we are to move from "*chalk and board*" teaching and delivery system to "*modern learning processes*" then much more is needed in terms of infra-structural investment. This is perhaps where institutions can diversify programmes on a regional basis to ensure investment is well targeted and serves a wider constituency. The foregoing capacity needs and weaknesses apply both to technical colleges and universities. Institutions that have benefited from consistent donor support are comparatively better off than those that rely fully on national funding support to run their programmes – in recent years direct donor funding has declined substantially (*annex 1*).

3.4 National policy framework for forestry and NRM education

Forestry education in most countries seems to be an *ad hoc* venture rather than informed by clear policies on what the country's needs are and the functional roles of trained foresters. The general guiding principles in most countries has been that university education is good for its own sake and therefore there has not been a deliberate attempt to match training with actual manpower needs in the country. Establishment of forestry schools has not always been guided by the principle of comparative advantage – programmes are started that tend to duplicate rather than complement existing ones. Perhaps a strategic planning and coordinated approach, both at national and regional levels, could create "specialised institutional niches" that best utilise available human and infra-structural capacity. For example, in the 1960s, the idea was to start forestry faculties on a regional basis and the first forestry schools were formed with this goal in mind (see further chapter 2 above).

In reality, the development of forestry schools in the regions never followed this thinking – for a variety of reasons (largely political in nature) each country decided to take their own path in developing a national professional forestry training. This was the main reason for each of the three East African countries to start its own forestry educational and training program. Notwithstanding the political influences of the time, one must look with hindsight

and question the wisdom of establishing three forestry schools in East Africa when only a single well-funded school would have been adequate.

At the national level, training needs are inter-linked with the forestry sector and with overall rural development policies. The lack of links in most countries between forestry education and the national forest service is all too obvious from available evidence presented in this report. Yet the wisdom of creating this linkage was recognised as early as in the 1970s just when many of the programmes were started (e.g. *Wyatt-Smith, 1970*) and when it was argued that training requirements for forestry should respond to:

- actual functional need for training in developing countries, rather than the organisational structure that exists to deal with problems
- premise that forestry is an applied technology – not so much a question of need for new knowledge (modifications of existing techniques to suit local conditions)
- training of all staff should be planned as an integrated exercise – i.e. skills are needed at the lower level cadre of staff just as it is (if not more) at the higher professional level.

Over twenty years later, there is a widening gap between technical and professional staff, because of large remunerative disparities between the two cadres of foresters to the detriment of the technical level. Vocational training is all together a neglected area. Deliberate national policy reforms and as well as regional and international forestry development agenda must seek to reverse these negative trends in forestry education and training.

4.0 CASE STUDIES ON FORESTRY EDUCATION

4.1 Faculty of Forestry and Nature Conservation at the Sokoine University of Agriculture, Tanzania)

4.1.1 Background

The Faculty of Forestry and Nature Conservation at Sokoine University of Agriculture, traces its history to the establishment of a Department of Forestry at Makerere University in Uganda in 1970 intended to provide professional level training in forestry for the three East African countries Uganda, Kenya and Tanzania. However, due to the political unrest in Uganda at the time, the Government of Tanzania in 1973 decided to start a Department of Forestry at the Morogoro Campus of the University of Dar es Salaam. This was made possible with funding support from the Norwegian Agency for Development Cooperation (NORAD). In 1974, the Department was elevated to a Division, giving it a mandate to develop into a full Faculty. Following an Act of Parliament establishing Sokoine University of Agriculture at Morogoro in 1984, the Division of Forestry became a fully-fledged Faculty of Forestry (*Ishengoma, 1998*) with five Departments (Forest Biology, Forest Mensuration and Management, Forest Economics, Forest Engineering and Wood Utilisation). In order to realign itself to emerging forestry issues and to broaden its mandate, the Faculty changed the name from "Faculty of Forestry" to "Faculty of Forestry and Nature Conservation" in 1998. The Faculty offers two degree courses at undergraduate level: B.Sc. Forestry and B.Sc. in Wildlife Management (introduced in 1998). At the graduate level, the Faculty offers M.Sc. (Forestry), M.Sc. (Management of Natural Resources for Sustainable Agriculture, MNRSA) and Ph.D. (by coursework plus research).

4.1.2 Historical development and current state

Since its inception, the Faculty of Forestry and Nature Conservation (FoF&NC) has experienced considerable growth in a variety of ways and it is today one of the few stable and reputable forestry schools on the continent. It is one of three main faculties making up Sokoine University of Agriculture – the other two are the Faculties of Agriculture and of Veterinary Medicine. A Faculty of Science is at forming stages. A few indicators of the growth of FoF&NC are worth mentioning here. The faculty started with a B.Sc. programme in forestry and has expanded to the current programmes mentioned above. *Table 3* shows the number of students graduating for the period 1985-2002. There was a rather steady number of graduating students from 1985 to early 1990s, averaging around 20, followed by some fluctuations in numbers (between 20 and 40) until 2002.

It is quite obvious that the ratio of male to female students is quite high with the number of female students ranging between 0 and 6. The increase in numbers in recent years is attributed to an increase in the number of students graduating from high school, and increased government support of students to obtain Bachelors degrees in various fields. By 1998, 85 students had graduated from the Faculty with a M.Sc. Forestry (including 3 females), the M.Sc. MNRSA admitted its first group of 10 students in same year, and only 11 had obtained a Ph.D. (Forestry) by then. Since its inception, the forestry programme at SUA has been reviewed twice: in 1988 and in 2000 following which the programme was changed from a term-system to current semester system. The program is currently run for three years (six-semesters) for full time students and up to 12-semesters for part time students.

Table 3. No of students graduating (B.Sc. Forestry) from the Faculty of Forestry & Nature Conservation (SUA), and the Department of Forestry (Moi University), for the period 1985-2002.

Year	Faculty of Forestry & NC (SUA)			Department of Forestry (Moi)		
	Males	Females	**Total**	Males	Females	**Total**
1985	21	1	**22**	20	0	**20**
1986	20	1	**21**	20	4	**24**
1987	14	2	**16**	35	3	**38**
1988	21	1	**22**	30	4	**34**
1989	25	0	**25**	29	8	**37**
1990	23	0	**23**	66	11	**77**
1991	20	1	**21**	35	8	**43**
1992	-	-	**-**	56	9	**65**
1993	17	3	**20**	34	4	**38**
1994	41	3	**44**	28	2	**30**
1995	33	2	**35**	30	0	**30**
1996	26	3	**29**	29	0	**29**
1997	35	6	**41**	18	3	**21**
1998	24	3	**27**	15	5	**20**
1999	17	4	**21**	22	2	**24**
2000	23	5	**28**	14	4	**18**
2001	33	6	**39**	17	4	**21**
2002	36	4	**40**	-	-	-

Data sources: Faculty of Forestry and Nature Conservation (SUA), and Department of Forestry (Moi University).
(-) means no students graduating in that year.

Much of the development of the Faculty can be attributed to NORAD support from 1973-2002. For example, in the period 1996-2000, funding support from NORAD to FoF&NC amounted to approximately US $ 2 million (which is quite substantial by any standard). Much of this funding support went into building capacity in terms of manpower training and building infrastructure. In addition to office space, laboratories and a computer unit, the faculty has three forests it manages and uses for research and student field exercises. The Olmotonyi Training Forest (840 ha) is a plantation forest leased from Forestry and Bee-keeping Division of the Ministry of Natural Resources and Tourism, renewable after every ten years. The other forest block is the Mazumbai Forest Reserve (320 ha) located in the Usambara Mts. (Lushoto, Tanga region) owned by the university (SUA), and the recently acquired Kitulangalo

Miombo Forest block (500 ha) – a miombo forest located in Morogoro region. These three forests represent three different forest types, therefore different ecological conditions and management requirements.

From a small faculty of seven academic staff (six expatriates and one Tanzanian) in 1973, the number had grown to 28 (all Tanzanians) in 1998: 21 Ph.D. and one M.Sc. on campus, and five others either on study leave or leave of absence. By any international standard for a forestry school, this is a very high concentration of Ph.D.-holders.

Based on current state of staff and infrastructure, the FoF&NC at SUA has the capacity to deliver a quality forestry education and has in fact done this consistently over the years. The reasons for this success (and possible constraints) are analysed below.

4.1.3 Factors contributing to success (or failure)

To evaluate success (or failure) of the case study forestry educational institutions, six key criteria are used in this report: (1) donor support, (2) curriculum content and development, (3) academic staff and infrastructure, (4) extent of external linkages, (5) postgraduate programme and research delivery, and (6) linkages to the national forest sector.

Donor support

The FoF&NC had substantial and consistent funding support from NORAD since it its inception in 1973 to 2002. Such commitment can only be a demonstration of confidence and positive collaboration between the donor and the Tanzanian government and, by extension, the beneficiary institution – most donor project typically run for 3-4 years cycles, renewable once or twice. The impact of this long term funding support is manifested in the number of staff trained and level of infra-structural development within the institution. Overall, the Faculty of Forestry and Nature Conservation at Sokoine University is one of the best-equipped schools of forestry in Africa, especially in terms of available expertise and facilities (*Temu, 1998*). This can also be related directly to the massive supplementary (to the NORAD input) investment by the government of Tanzania in forestry education.

Curriculum content and development

From a rather temperate forestry oriented curriculum at its inception, the Faculty has had two curriculum reviews, in 1988 and more recently in 2000 to usher in a semester system. By virtue of having several Departments within the faculty, a broad range of courses are offered (core and elective). The first year is mainly occupied with basic introductory courses, year II is more of subject content and concepts and techniques, and finally year III is devoted to management aspects, including extension skills. The progression from the basics to the applied is well brought about in the curriculum. Although the curriculum content is still largely biased towards "core forestry", there is a deliberate attempt to capture emerging issues in forestry. For example, aspects of non-timber products, entrepreneurship and feasibility studies, environmental economics, and development related courses are included. The programme is designed to provide as wide an exposure to forestry and natural resources issues as possible and yet retains a solid scientific content. Although the programme is rich in terms of overall content for a B.Sc. (Forestry) degree, it seems rather weak for producing graduates for the wood industry. This raises the perennial question whether wood science and technology is best covered within the general B.Sc. forestry course or as a separate degree program. To produce competent graduates for the wood industry, six months to one year of highly specialised postgraduate training (after a B.Sc. Forestry) would be needed. Remote sensing and GIS tools are covered in the curriculum and this must be strongly encouraged as sound management of natural resources will increasingly rely on use of these tools.

Academic staff and infrastructure

The faculty has a strong academic staff team of over 22 Ph.D.-holders, and economic possibilities of bringing in expatriate stuff on part time basis. The presence of such a number of staff on the ground reflects the immense capacity building over time (made possible by NORAD support and possibly from other collaborative ventures) and more importantly a high retention level. Stability of academic staff is a function not only of patriotic commitments by individual staff members but also a working environment that promotes professional growth. Democratic practices (election of Deans and Departmental Heads), a competitive and transparent promotion system devoid of politicisation, avenues for personal enhancement, e.g. an enabling environment to engage in consulting, are some of the factors that foster staff longevity in academic institutions even when overall pay packages might not be that high. The FoF&NC at SUA has long institutionalised these good practices and this may explain the high stability of academic staff. The faculty has a consultancy unit (FORCONSULT) that helps staff to take on large projects mainly

from the Forestry and Beekeeping Division of GoT achieving the twin benefit of improving staff incomes and attracting funds into the faculty, but also creating linkages with the larger forest sector. The faculty level consultancy services are in addition to personal initiatives of individual staff.

The faculty has very well established infrastructure (office space, classroom and laboratories) and forest field teaching blocks that enhance quality of programme delivery and student exposure to field conditions.

External linkages and impacts

The success of FoF&NC can also be attributed to a large extent to its ability to link with international organisations. Perhaps more than any other forestry school in the region, the forestry program at SUA has had considerable impact in terms of individuals who were trained or worked at institution and who now hold key and influential positions in several international organisations or forestry networks such CIFOR, ICRAF, AFORNET, etc. Many of the current faculty are actively involved in regional and international forestry processes and this has the beneficial effect of bringing about renewal and constant in-flow of new ideas into the teaching programme. Faculty at SUA has helped trained foresters and also played a critical role in the establishment and strengthening of the forestry programmes for countries in the region (Kenya, Uganda, Rwanda, Malawi, Zambia, Zimbabwe, Mozambique, Ethiopia, etc.). The availability of senior staff from SUA in international forestry related organisations (e.g. IUFRO) has greatly helped to profile forestry issues in Africa and significantly contributed to the creation of relevant forestry capacity not only in universities but also among national forestry and agricultural research institutions.

Postgraduate programme and research delivery

Although the faculty has a well developed graduate programme, this is still largely constrained by the small number of graduate students being enrolled. The two master degree programmes (M.Sc. Forestry and M.Sc. NRMSA) provide students with flexibility in terms of orientation: those inclined to forest science will opt for M.Sc. Forestry whilst those who have an interest in natural resource management would go for M.Sc. NRMSA. The challenge to the Faculty is to find ways of making these two programmes more attractive for students (by attracting research and scholarship grants). The number of academic staff available would seem to be rather excessive and unjustifiable unless this capacity can be fully utilised in increased postgraduate enrolments and research, and mounting of short professional courses. The Faculty offers excellent opportunities for continuing education beyond specialised training for resource managers, to develop a public awareness on forestry and natural resource management issues.

The level of research judging by the number of peer-reviewed publications and conference/workshop proceedings is good. For example, between 1995 and 1998, 201 scientific papers were produced (139 in refereed journals and 62 in proceedings) and if you divide by 22 staff on the ground this translate to at least 3 papers by individual staff/year. Given the resource constraints facing faculty in many universities in Sub-Saharan Africa, these are laudable achievements. It is also noteworthy how successful SUA forestry staff is in obtaining competitive research grants from programmes such as AFORNET and IFS.

Linkages to the national forestry sector

Beyond the high quality of graduates produced, the real impact of any educational program should be judged by its overall impact on national development. It is difficult in a review of this scope to ascertain the national impact of the forestry education and training program at SUA. It must be pointed out, however, that it is the main source of the country's forestry manpower contributing directly to the national forest service, local level community forest management, Tanzania National Parks, NGOs and private entities. The current Director of Forestry and Bee-Keeping Division is a professor of the FoF&NC. Through its consulting unit, the faculty takes up many national projects and contributes directly to national forest policy formulation.

But perhaps the greatest challenge to the Faculty in terms of national impact is best summed in comments raised by *Temu (1998)* during the Faculty's 25th Anniversary Jubilee:

"How best can the faculty help to build skills, impart new knowledge, shape attitudes to assist the country to position itself strategically to benefit from global trade relating to forest products and services? How can the country's vast forest resources be managed and developed to contribute more to the national economy (rather than the current 3% contribution to GDP)? What models will best capture the dependence of rural communities on forests as sources of economic livelihoods? How does forestry education/training help the country to best counteract the negative impacts of and reap from globalisation?

It is quite obvious from above that there is considerable scope for forestry development in Tanzania and the FoF&NC has tremendous potential to contribute to and greatly influence future directions in forest sector development. The Faculty can tap into its wealth of expertise, infrastructure and international linkages to be a leader in elaborating models of community forest management and pushing for a "development oriented forestry agenda". The diversity of expertise available in the faculty and stability of staff can also be a great asset in establishing and running specialised short courses to serve national and regional interests.

4.1.4 Constraints facing the institution

The biggest constraint facing the forestry school at SUA is continuing to run a robust training and research programme amidst dwindling national and donor funding resources. Infra-structural facilities developed through NORAD funding support will continually need to be maintained and some (e.g. computers) replaced fairly frequently. Research funding from whatever sources tends to be small and restricted to actual project research work and not to the purchase of expensive equipment like vehicles or major lab instruments. The capital cost of big equipment will have to be met by government funding (which is extremely limited in all SSA) and through major collaborative donor support programmes. Universities must now seek more sustainable solutions (mounting "attractive short courses"), taking up consultancy projects and linking up with industry. This will also require active linkages between forestry education, the national forestry service and the NGO sector. Collaborative arrangements with other national and international organisations must be pursued more vigorously than in the past.

FoF&NC has trained many foresters for other countries: Niger, Sierra Leone, Nigeria, Ethiopia, Sudan, Gabon, Gambia, Mozambique, Kenya, and, especially, Zambia and Malawi. In fact, the growth of the faculty in the eighties was encouraged by both government and donors because of the perceived increasing role of the faculty in enhancing forestry education in SADC countries.

4.2 Department of Forestry at Moi University, Kenya

4.2 1 Background

Forestry education at university (professional) level in Kenya started in 1977. Previously, Kenya sent its nationals for professional forestry training to other countries, mostly Europe, USA and Canada. It was argued then that the country needed only a few foresters (less than 10 graduates/year) (*Owino, 1983*), to justify setting up a forestry school. Like other countries in the region, Kenya realised the undesirability of training foresters outside Africa as it made them rather "off-beat" when they returned to practice in their own country due to the different ecological and socio-economic conditions. Within East Africa, Kenyan foresters were initially trained at Makerere University and later at the University of Dar es Salaam. Following the collapse of the East African Community in 1977, Kenya also decided to start its own forestry education and training programme. Thus, a Department of Forestry was hurriedly established within the Faculty of Agriculture at the University of Nairobi. The abruptness with which the forestry programme was introduced during the 1977/78 academic year meant that the University of Nairobi had very little time to formulate an appropriate curriculum for the degree of Bachelor of Science in Forestry. The Dar es Salaam curriculum originally designed by a team of forestry experts from Norway was adopted with only minor modifications. This curriculum came under sharp criticism in professional forestry circles as being largely irrelevant in preparing professional foresters for development tasks expected of them in the tropics.

In 1984, the Department of Forestry was transferred from the Kabete Campus of Nairobi University to form the premier Department of the newly established Moi University (second university in Kenya). A year later, in 1985, a second Department was established in what is now the Faculty of Forest Resources and Wildlife Management. At present, the faculty has four Departments offering four different degree programmes: Department of Forestry (B.Sc. Forestry), Department of Wildlife Management (B.Sc. Wildlife Management), Department of Wood Science and Technology (B.Sc. Wood Science and Technology) and Department of Fisheries (B.Sc. Fisheries).

4.2.2 Historical development and current state

One could argue that the present state of the Forestry training program at Moi University is one of missed opportunities. Initially, the Department of Forestry had immense resources at its disposal being the premier

Department of the newly established Moi University. For a period of almost five years, the entire university infrastructure supported only two academic Departments (Forestry being the dominant of the two). This however changed quickly when new Faculties were started and student enrolment rapidly increased and has been increasing since 1990 as the university expanded its programmes. When the forestry programme started, there were only a few Kenyan Faculty members and the Department relied heavily on Faculty from SUA who came to teach various courses on a part-time basis. Expertise was also sought from various other parts of Africa, especially from West Africa, and from USA and Europe. Between 1985 and 1995, a good proportion of the teaching staff was non-Kenyans either on a part time basis, sabbatical arrangements or on 2-3 year renewable contracts.

The period from 1987 to 1996 was a time of major adjustment within the Kenya tertiary education system. The government had implemented a change of the education system from 7-6-3 (7 years of primary, 6 of secondary and 3 years of tertiary education) to the present 8-4-4. This meant that two years of high school (Advanced Levels) were abolished and one year added to university education. Two things that have had far reaching implications for Kenya's tertiary education happened during this time. First, to deal with a backlog of admissions to university, the government forced all public university to admit a double-intake of students for the 1987/88 academic year. Universities were clearly ill-prepared to implement this policy direction in terms of existing capacity (especially infrastructure). The second event was managing the transition in early 1990s from the 7-6-3 to 8-4-4 system of education. All academic departments were forced to hurriedly review the curricula to usher in the new system. Meanwhile, the faculty of Forest Resources and Wildlife Management had expanded and three additional Departments were added, viz. the Departments of Tourism (which has since been shifted to a different Faculty), Fishery Resources and Wood Science and Technology. The latter was formed because of consistent criticisms that the Department of Forestry did not prepare graduates adequately for the wood industry.

In brief, the premier Department of Forestry at Moi University found itself in a very tricky position when suddenly university resources were thinly spread to many other Departments and towards capital costs of expansion. Despite being the first Faculty of the University, the Faculty of Forest Resources and Wildlife Management is yet to ground itself in terms of infra-structural development. Nevertheless, student numbers coming to forestry were quite high although with considerable fluctuations (*Table 3*). Staffing needs have also fluctuated over time. By early 1990s, many of the national staff (first graduates of the forestry program) had returned home from studies overseas and this brought in considerable boost to the Department. But this was short-lived as many of these quickly left again in search of better job opportunities outside the university. At present, the Department has 15 academic staff but only 13 on the ground - 8 Ph.D. and 5 M.Sc.-holders.

The B.Sc. Forestry curriculum has undergone two minor reviews (in the 1980s and in the early 1990s to usher in the 8-4-4 system) and a participatory review through funding from ANAFE (Sida) in late 1990s which came into effect in the 2002/2003 academic year.

4.2.3 Overall state of forestry education at Moi University

The overall state of forestry education at Moi University leaves a lot to be desired. Despite the approval of the revised curriculum by Senate, programme delivery continues to be undermined by high turn-over rates of academic staff and severely constrained by lack of infrastructure. It is the only forestry school in East Africa that lacks a faculty building block, no computer labs and has not access to a teaching forest. Although there could have been an advantage in housing the Department in the same faculty with others dealing with natural resource management (Fisheries and Wildlife Management), this has not necessarily enhanced an integrated approach to teaching – hence expected synergy effects have not been realised. However, with radical curriculum reforms, it is possible to take advantage of this kind of "faculty model" to foster integrated teaching of natural resource management courses and respond to emerging issues in this field. There is also the issue of whether it was prudent, given the forestry job market and the level and extent of the wood industry in the country, to establish a separate Department of Wood Science and Technology.

4.2.4 Factors contributing to success (or failure)

The same factors (criteria) are used to evaluate the forestry educational programme at Moi University as were used for SUA above. To put the development and current status of the forestry teaching and training programme at Moi University in context, a brief comment on the national forestry sector is warranted. For much of the 1990s and into

the 21st century, the forestry sector in Kenya has experienced very challenging times. There was a brief period of great optimism in the early 1990s following a huge bilateral agreement between the Kenya government and the government of the United Kingdom through which substantial funding support was negotiated to support management of indigenous forests - the Kenya Indigenous Forest Conservation (KIFCON) Programme. This was in addition to a World Bank funded plantation forestry project and other area-specific donor supported forestry projects. However, due to a variety of reasons, largely political, KIFCON was discontinued in 1993 as was most other donor funding support to the country. Consequently, a Kenya Forestry Master Plan (developed in 1994) could not be implemented. Forest policy reforms and legislation initiated in the early 1990s are yet to be completed. In response to tough donor conditions, the government put a freeze on public sector employment. Hence, forestry graduates have not been hired by the government since 1990 except in a few, random cases. The national forestry situation has had direct and indirect effects on forestry education, not only at the university but also at the technical level. With this brief background in mind, we can now return to the forestry education programme at Moi University.

Donor support

Donor support to the Department of Forestry at Moi University has been limited and intermittent. Some funding support was received between 1989 and 1995, through collaboration between the Department and the Oxford Forestry Institutes, funded through the British Council. Within the same period, a collaborative project between Moi University and University of Toronto (funded by IDRC) allowed several staff to receive Ph.D. and M.Sc. training in Canada. Both of these projects were limited in scope and time. They contributed a small amount of infrastructure but good support in staff training. Major support to infrastructure was probably not deemed necessary at the time as the Faculty of Forest Resources and Wildlife Management had access to all facilities (labs, classrooms and vehicles) in the University. With reduced donor support to the forest sector at the national level in 1993, this trickled down to the education and training programme at the university. Throughout its development history, therefore, the Department has not enjoyed any substantial or consistent donor support, greatly constraining development of capacity for programme delivery.

Curriculum content and development

All forestry schools in the region have started with training programmes heavily influenced by temperate region forestry. The first comprehensive review of the curriculum started in 1995 and the new programme came into effect only in 2002 (rather too along a process!). The curriculum review process was participatory involving a wide range of stakeholders (academia, government, NGOs, international forestry organisations, and the national forest sector) especially at the initial stages. This was a welcome move as it heralded a departure from traditional practice in which university staff worked in isolation to develop academic programmes. The present B.Sc. Forestry curriculum is comprehensive in scope and has very high forest science content. Although the review addressed some of the fundamental flaws of the previous curricula, the changes are rather cosmetic – it seemed that the review only achieved an increase in course load and has not really captured new themes in forestry in a substantive way. The first year of study is taken up by basic science courses (chemistry, zoology, botany, mathematics, communication skills), year II has more basic science and introductory and core forestry courses, year III still more forestry courses and year IV a few applied forestry courses and a suite of electives, all in the same fields of forestry. The same old curriculum expanded! The only real benefit from the review is that there is more emphasis on field exposure, courses geared towards natural forest management and new courses in urban forestry and non-wood forest products.

Academic staff and infrastructure

The Department has experienced a rather high turnover of teaching staff (especially at the senior level) in recent years. Between 1990 and 1997, Departmental Headship changed hands six times. More than any other factor, this very frequent change of leadership undermined the growth and development of the Department. The spill-over effect of this was that other senior academic staff also found the situation demoralising and left the Department. This situation is yet to stabilise - a critical factor in the development of forestry education in Kenya.

The state of infrastructure is clearly wanting. The Department is urgently in need of office space and operational field stations. It has been proposed that one way to attract more resources to the Department of Forestry at Moi University is to form a separate faculty of forestry. But it would be far more beneficial for the four Departments (Forestry, Wildlife Management, Fisheries, Wood Science and Technology) housed together in the same Faculty to do a radical surgery of their programmes and repackage them, taking advantage of available expertise, market conditions and need for integration.

External linkages and impacts

The Moi University-Oxford Forestry Institute and the linkage with the University of Toronto were extremely beneficial to the Department. Indeed, the existing capacity in terms of staff can be directly attributed to these collaborations. Several members of the academic staff have used contacts made during formal collaboration with Oxford and Toronto to acquire sabbatical positions and also research funds after completion of Ph.D. studies. The most visible research activities at the Department by individual staff have developed from these two initiatives. The Department was actively involved in a GEF funded biodiversity project in the early 1990s which sought to build capacity within institutions in East Africa and this project was instrumental in profiling institutional and national interest in biodiversity issues.

Overall, however, the Department has had limited formal linkages with national and international organisations apart from the two mentioned above. But individual faculty members are well networked through self-initiative. The Department has been an active member of ANAFE and has been involved in all ANAFE activities. But there is no doubt that frequent changes in leadership within the Department and a fairly high academic staff turnover have negatively affected the Department's ability to build strong linkages.

Postgraduate programme and research delivery

The M.Sc. Forestry programme at Moi University has been running for over ten years. The programme orientation encourages specialisation in four key areas: tropical biology and silviculture, forest economics and management, forest soils and hydrology and agroforestry. Like the undergraduate program, the M.Sc. programme is biased towards conventional forestry and this is understandable because the programme was developed when most staff members in the Department "were of the traditional school." The postgraduate program at the Department is currently being reviewed to make it more responsive and flexible, allow more options to students and also being expanded to Ph.D. level. But progress of the review process has been rather slow and greatly constrained by lack of funds to facilitate critical steps. Student numbers have declined considerably in the past few years. During the initial years of the programme, the Department admitted 5-10 students and this has declined to almost 1-3 with some years going without any student being admitted into the M.Sc. programme. There are three main reasons for this. The most important is declining funding support to forestry and many of the students cannot raise tuition fees let alone research funds. The factor of staff changes, especially senior staff capable of supervising students, is the second reason. The shrinking job market, resulting in students who graduate with a B.Sc. (Forestry) degree being forced into other fields, is the third. The few who come to forestry tend to move into the field of agroforestry, confirming a deliberate shift from traditional forestry.

It is critical that the Department addresses these dynamics in the review process and build strong research linkages that will enable students to access research funds if the postgraduate programme is to remain viable in coming years. This author sent a quick survey to former students of the Department (in the course of this study) to solicit their views on the programme. Although those who responded were too few to make statistically valid conclusions, their responses were quite telling. All of them wanted to pursue an advanced training course or career either in the field of natural resource management, soil science or environmental studies. As can be expected, in absence of a strong graduate programme at the Department and severe national funding cutbacks to Universities in general, research activities are greatly hampered. But limited research work is going on at faculty level, mainly linked to the projects housed within the faculty of Agriculture.

Linkages to the national forestry sector

The Department of Forestry at Moi University has been the main source of forestry manpower in Kenya for the last 25 years or so. In the recent past, many of its graduates have aggressively joined NGOs and other private organisations and have been quite visible in the fields of environment and natural resource management. To this extent, the Department has had a positive contribution to the national forestry sector. Many individual academic staff members are actively involved in consultancy projects with local and international organisations within the country. The Department has also taken up small projects, for example with the World Bank funded Lake Victoria Environmental Management Programme – contributing to watershed protection aspects.

However, the role of the University in informing national forestry policy has been wanting and represents a much bigger problem now afflicting the country's forestry sector. It is expected that forestry professionals from the university would take a more active role in refocusing the national forestry agenda. There are positive signs of reform in the forestry sector – key being a proposal to transform the national Forest Department to a quasi-government body, the Kenya Forest Service. Far reaching policy reforms must link forestry education and training to the national implementing forest agency and larger field of natural resource management. Much more remains to

be done to ensure that the forestry educational programme at Moi University takes its place in the national forestry development agenda.

4.2.5 Constraints facing the institution

From the foregoing, it is evident that the forestry education and training programme at Moi University faces many more challenges than its counter parts in the East African region. Key among these are:

Developmental

Since its inception, the programme has never achieved stability in almost all critical aspects largely because of concurrent development changes taking place in the newly established Moi University. Even at this point in time, it is not yet settled whether Forestry should develop into a full faculty like in the sister Universities of Makerere and SUA, or the current arrangement of being housed with other Departments dealing with natural resource management is the preferred option. This basic developmental issue needs to be addressed.

Declining student numbers

Although not at all unique to the Department of Forestry at Moi University, but the issue of making forestry relevant to the job market cannot be gainsaid. It includes major forestry sector reforms at the national level. There is currently a proposal to transfer management of the Kenya plantation forest estate to the private sector and to grant communities ownership and management responsibilities of some forests. The role of the national forest service would be regulatory and policy making, and to a limited extent management of natural forests and watersheds. If these reforms are implemented, the forestry job market would greatly expand and furthermore, synergy could be created between training institutions and the various forest management entities created. Private sector involvement in forestry education and training will be greatly enhanced. Curriculum would need to be reviewed to reflect such changes.

Capacity constraints to programme delivery

As already mentioned above, the Department of Forestry at Moi University has serious capacity constraints, both in terms of human capacity and physical infrastructure. Improving condition of service for university lecturers is a nationwide issue as attested by a big national strike (in late 2003) that paralysed learning in all public universities in the country. It is expected that a positive response of the government to this issue will lead to enhanced stability of academic staff within the institutions. The Department must aggressively seek donor funding and collaborative research projects to improve its facilities – laboratories, establish a computer unit, office space and field stations. The Department is currently seeking linkages with industry – for example a joint venture with Total Kenya Oil Company Ltd. to promote a nationwide afforestation programme and building capacity at the Department is in the offing. More involvement of industry and private sector in forestry education is extremely beneficial in view of declining public sector support.

5.0 AN OVERVIEW OF FORESTRY EDUCATION IN SUB-SAHARAN AFRICA

5.1 Key findings of the state of forestry education

From the review of pertinent literature on forestry education in Africa and analysis of data from a recent institutional survey, the following key findings can be summarised:

- Forestry education in Africa was introduced in the early sixties with much expectation. Over time, this early optimism that defined the profession waned and it was replaced with realism as forestry went through many phases.
- Although concerted efforts spearheaded by FAO were applied to ensure that forestry schools were founded on solid theoretical and socio-economic bases, the political dispensation of the emerging African states had immense influence on the direction of forestry education. The forestry development agenda was pushed through narrow national interests and compromised the benefits anticipated from a regional approach to training.

Consequently, many forestry schools sprang up all over the place and for the most part leading to duplication of programmes.

- The establishment of forestry education in Africa was largely tilted towards temperate and plantation forestry in view of the fact that pioneer forestry scholars on the continent were expatriate staff from the north or African nationals who obtained their education from either Europe or North America. This orientation – has led to a limited view of forestry in the tropics and led to the now much criticised "timber oriented view of forestry". This has been costly in the tropics where forestry is directly linked to a whole range of other values – not least rural livelihoods and land tenure/use systems.
- The early discourse that shaped forestry education on the continent did not carry through to the implementation of the programmes. Thus, even if there has been much talk about a shift in forest management paradigms in the past two decades and despite a big international interest in forestry issues, this is not mirrored by a corresponding debate in forestry education.
- Forestry has undergone significant conceptual changes as a profession – a shift away from a timber management orientation to multiple value forestry with involvement of more stakeholders. This has, in a way, disoriented foresters - a clearer view of "scope and mandates" for forestry is yet to emerge, especially with respect to other disciplines related to natural resource management. The philosophical underpinnings of forestry as a profession have direct implications on forestry education and training. Forestry educational institutions are grappling to review their curricula to capture a "fast paced and dynamically" evolving forestry situation. The time for forestry academia and other key stakeholders to better inform the situation could not be more urgently needed!
- Linkage between land use sciences (forestry, agronomy, livestock husbandry, wildlife management) calls for an integrated approach to teaching of NRM at tertiary institutions and this poses a great challenge as institutions were originally established and developed separately along disciplinary lines. The benefits of this approach can not, however, be overemphasised in terms of utilisation of limited capacity and funding support.
- There is considerable potential for linkages between forestry research and educational institutions but these can only be fully realised through a well elaborated national research policy. Currently, more funding from the exchequer and donor agencies is channelled to research institutions than to educational institutions because they are seen to be conducting strategic, problem-oriented research as opposed to research for "journal articles". Nowhere is this disparity in funding support more obvious than in agriculture. There is a degree of complementarity that can be built between forestry research and educational institutions.
- New initiatives in regional collaboration are being forged but more remains to be done before benefits of such collaboration become a reality. Many international organisations have promoted networking among national institutions at the regional level. These opportunities should be expanded to create linkages with the private sector and NGOs and to promote continuing education.
- There is an apparent lack of connection between forestry schools producing manpower and national forestry agencies charged with implementation of forestry programmes. Often, there is no national policy to guide forestry education vis-à-vis the national forest sector.
- In the last two decades, a worrying trend is emerging of a declining student enrolment to the forestry profession, especially at the technical level, attributed to low investments in forestry education and to the implementation of SAPs in Africa forcing retrenching of public sector employees (including forestry). There seems to be an increase in professional level education at the expense of the "really needed technical level" training. Student enrolments are still largely in favour of male students despite a major international push for gender balance in the last decade. However, this imbalance is not in any way unique to Africa.

5.2 Lessons learnt from the case studies

Arising from overall issues discussed in this report and specifically from the case studies, important lessons are:

- Expansion of forestry educational programmes without clear linkages to national manpower requirements has flooded the public sector market with forestry professionals, making forestry less competitive as a discipline.

Targeting forestry training to public sector employment only was short sighted as it has created unsustainable forestry educational programmes in most countries. In other words, the current student enrolment levels cannot justify the heavy infrastructure and running costs of programmes. This is critical in view of increasingly dismal national funding allocations to universities. Unless forestry education is repackaged to make it more competitive in terms of student enrolment and future career options, many institutions will be forced to cutback heavily or close down forestry as is already happening among technical level institutions. There is an urgent need for rethinking the original idea of a regional approach to forestry education and/or building on diversity or "specialised centres" of excellence rather than duplication of programmes.

- The temperate plantation forestry influence led to a rather narrow view of forestry in developing countries and forestry education has correspondingly developed in the same direction. Consequently, graduates in agricultural (agricultural, forestry and other fields of natural resource management) have contributed little in transforming livelihoods of small-scale landholders. Despite vast forest resources available in some countries, these countries do not reap maximum benefits from them.

- Effective and sustainable management of African forest resources for economic development and biological conservation will require "a new breed" of well trained resource managers. The challenge is to break the tight links to classical forestry thinking and encourage a flexible, more receptive attitude to new themes in forest management. But there is a caveat - the battery of "new ideas" and "fast-paced paradigm shifts" can often lead to ill-defined forest conservation and management approaches. Rethinking the paradigm must not mean more of everything and less of science! There is no substitute to a good understanding of a forest as a biological unit and training must stress this, especially given the complexity of tropical forest ecosystems.

- The expanded forestry mandates has created much confusion in terms of institutional response. Whereas the general trend is for schools to reform their curricula to embrace new themes, benchmarks for these changes are non-existent creating an oscillating endeavour in search of focus. How much forestry or agroforestry? How much science or social sciences in the curriculum? What is the name of the degree or programme? One would have expected an expanded job market for foresters in view of the many emerging issues but many African graduates are jobless. This is partly because of the shrinking originally targeted public sector employment and un-clarity regarding an institutional home for the new themes.

- Forest research and teaching at professional or at technical and vocational levels can be seriously undermined by lack of resources. In fact, the issue is not so much the content of the curriculum but the delivery process. The importance of getting the right balance between theory and practice cannot be overemphasised – which means investment not only in facilities on campus but also availability of forest field facilities to offer students adequate exposure to field conditions. Donor support to forestry education is critical - not just in terms of amounts but more in terms of long term commitment. It is not uncommon to have heavy infusion of capital into the national forest sector and yet nothing trickles down to the educational institutions. Action needs to be taken to transform traditional modes of teaching to modern ones utilising information communication technology.

- Some of the constraints just mentioned could be addressed through institutional collaboration (both national and international levels). This would provide feedback mechanisms for monitoring the performance of forestry graduates and create an interactive atmosphere between trainers and resource managers, thus ensuring that training is not too academic and theoretical and of little relevance to practical forest management. There is also a need to enhance linkages between research, education and. Through such interactions, national implementing forest agencies could tap the wealth of expertise available in training institutions and hence bring about improvements in management techniques and practices. Isolationist attitudes should be discouraged. Moreover, institutional collaboration would bring about sharing of scarce resources. The support of international organisations (through joint ventures and collaboration) is important but should not take the functions or training responsibilities of national institutions. If this happens, the objective of building capacity within national forestry education and training institutions will be compromised.

5.3 Overcoming the constraints: what needs to be done?

There are innumerable constraints to forestry education to which urgent solutions are needed. Some suggestions include doing the following things:

- Create consensus on the scope and extent of integrating forestry education into other natural resources disciplines. Africa will need to rethink and redefine the mandate of the forestry discipline and forestry professionals for the continent and develop principles to underpin and guide forestry education for the 21st century.
- Carry out a study to ascertain country manpower needs vis-à-vis training taking place within colleges and universities. Although valuable data was obtained from a recent institutional survey, little is known of the changing job market and how forestry graduates can be absorbed in a "market created by emerging themes in forestry".
- Identify and promote regional linkages that can be fully developed to utilise regional capacities and comparative advantages to create diversified programmes and "institutional niches". This will require support of international organisations to facilitate such regional linkages.
- Identify areas and fashion forestry education and/or training in NRM in order to help countries position themselves and respond strategically to benefit maximally from sustainable use of forest and tree resources, including the potentials of global markets.
- Forestry schools must not only seek to address the problem of declining student enrolments by making programmes relevant to the job market, they also have to address challenges to the delivery process and changing negative perceptions of forestry by most prospective students. The forestry profession has been biased in favour of male students arising from deep historical roots. Strong linkages with the NGOs and private sector with known markets will encourage more female students into the field.
- Make continuing education a critical supplement to tertiary agricultural education as this can open enriching interactions between forestry training institutions and the general public and natural resource managers. Many NGOs working in forest conservation can have personnel without forestry education and can benefit from short courses offered through a programme in continuing education. Another benefit of encouraging continuing education is that it will offer opportunities to capture emerging themes in forest management to field practitioners and forestall the necessity for frequent review of the teaching curriculum.
- Ensure that forestry education and training correspond to national forest sector reforms – professional leadership is needed to show how training meets national manpower requirements beyond public sector employment in what is becoming an increasingly dispersed market. More than ever before, there is need for national policy to inform forestry development and personnel who are agents of that development must be part of the equation.

6.0 CONCLUSIONS AND RECOMMENDATIONS ON FORESTRY EDUCATION

In this chapter, an attempt has been made to highlight critical issues in forestry education by analysing the overall situation, giving examples of success, identifying untapped potentials and also by pointing out where key constraints or problems are. An historical context has been given where necessary. In order not to be too repetitive this concluding section will be used to recap some of the points discussed or suggest urgent actions needed in way of recommendations.

Despite a history of over fifty years (beginning with forestry colleges established during the colonial era), we enter the 21st century with declining capacity for forestry development. Student numbers are going down, especially at more relevant level (technical and vocational) and there is a mismatch between training and national manpower requirements. Colleges and universities are finding it increasingly difficult to attract students to their programmes and despite expanded issues in forestry, it is not mirrored by an increase in employment of forestry graduates. This study has given a fairly in-depth view of the situation – the signs are not encouraging and urgent action is needed if forestry education is to remain relevant and prepare foresters or natural resource managers to ensure sustainable forest management in Africa. Among others, we propose the following actions relating to forestry education and training:

Assess the extent of forestry job markets and manpower requirements in selected countries

The study would evaluate forestry job markets vis-à-vis education and training being offered for selected countries and also taking a regional approach. The manpower projections made in the late sixties and early seventies have been overtaken by wide margins - does this mean there is adequate capacity within countries and, if so, where is the mismatch? Such an analysis would also need to provide insights into salary scales, and prestige (if any) associated with being a forester in Africa. How much better or worse off are foresters in relation to other professionals in related fields of natural resource management? What is the forestry "niche" in the dispersed job market and how should forestry training institutions link or direct their graduates to these "new jobs"? These are questions that could not be well addressed in this study because of lack of data and time but which would be extremely beneficial to address in view of the diminishing job market for foresters. Among key objectives of such an analysis would be to:

- Prepare national level human resources development plans including not only forestry but also the larger environmental sector to ensure a match between the job market and graduates.
- Revise curricula at all levels to be continuous, institutionalised and research based – and taking up emerging issues from forest management. Curricula reviews will help match training with requirements of the job market – and an improved job situation will directly attract more students into forestry. Training must no longer be on an *ad hoc* basis but be driven by national needs (public and non-public job market).
- Include courses on forest management ethics in forestry curricula, mainly to deal with question of attitudes, professional forestry practice and "release" young foresters from the dogma associated with a traditional forestry orientation.
- Popularising forestry activities through various print and broadcast media.
- Create an enabling environment where forestry and foresters potentials can be utilised to the fullest.

Provide a vision for forestry in tropical Africa and rethink past and present models

Hold an expert workshop with heavy representation of forestry academia and international support organisations to consider the results the study above, as well as models of forestry education from other parts of the world, and come out with key principles to guide:

- Extent and desired integration among natural management related disciplines within agricultural tertiary educational institutions.
- Integration of forestry education and training at all levels.
- Curriculum responsiveness to changes - scope, content and delivery processes.
- How institutional harmony in programme delivery within regions could be achieved to seeking diversification rather than duplication of programmes, given overriding national interests.
- Institutional reforms needed to develop forestry educational programmes and make them more responsive to land production and rural development needs of the 21st century.

Identify and promote regional educational networks

It is necessary to enhance the quality of teaching and sharing of experiences so that forestry schools within regions can work more closely together by encouraging student exchange and sharing of expertise among teaching staff. Such regional networking must be cost effective and involve a small number of institutions only. It must not just be "a get-together club" but a viable arrangement to promote real collaboration in concrete, definable programme areas - including identifying areas of comparative advantage within each institution. There are four potential network regions in SSA - in West Africa, Central Africa (one already started), Southern Africa and Eastern Africa. International organisations can help facilitate initial steps and forming of the linkages. Taking advantage of emerging geopolitical and economic blocks would be extremely helpful.

Strengthen linkages between research, education and development

Scattered capacities within both research and training institutions can be harnessed through a national networking approach. There is a need to put in place mechanisms of sharing resources and staff among institutions of forestry research and education by:

- Encouraging staff exchange programmes and effective collaborative research among these institutions.

- Including higher education centres as major research partners.
- Creating mechanisms of information dissemination linking training, research and development – land resource managers (including foresters) and research scientists should seek to improve rural livelihoods through adoption of technologies.

Explore and determine ways of profiling forestry education and profession at national level

Part of the reason why forestry has faced many challenges in many parts of the world is that its real contribution to national development goals and especially in enhancing rural livelihoods has not been well brought out or fully appreciated. The positive contributions of forestry must be demonstrated through:

- Highlighting its role (in concrete terms) to rural development – underpin models.
- Profiling and encouraging more exposure and recognition of forestry graduates in "dispersed job market" – this is really only possible when we, as forestry professionals, agree on which direction forestry should take in future.
- Enhancing more understanding of the multiple values of forestry to other stakeholders and the need for well trained forest resource managers through continuing education.
- Demonstrating forestry as an integral component of overall natural resource management and rural life support systems.

Demonstrate and elaborate the strong linkages between forestry education and forestry practice through national policy reforms

Perhaps the greatest problem facing most, if not all, forestry educational institutions in Africa is the apparent lack of connection between training and operations of the national forest service or forestry sector as a whole. National forest policy formulation must provide a clear linkage between demands and expectations of the forest sector and those expected to perform these tasks. It goes back to the issue of analysing current forest sector needs and manpower requirements. Forestry academia and professionals have the challenge to inform this process and enlist support of policy makers in such policy formulation.

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ANNEX 1: BASIC SURVEY INFORMATION FOR SOME FORESTRY INSTITUTIONS IN AFRICA, PERIOD 1993-2002.

Name of Institution	Year started	Training offered				Average No. of B.Sc. students graduating/yr			Institutional capacity			
		Cert/Dipl	B.Sc.	M.Sc.	Ph.D.	1993-97	1998-02	1993-02	National financial support	Teaching staff	Infra-structure	Donor funding
Faculty of Natural Resources and Env. Values, University of Kordofan (SUDAN)	1990		*	*		16	21	**19**	IDQ	IDQ	IDQ	Nil since 1990
Faculty of Forestry, Univ. of Khartoum (SUDAN)	1975		*	*	*	22	31	**27**	IDQ	IDQ	IDQ	Nil since 1985
College of Forestry and Range Science, Sudan Univ. of Science and Technology (SUDAN)	1946		*			(34)	60	**-**	IDQ	ADQ	IDQ	Nil since 1990
College of Natural Resources and Env. Values (SUDAN)	1977		*	*		11	16	**14**	IDQ	IDQ	IDQ	Limited (ANAFE)
Faculty of Forestry and Range Science, Upper Nile University (SUDAN)	1993		*				3	**-**	IDQ	IDQ	IDQ	Nil
Centre de Formation Practique Forestier (CFPF) (MALI)	1982	*				10	15	**13**	IDQ	ADQ	IDQ	Limited
Institut Polytechnique Rural (IPR) (MALI)	1965		*	*		22	29	**26**	IDQ	ADQ	IDQ	Nil
Institut du Developpement Rural (IDR) (MALI)	1973			*		_	_	**_**	IDQ	IDQ	IDQ	Limited
Ecole Nationale Des Eaux et Foret (ENEF) (BURKINA FASO)	_	*				(63)	(51)	**(57)**	IDQ	IDQ	IDQ	Limited AFRENA

UFR/SVT (sciences de la vie et de la terre) (BURKINA FASO)	1988			*	*	_	_	**_**	IDQ	IDQ	IDQ	Limited (joint res. Projects)
Dept. of Forest Resources Management, Univ. of Ibadan (NIGERIA)	1963		*	*	*	18	3	**11**	IDQ	ADQ	Fair	Limited (earlier FAO and UNDP)
University of Agriculture, Abeokuta (NIGERIA)	1989		*	*		11	29	**20**	IDQ	ADQ	IDQ	Nil
Department of Forest Science, University of Stellenbosch (SOUTH AFRICA)	1932		*	*	*	27	19	**23**	IDQ	IDQ	Fair	Limited (industry)
Kenya Forestry College, Londiani (KENYA)	_	*				(15)	(48)	**(31)**	IDQ	IDQ	IDQ	Nil (in past)
Department of Forestry, Moi University (KENYA)	1977		*	*		28	17	**23**	IDQ	IDQ	IDQ	Limited (ANAFE, in past)
Faculty of Forestry and Nature Conservation, SUA (TANZANIA)	1973		*	*	*	34	31	**33**	IDQ	IDQ	IDQ	NORAD (Ended)
Forestry Programme, University of Natal (SOUTH AFRICA)	_	*	*			_	_	**_**	ADQ	ADQ	ADQ	
Faculty of Forestry and Nature Conservation, Makerere University (UGANDA)	1970		*	*		35	37	**36**	IDQ	IDQ	IDQ	Some (NORAD)
Zimbabwe Forestry College (ZIMBABWE)	_	*				20	20	**20**	IDQ	IDQ	IDQ	Limited (ANAFE)

(Data source: Temu, A. 2003. Survey of Forestry Institutions in Sub-Saharan Covering 1993-2002 Period Study Report , ICRAF/FAO)

*: Type of educational /training programme offered

ADQ= Adequate, IDQ= Inadequate referring to capacity aspects within institutions

ANNEX 2: RESPONSIVENESS OF TRAINING INSTITUTIONS TO CHANGING FROM MANAGEMENT VALUES

Country	Institution	Responsiveness to changing forest management values					Curriculum review in past 10 years	Are aspects incorporated in curricula?
		Participatory extension aspects	Shift to multiple use forestry	Environmental values, pro-tection & sustainability	Antagonistic /repressive attitude changing	Open job market: from public to private & NGO sectors		
SUDAN	Faculty of Natural Resources and Env. Values, University of Kordofan	*	*	*		*		To limited extent
	Faculty of Forestry, Univ. of Khartoum	*	*	*		*		To limited extent
	College of Forestry and Range Science, Sudan Univ. of Science and Technology	*	*	*		*		To limited extent
	College of Natural Resources and Env. Values, Univ. of Juba	*	*	*		*		To limited extent
	Faculty of Forestry and Range Science, Upper Nile University	*	*	*		*		To limited extent
MALI	Centre de Formation Practique Forestier (CFPF)	*	*		*	*		YES
	Institut Polytechnique Rural (IPR)	*		*	*	*		YES
BURKINA FASO	Institut du Developpement Rural (IDR),	*				*		To limited extent
	Ecole Nationale des Eaux et Foret (ENEF)	*				*		To limited extent
	UFR/SVT (sciences de la vie et de la terre)	*		*		*		To limited extent

NIGERIA	Department of Forest Resources Management, Univ. of Ibadan	*	*	*	*	*	YES	YES
	University of Agriculture, Abeokuta,					*		(?)
SOUTH AFRICA	Department of Forest Science, University of Stellenbosch	*	*	*	*	*	YES	YES
	Forestry Program, University of Natal	*						To limited extent
KENYA	Kenya Forestry College, Londiani	*		*	*	*	YES	To limited extent
	Department of Forestry, Moi University	*	*		*	*	YES	YES
TANZANIA	Faculty of Forestry and Nature Conservation, Sokoine University of Agriculture	*	*		*	*	YES	YES
UGANDA	Faculty of Forestry and Nature Conservation, Makerere University, UGANDA	*	*		*	*	YES	YES, B.Sc. in Community Forestry
ZIMBABWE	Zimbabwe Forestry College	*	*	*	*	*	YES	YES –influence of CAMPFIRE model

(Data source: Temu, A. 2003. Survey of Forestry Institutions in Sub-Saharan Covering 1993-2002 Period Study Report , ICRAF/FAO)

(*): Training program incorporates the aspect

(?): Status unknown

ANNEX 3: INSTITUTIONS, PROGRAMMES OFFERED AND CURRICULA REVIEWED WITH SUPPORT OF ANAFE 1993-2002

Name of institution	Programme(s) offered	Full[1]	Partial [2]	Status 2002
1. Botswana College of Agriculture, Botswana	B.Sc. (Agriculture)	X		Operational
	Diploma (Forestry)	X		Operational
	Diploma (Horticulture)	X		Operational
2. Bunda College of Agriculture, Malawi	B.Sc. (Agriculture)	X		Operational
	M.Sc. (Social forestry and agroforestry)	X	X	New
3. Bunda College of Agriculture, Malawi (Faculty of Natural Resources and Environmental Sciences)	B.Sc. (Forestry, Horticulture and Aqua-culture &Natural Resources Management)	X		Operational
4. Malawi Forestry College, Malawi	Certificate		X	Operational
	Diploma in Forestry			Operational
5. Ogongo Agricultural college, Namibia	Certificate in Forestry	X		Operational
	Diploma in Forestry	X		Operational
6. Faculty of Agriculture and Natural Resources, Ogongo Namibia	B.Sc. Agriculture (Crops Science Option)	X		Operational
7. Lesotho Agricultural College	Certificate in agriculture	X		Operational
	Diploma in agriculture	X		Operational
8. Fort Cox College of Agriculture and Forestry, South Africa	Certificate in agriculture and forestry		X	Operational
	Diploma in agriculture and forestry		X	Operational
9. Fort Hare University	B.Sc. (Agroforestry)	X		New 2002
10. Stellenbosch University, South Africa	B.Sc. (Forestry)		X	Operational
	M.Sc. (Forestry)	X		Operational
11. Zambia Forestry College, Zambia	Certificate in Forestry	X		Operational
	Diploma in Forestry			Operational
12. School of Agricultural Sciences, University of Zambia	B.Sc. (Agriculture)		X	Operational
13. Université nationale du Benin, Bénin	DESS/INRM	X		New
	M.Sc.			New 2002

[1] The whole curriculum re-designed

[2] Agroforestry incorporated without a major review of the rest of the program

14. Sokoine University of Agriculture, Tanzania	B.Sc. (Agriculture)		X	Operational
	B.Sc. (Forestry)	X		Operational
	M.Sc. (Forestry)		X	Operational
15. Uyole Agriculture Centre, Tanzania	Diploma in Agriculture		X	Operational
16. Olmotonyi Forestry Training Institute, Tanzania	Certificate in forestry			Operational
	Diploma in forestry		X	Operational
17. Tengeru Horticultural Research & Training Institute, Tanzania	Certificate in Horticulture		X	Operational
	Diploma in Agriculture and Horticulture		X	Operational
18. Africa University, Zimbabwe	B.Sc. (Agriculture)	X		Operational
19. Zimbabwe Forestry College	Diploma in Forestry		X	Operational
20. University of Zimbabwe	B.Sc. (Agriculture)	X		Operational
21. Université de Ouagadougou, Institut du Développement Rural, Burkina Faso	Engeneur Dev. Rural, DESS/AF and INRM	X	X	Operational
22. Ecole Nationale des Eaux et Forêts, B. Faso	Certificate in Forestry		X	Operational
23. IPR Annex, Bamako, Mali	DESS IPR, Mali		X	Operational
24. Institut Polytechnique Rural de Katibougou (IPR), Mali	Ingineur Rural development	X		Operational
25. Ecole Nationale Supérieure d'Agriculture (ENSA), Senegal	Ingineur		X	Operational
26. Centre National de Formation des Eaux, Forets Chasses et Parcs Nationaux, Senegal	Certificate in Forestry		X	Operational
27. Faculté d'Agronomie, Université Abdou Moumouni de Niamey, Niger	B.Sc. (Agriculture)		X	Operational
28. Moi University, Kenya	B.Sc. (Forestry)	X		Operational
29. Kenyatta University, Kenya	M.Sc. (Agroforestry and Rural Development)	X		Operational
30. Makerere University, Uganda	B.Sc. (Forestry)		X	Operational
	M.Sc. (Agroforestry)	New		Start 2002
31. Nyabyeya Forestry College, Uganda	Certificate in Forestry	X		Operational
	Diploma in Forestry	X		Operational
	Diploma in Agroforestry			New
32. Awassa College of Agriculture, Ethiopia	B.Sc. (Agriculture)		X	Operational
33. Jimma College of Agriculture, Ethiopia	Diploma in Agriculture	X		Operational
	B.Sc. in NRM	X		New 2002
34. Wondo Genet College of Forestry, Ethiopia	Diploma in Forestry		X	Operational
	B.Sc. (Production Forestry)	X		New 2002

	B.Sc. (Farm Forestry)	X		New 2002
	M.Sc. (Forestry)		X	New 2002
35. Mekelle University College, Ethiopia	B.Sc. (Agriculture)			New
36. University of Science and Technology, Ghana	M.Sc. (Agroforestry)	X		Operational
37. University of Ghana, Legon	B.Sc. (Agriculture)		X	Operational
	M.Sc. (Agroforestry)	X		New
38. University of Ibadan, Nigeria	B.Sc. (Forestry)		X	Operational
	M.Sc. (Agroforestry)			New 2002
39. Federal University of Agricultural Technology, Akure, Nigeria	B.Sc. (Agriculture)		X	Operational
40. Faculté d'Agronomie et des Sciences Agricoles, Université de Dschang, Cameroun	B.Sc. (Forestry)	X	X	Operational
	Diploma in Agroforestry	New		under review
41. Ecole des Eaux et Forêts (EEF) Mbalmayo, Cameroon	Diploma in Agroforestry			New
42. Institut Superieure d' Agriculture et d'Elevarage, Rwanda	Diploma in Agroforestry	X		Started 2002
43. Juba University, College of Natural Resources and Environmental Studies, Sudan	M.Sc. (Agroforestry)			Started 2002