

Improving Agriculture and Natural Resources Education in Africa

A stitch in time ...



August Temu
Inonda Mwanje
Kebadire Mogotsi



World Agroforestry Centre

TRANSFORMING LIVES AND LANDSCAPES

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The African Network for Agroforestry Education (ANAFE) was established in April 1993. Its objective is to enhance multi-disciplinary approaches to land use education and to make it useful to farmers and other land users. The network has over 120 member colleges and universities in Africa.

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Foreword

Education plays a very important role in the development of any society. There is a positive relationship between the average level of education and the degree of development. For Africa, education in agriculture and natural resources management (NRM) is extremely important because it touches on the key sources of livelihood, especially for rural communities. African educators in these fields have broken the mould by engaging in the analysis and criticism of their work. This is in itself a major change of attitude, and it will help to expand their roles and contribution to Africa's development.

Three areas touched upon in this book are pertinent, and I would like to underscore them. The first is on smallholder farmers and subsistence farming. There is a need for a technological leap to transform the farmers from mere subsistence to higher levels of prosperity. For that to happen, there must be fitting policies, knowledge support and good strategies. The vision presented in this book is certainly worthy of attention. The second area is closely linked to this - that is, transformation from production-oriented agriculture to enterprise development. This introduces the element of profitability, which is so essential for development. The third area is that of initiating the youth into profitable and beneficial agriculture and NRM. The youth represent the future, and they hold the prospects of sustainability of society and development. Every effort should be made to invest in the youth.

In this book, the rich presentation of facts, figures, analyses and strategies clearly shows that Africa's educators are not only ready for change, but they are also leading it. I am proud to say that this is indeed the case, because all too often, the need for change in Africa is conceptualized and driven from outside the continent.

I congratulate our educators in agriculture and NRM, and recommend that governments and development institutions provide full moral, political and financial support to Africa's educational institutions as they implement the action plan so well laid out in this book.

Professor Paul B. Vitta
Director, UNESCO Nairobi Office



Preface

In Africa, it is commonplace to encounter policy statements that present agriculture as the backbone of economies, and natural resources as major foreign exchange earners. The reality is that outside Botswana and South Africa, lamentably few African countries live up to these statements. The main problem is that these policy statements are not matched with commensurate institutional arrangements, programmes and actions to allow agriculture and natural resources management to become the engines of social and economic development.

Among the key problems are inadequate policies or policy failures such as insecure land tenure, production disincentives, low investment in post-harvest processing and handling systems (especially value adding and marketing), too little commitment to knowledge management and unfair terms of trade (for example, weak influence on global markets). The effect is declining volume and quality of output, resulting in low prices. Weak supportive infrastructure, especially poor access to transport and communication to facilitate the inflow of inputs and the outflow of products exacerbates the situation. These factors contribute to low profitability, with farmers sometimes selling their produce at prices below production costs, thereby impoverishing them further.

In addition to these problems, natural disasters such as droughts, floods, disease or pest outbreaks, and typhoons interrupt production or destroy both crops and livestock. Social disasters such as political instability or poor governance and wars displace people from their agricultural assets, interfering with production. Under such conditions, natural resources are plundered and siphoned out of the continent.

Africa is endowed with a rich biodiversity, comprising valuable genetic resources. Yet the agricultural scene is awash with peasant farmers eking out a living from increasingly degrading and less productive agro-ecosystems. Can the smallholder subsistence farming bring prosperity to Africa? What kinds of technologies are available and suitable for these farmers? Should farming be left to just a few people who would do it more competitively on a commercial basis? Should we continue to export raw materials such as coffee beans, logs from forests, or medicinal plants, without adding any value? These are some of the key policy questions that must be resolved. Clear policy statements on these issues would also help to determine the direction of education, research and business in agriculture and natural resources management. In turn, research, education and development institutions have a role to play in linking agriculture to social and economic development.

Africa has over 200 universities, of which at least 87 teach agriculture and natural resources management. Each year, these universities produce thousands of graduates in

agriculture and natural resource sciences, many of whom do not find employment in these sectors. More devastating, they are not well prepared, nor are the existing policy and institutional arrangements suitable for them to create businesses in these sectors. Despite the highly competitive global business environment, the contents of African college and university programmes remain traditional, production oriented and largely theoretical. Key aspects such as enterprise development and marketing are recent introductions and are given very limited coverage. Consequently, our investment in tertiary education has very limited returns.

Can Africa succeed in its ambitions to use agriculture and natural resources to overcome poverty and bring about social and economic development? What can educators, researchers, policy makers and private business do to achieve better use of Africa's agricultural and natural resources? What curricular and policy changes are necessary? These and other related issues were analyzed at a symposium held at Kenyatta University in Nairobi, Kenya from 14 to 16 April 2003. The symposium organized by ANAFE brought together 127 educators, policy makers, farmers, enterprise developers, natural resource managers, researchers and development workers from 25 countries; and experts from international agencies such as ICRAF, IPGRI, FAO, UNEP, among others.

In this book, the authors share the key outcomes of the symposium. The material is clearly useful for policy makers, educators, researchers and investors in agriculture and natural resources. I strongly believe that if all stakeholders play their roles effectively, there is an opportunity for the peoples of Africa to really benefit from agriculture and the continent's rich natural resources.

Dr Dennis Garrity
Director-General
World Agroforestry Centre
Nairobi, Kenya



Acknowledgements

The ideas, experiences and actions shared in this book were generated by the 127 persons who participated at the symposium on *"Building agricultural and natural resources capacity in Africa: quality and relevance of tertiary education"*, held at Kenyatta University, Nairobi, Kenya from 14 to 16 April 2003. We thank them, their employers and the 25 countries they represented.

The symposium was sponsored and financially supported by the World Agroforestry Centre (ICRAF), the Swedish International Development Cooperation (Sida, through ANAFE), the Ford Foundation, CTA, Regional Unit for Land Management (RELMA), Kenyatta University (KU), Jomo Kenyatta University of Agriculture and Technology (JKUAT), and college and university members of the ANAFE network, which due to lack of space, cannot be listed by name. Their contributions are gratefully acknowledged.

The success of the symposium was made possible by the hard work of the organizing committee, comprising Wellington Nguya Wamicha, Daniel Mugendi, Victoria Ngumi, James Kung'u, Azene Beleke-Tesemma, August B. Temu, Justus Inonda Mwanje, and Keadire Mogotsi. Ms. Rita Mulinge and Ms. Evelyn Kang'ethe provided administrative and logistical support. The professionalism and dedication shown by all made the symposium a great success. The Organizing Committee and ANAFE Steering Committee have also guided the content of this book. While the organizations concerned with the production of this book firmly believe its subject is of great importance for tertiary agricultural education (TAE), they are not responsible for opinions expressed herein.

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Acronyms

ANAFE	African Network for Agroforestry Education
BCA	Botswana College of Agriculture
CGIAR	Consultative Group on International Agricultural Research
CTA	Technical Centre for Agricultural and Rural Cooperation
FAO	Food and Agriculture Organization of the United Nations
FF	Ford Foundation
GDP	Gross Domestic Product
ICRAF	World Agroforestry Centre
IPGRI	International Plant Genetic Resources Institute
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KU	Kenyatta University
MDG	Millenium Development Goals
NEPAD	New Partnership for Africa's Development
NRM	Natural Resources Management
READ	Research and Education for Application to Development
RELMA	Regional Unit for Land Management
SEP	Supervised Enterprise Projects
Sida	Swedish International Development Cooperation Agency
SSA	Sub-Saharan Africa
TAE	Tertiary Agricultural Education
UNESCO	United Nations Education, Scientific and Cultural Organization
WSSD	World Summit on Sustainable Development

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1

History and Achievements

Introduction

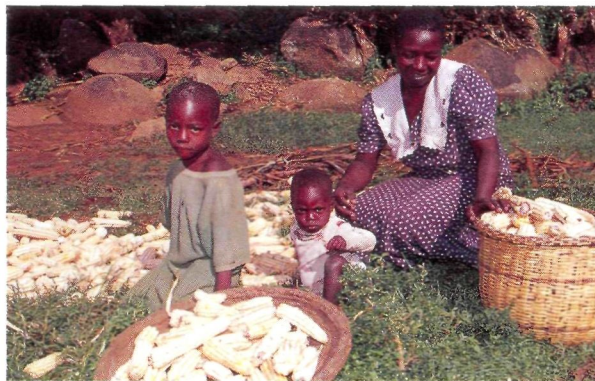
McCalla (2000) observed that the first and continuing challenge facing world agriculture and in particular Africa's, is to produce enough food to feed the growing population. With two thirds of her population living in rural areas and depending directly on agriculture and natural resources for their livelihood, Africa's strategy in the development of these sectors is crucial if social and economic development is to be achieved. To be successful, strategies for managing Africa's agricultural and natural resources must be based upon and tap into knowledge systems. This is the base upon which this book is founded.

Training of agricultural professionals in Sub-Saharan Africa (SSA) is predominantly based on curricula adopted from the countries that had colonies in Africa. These curricula were founded on an agricultural philosophy and policy that aimed at the production of cash crops for consumption by the colonizing countries. Colonial

governments placed a low priority on the needs of local communities. Very little investment was made on programmes that could have enabled self-sustenance among the governed people. As a result, few opportunities for broad-based development of the agricultural sector emerged. When it came to products from the natural resources, the materials were harvested and largely exported in raw form.

Post-independence agricultural reforms brought in some new thinking into the development of tertiary agricultural education (TAE)¹ programmes, to address local social and economic challenges. Yet the

Anthony Njenga



Maize staple dominates the smallholder system

¹ The term *Tertiary Agricultural Education (TAE)* refers to education in all aspects of agriculture, horticulture, forestry and other natural resources management sciences.



What inspiration can the youth pick from their peasant parents?

training offered at tertiary institutions has so far proved to be inadequate to meet these needs, because the broader aspects of the agricultural sector have not been adequately developed. The continent is still using educational programmes that are poorly tailored to meet the needs. This problem is partly attributed to the fact that, for decades, the curricula taught at these institutions were meant to prepare graduates for public sector service and very limited efforts have been made to equip them with entrepreneurial skills, vital for creating self-employment.

In addition, globalization and liberalization of trade and markets have created new opportunities as well as challenges that have not been adequately addressed in TAE programmes. Other global challenges include environmental degradation, global warming, high rural

g, poverty levels, severe rural to urban J. migrations, and the effects of pandemics > such as HIV/AIDS, among others. All o

f these impact on farming and natural resource management (NRM) practices. In this book, we present the key outcomes of a Symposium on **Building Agricultural and Natural Resources Education in Africa: Quality and Relevance of Tertiary Education** organized by the African Network for Agroforestry Education (ANAFE) at Kenyatta University in Kenya (on 14-16 April 2003). These include succinct problem statements, recommendations and action points. A compelling argument for an integrated land use education is presented. Investors in NRM in Africa, governments and academic institutions are challenged to take appropriate actions that will help Africa to revolutionize rural development through appropriate educational programmes in agriculture and NRM. Changes are imperative, and they must happen soon.

Technological advances in agriculture and natural resources management

Following the green revolution, there was a marked gain in agricultural productivity

with the resultant increase in food production far beyond the population needs. But this windfall in production eluded Africa, primarily because the conditions were not properly set for the continent to benefit from the green revolution. Among others, policies, institutional arrangements and capacity for knowledge management were inadequate. SSA has remained largely under subsistence agriculture. To date, products from natural forests are harvested and exported in raw form, thus denying Africa the extra income from adding value to raw materials.

Agricultural investment in rural SSA has been associated with large-scale farm production systems, especially those

established during the colonial era. Kenya, South Africa and Zimbabwe have good examples of this. The system ensured sustainable export and in some cases, the availability of surplus strategic food reserves. However, it did not provide for strong participation of indigenous population except in the provision of labour. This left the smallholder production systems faced with a myriad of technological and managerial challenges. Under these circumstances, the age-old practices of agroforestry thrived as the local people struggled to manage their small plots.

Studies in agricultural development in SSA have revealed that integrated farming systems involving crops, livestock and

trees on smallholder units of land will persist even in the 21st

Century. While such approaches have led to increased productivity in food crops, livestock products and other outputs, the problem of lack of funds to purchase vital inputs such as fertilizers has persisted. Smallholder systems are vulnerable because they are often not creditworthy. The farms tend to be subdivided into smaller units, becoming increasingly less economic (Temu *et al.*1996).

August Temu



Extremely valuable logs heading for export, unprocessed

Growth of tertiary agricultural education in Africa

UNESCO World Education Report (1993) showed that opportunities for tertiary education vary greatly in Africa. They range from enrolments of 1698 persons in Egypt to 16 persons per 100 000 in Mozambique. In the Francophone countries, the range goes from 958 in Morocco to 50 in Rwanda. In a number of countries low levels of education are accompanied by per capita annual incomes of less than US\$500. This includes much of SSA.

Over the past decade, there has been a steady increase in the number of tertiary institutions on the continent. There are over 200 universities, of which at least 87 teach agriculture and NRM. Each year, these universities produce thousands of graduates in agriculture and natural resource sciences. Unfortunately, most of the graduates from these TAE institutions fail to secure employment in their fields of specialization. The question is why is this the case and yet Africa is yearning for manpower to propel the rural development programmes? The problems lie in inadequacies of agriculture and

natural resource sector development policies and shortfalls in content and delivery of these disciplines at colleges and universities. These problems have led to questionable returns to national investment in tertiary education.

A number of development agencies have contributed to the world growth of agricultural research, extension and tertiary education. However, such support tends to be minimal with regard to enhancing TAE programmes. For instance, between 1987 and 1997, the World Bank provided US \$4819 million (Willet 1998), of which 51.50% went to agricultural research; 46.25% to extension; and the remainder, 2.25% to tertiary education. This demonstrates the low priority given to education.

Some post-independence governments tended to adopt the policies of colonial governments, especially those on land use and NRM. Such policies limited the access to, ownership and management of land and natural resources by the indigenous peoples. In addition, there were conflicts in the administration of the various instruments for implementing policies. The desire for a new policy dispensation has been overwhelming and has even led to conflicts in some countries.



In recent times, policies designed to improve agriculture, NRM and environment have found their way into the legislative and educational systems of some SSA countries. This has the potential to eliminate conflicts in mandates and management of agriculture and natural resources (Mwanje 2003).

Achievements in tertiary agricultural education programmes

Individual TAE institutions have recognized the problems and have made some efforts to implement change. Progress has been made in the following areas:

- The process of reforming agriculture and NRM policies has been initiated in many countries
- The number of institutions with educational programmes in agriculture is increasing. However, this is skewed in favour of universities rather than vocational and technical colleges.
- Education institutions are reviewing and improving on their programmes to address societal needs

- Many TAE institutions have recognized the importance of integrating agriculture with natural resource sciences in teaching programmes
- The concept of incorporating entrepreneurship in agriculture and natural resource programmes has been accepted, although implementation is highly varied
- There is a growing interest in linking and coordinating TAE programmes and institutions

The imperative for change

It is estimated that by the year 2020, the human population in SSA will more than double to 1.1 billion people (Dyson 1995; Rosegrant *et al.* 1995). It is further predicted that given the present trends, the problems of food insecurity will be exacerbated by natural resources degradation, and by 2020, Africa will need to import about 50-70 million tonnes of foodstuff - mainly cereals - per year to meet the demands of the increasing population (Dyson 1995; GCA 1996).

So despite the global scientific and technological developments in agriculture and natural resources, the

capacity of African agriculture to feed its people remains inadequate. This scenario would seem to challenge the statements often made by African governments, which project agriculture as the engine of social and economic development. It is not clear what strategies are being put in place to overcome the weaknesses of African agriculture as expounded later in this document.

Minde (2003) suggests that there is need for agricultural transformation in which small-scale farmers shift from highly diversified, subsistence-oriented production to more specialized production, with appropriate marketing systems. If this were to take place, then tertiary education would have to produce

the needed human resources to champion this transformation. Such graduates would spearhead the development of responsive policies, strategies and programmes designed to extricate Africa from donor-dependency for food, processed natural resource products and services.

The New Partnership for Africa's Development (NEPAD) is calling for a 6% annual growth in agricultural gross domestic product (GDP), despite the fact that the average rate of technical change in the world is just 2.5% per year, and even lower for Africa. For the NEPAD target to be realized, it would require enormous changes in policy (land tenure, markets, land management); capacity building and mobilization; institutional reforms (smallholder and large-scale production systems); major investments in agricultural science and technologies, and major transformation in the energy, water and transportation policies to favour agriculture.

The first Millennium Development Goal is to halve the number of poor and malnourished people by 2015. Equally important is the second goal of attaining "education for all". It has been argued that this would act as a platform for the transformation of agricultural and NRM

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Agroforestry - diversify and sustainability possibilities

programmes. Inclusion of such programmes in basic education would better prepare and equip the youth for agricultural production and entrepreneurship. In this way, they are enabled to become active participants in promoting economic, social and cultural dimensions of development.

Mrema and Woodend (1995) observed that TAE had achieved only two objectives:

- Imparting knowledge, which has enabled students to become familiar with terms, facts, classifications of subject matter, abstractions, and so on
- Enabling comprehension of subject matter, which has enabled students to interpret and present knowledge in own words and illustrations

Agricultural education programmes offered at tertiary institutions in Africa (in their present format) are yet to achieve the following four important objectives:

- Developing the capacities to apply knowledge. This would enable the students to relate knowledge and skills to specific problems and situations, extrapolating basic principles.
- Achieving capacity for analysis to recognize relations, and thus

packaging knowledge to fit specific situations

- Attaining capacity for synthesis, necessary to bring together elements of subject matter from various sources to solve a specific problem
- Attaining the capacity for evaluation to set and apply criteria to judge quality and/or content

The observations made above are as true today as they were ten years ago! It is crystal clear that educational institutions are very slow at responding to social, political and organizational changes. Ideally, TAE must enable students to identify and analyze development problems, and work out integrated solutions.

In the last few years, there has been a growing need to develop an integrated approach in agriculture and NRM programmes. This entails the understanding that "the whole is much more than the sum of the parts". In practice, it is expected that the approach will produce better graduates to handle those challenges alluded to in the preceding section. For example, in an attempt to offer an immediate solution to the problem of unemployment among agricultural graduates, the Botswana

College of Agriculture (BCA) introduced the innovative Supervised Enterprise Projects (SEP) training programme (Munthali 2003). Under this programme, graduates are equipped with entrepreneurial skills that make them better prepared for employment by the private sector or for self-employment. Emphasis is on technical and practical experience in agribusiness enterprise—covering production, business management, marketing and bookkeeping. Initial results indicate that

the first 12 graduates who undertook the programme made good profits in their choice of enterprises.

Integrated TAE is only possible and meaningful where commensurate reforms are made in broad-based policies in agriculture and NRM. By synchronizing all the initiatives discussed in this section with innovative curricula at tertiary institutions, Africa stands a better chance to address the emerging challenges in the sector.

2

Education to Development Nexus

Education in society

Education can be described as the process of preparing an individual to become a functional and acceptable member of society. Farrant (1976) regards education as the process of learning to live as a useful and an acceptable

member of the community as well as a good citizen. Two concepts are inbuilt in the definition of education, namely, creation of knowledge and experience; and growth and development, thus signifying the importance of education in human development. According to Temu (2003), unless tertiary agricultural

education (TAE) is able to respond to societal changes and expectations, society will also have difficulties understanding the roles of TAE that figure 1 illustrates.

Despite the fact that TAE programmes in Sub-Saharan Africa (SSA) are relatively young, many of them have moved quickly to specialize in several areas such as

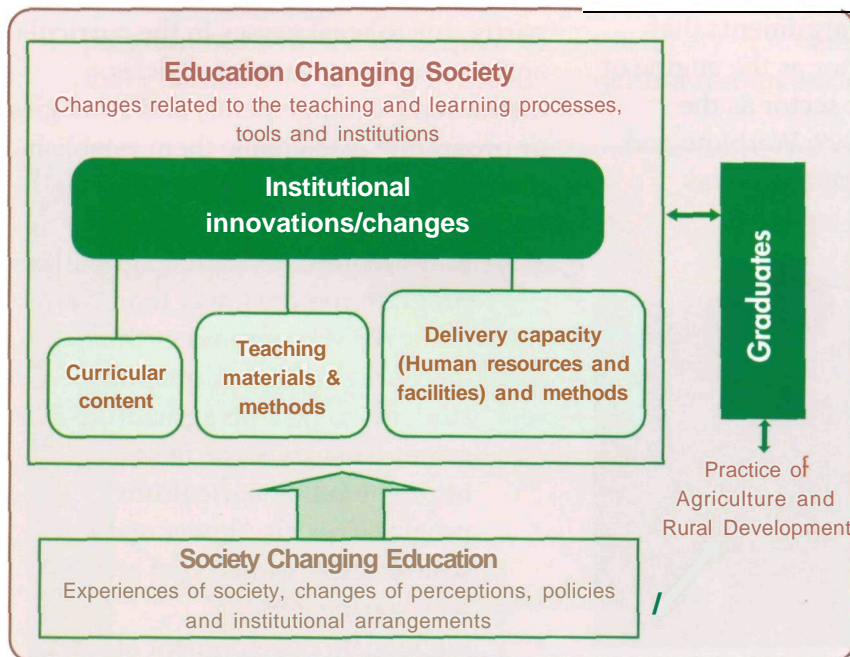


Figure 1. **Influence of society on education and vice versa** (adapted from Rudebjer 2002)

Entomology, Horticulture, Food Science, Home Economics, Beekeeping, among others. The thrust to specialize has been so strong that highly specialized professionals are being produced but are lacking in the broader aspects of integrated natural resources management (NRM).

Shortfalls in tertiary agricultural education

Contemporary agricultural sector strategies in many SSA countries follow the economic liberalization and structural adjustment arguments that ascribe the private sector as the engine of growth and the public sector as the facilitator (Maxwell 1999; Werblow and Williams 1999). This approach was

expected to bring greater gains to the sector. However, the continent continues to face food insecurity, widespread poverty, and environmental degradation, among other problems.

The majority of TAE institutions in SSA are less than 25 years old. Most of these institutions were established and are directly supported by national governments, which in turn find themselves unable to absorb the graduates into the public sector. At the same time, these graduates are poorly prepared to generate self employment partly due to weaknesses in the curricula and also to the absence of policies, institutional arrangements, and strategies or programmes to enable them establish their own farming enterprises. The key weaknesses may be summarized as:

- Entry requirements into agriculture programmes are lower than many other NRM programmes thus discouraging highly qualified students to take up agriculture as a career. This gives the false impression that agriculture programmes are "lower on the scale of professions" that attract well paying jobs.
- Inadequate development of agricultural industry and markets



Anthony Njenga

Investment in TAB should lead to self-employment



exacerbates the aforementioned weakness, as few job opportunities are generated. Fortunately, the situation is better in the case of wildlife, forestry and veterinary education programmes.

- Inadequate investment in training farmers (see figure 2). Investment in TAE emphasizes professional at the expense of technical and vocational programmes. This is not strategic and falls short of the real needs of the farming community.
- TAE institutions tend to offer specializations too early in their programmes with the consequence that graduates are lacking in broad

perspectives of NRM

- National and regional coordination of TAE institutions and programmes is weak
- Some TAE programmes are too poorly designed to facilitate interaction with farming communities

From figure 2, it is clear that the majority of persons becoming farmers are either uneducated or have (at most) primary education. Few of these ever find opportunities to undergo training at farmers' training colleges. At the same time, the absorption of college and university graduates into agriculture and natural resource scientific fields has been

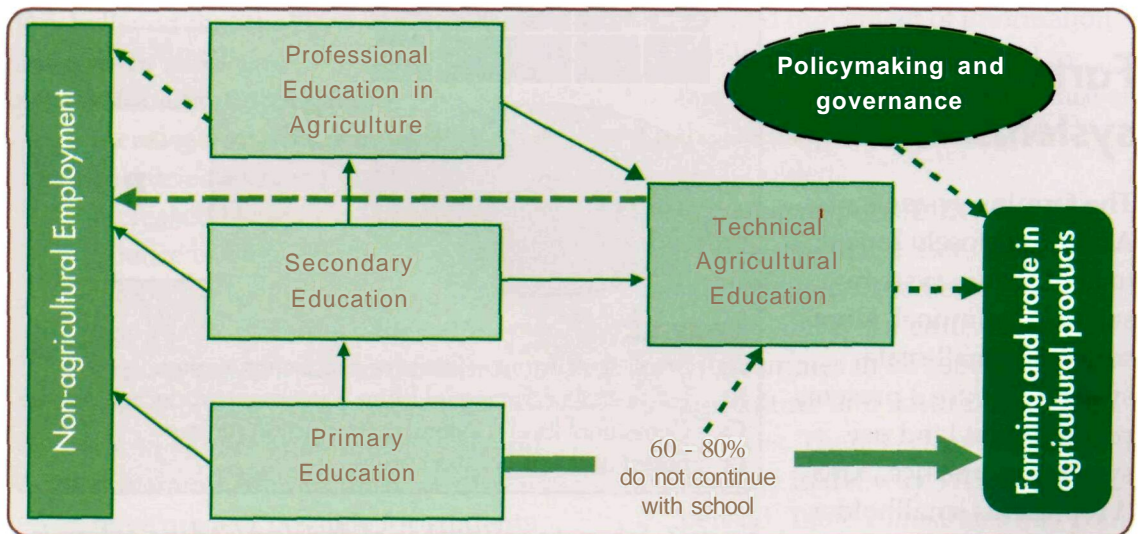


Figure 2. Flow of labour and expertise into agriculture (Temu 2003)

reduced to a trickle. Coupled with deteriorating extension services, it is obvious that under these circumstances, farming is very unlikely to bring prosperity to smallholders.

To fill the yawning gap of educational and training needs, many universities and colleges are adopting and adapting programmes that 'patch up' their teaching. Taking up such changes without investing seriously in strategic thinking on the roles of educational institutions in social and economic development is risky. It is not clear what these institutions can achieve with such an approach.

Farming systems

The farming systems in Africa are closely linked to land tenure systems such as communal, large-scale and small-scale systems. Figure 3 presents predominant land use systems in practice. Area A represents smallholder farms under intensive

management regime. Normally, the tenure would be secure and may be traditional or formal. B represents farms that are large scale and commercial. These farms would normally be intensively managed, and tenure is formal and secure. C represents communal or public lands that are extensively managed. It is in such areas where we find shifting cultivation and nomadic pastoral systems, among others. D represents forests and conservation

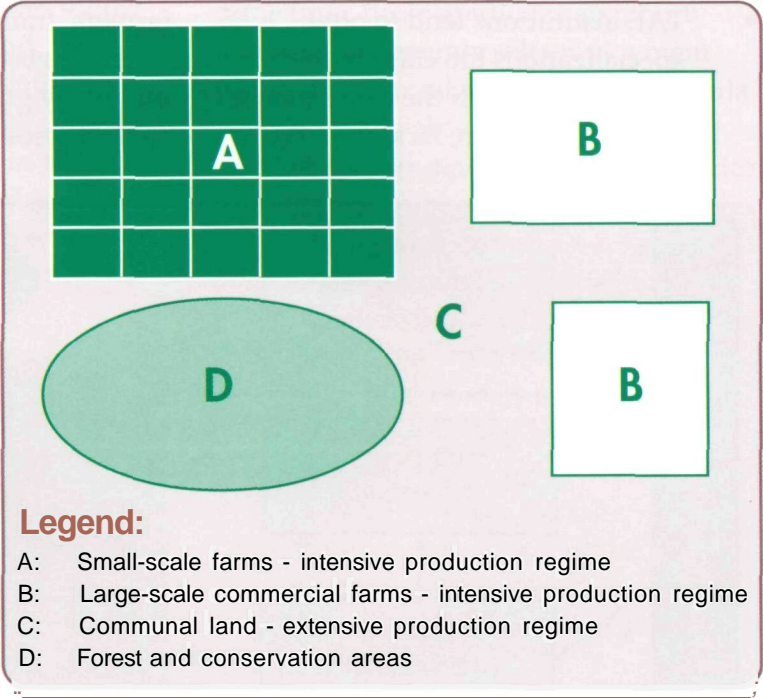


Figure 3. Schematic presentation of dominant land use systems in 55A

areas that are usually public owned. Some important considerations are:

- In area A, where farms are managed under traditional tenure systems, the land is sub-divided (using inheritance laws) into smaller and smaller units that may not be economically viable. Because of the ownership arrangement, it becomes difficult to secure credit.
- Large-scale commercial farms can secure credit and subsidies
- Market failures impact more on small-scale farmers due to lack of buffer mechanisms

Challenges

It is believed that the driving forces that shape TAE in SSA are:

- **Globalization:** characterized by increased interdependence among countries and accelerated by increased trade flows as a consequence of liberalization of markets. Globalization has raised competition for educational programmes. Private colleges and universities are emerging. At the same time, rapid advances in information and communication technologies (ICTs) have made it possible for students to register for educational pro-

grammes overseas, while remaining resident in their countries.

While TAE is not being offered in this way at the moment, some students are nevertheless able to access other programmes and thereby avoid TAE.

« **Macroeconomic reforms:** These are characterized by liberalization, decentralization and privatization. The inevitable streamlining of the civil service in SSA countries has resulted in the retrenchment of key technicians who hitherto played a major role in the dissemination of new innovations to farmers. The consequence of investing less in technical and vocational training is reduced movement of information and knowledge that is useful to farmers, resulting in maintenance of the status quo, particularly for smallholders.

- **Divided responsibility for TAE:** Within countries, there is no consolidated vision and responsibility for educational programmes in all aspects of agriculture and natural resource sciences. There is clear lack of synergy in the way TAE is dispensed. Table 1 illustrates this point.



Table 1: Typical division of responsibilities for agricultural and natural resources sciences education in Africa

Type and Level of Education	Responsible Ministry
<ul style="list-style-type: none"> • Agriculture in primary and secondary schools • Vocational and technician training in agriculture • Vocational and technician training in forestry, beekeeping • Farmer training centres • Professional education in agriculture (BSc, MSc, PhD) 	<ul style="list-style-type: none"> Basic education Agriculture Natural resources and environment Rural development Higher education

In addition, many TAE institutions suffer from several if not all the problems expounded in table 2 (modified from van Lierop *et al.* 2003).

- Dwindling national budgets: The economies of most SSA countries are in a poor state and therefore the level

of investment by the state in TAE has declined. This happened before the private sector could take the cue and invest in TAE. The result is reduced support and sometimes closure, especially of some of the technical training schools and colleges (figures 4 a & b).

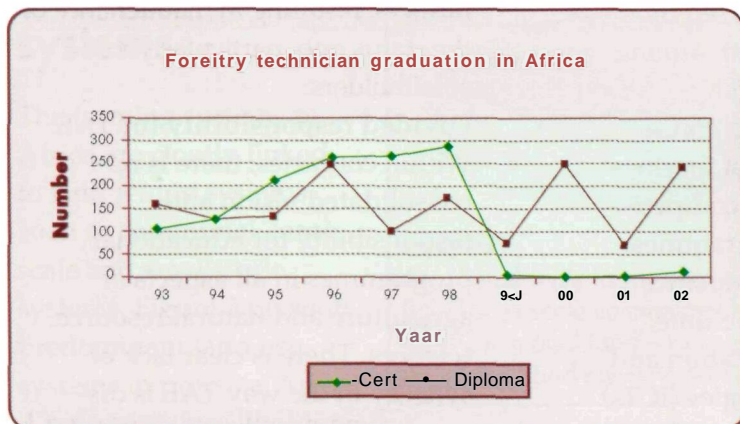


Figure 4a. Forestry certificate and diploma graduation in the period 1993-2002

In figure 4a, an analysis of 20 technical colleges in forestry shows clearly the consequences of reduced government support to technician training. From 1999, the certificate courses in forestry were almost wiped out while diploma programmes were substantially reduced. This trend clearly reversed previous gains.

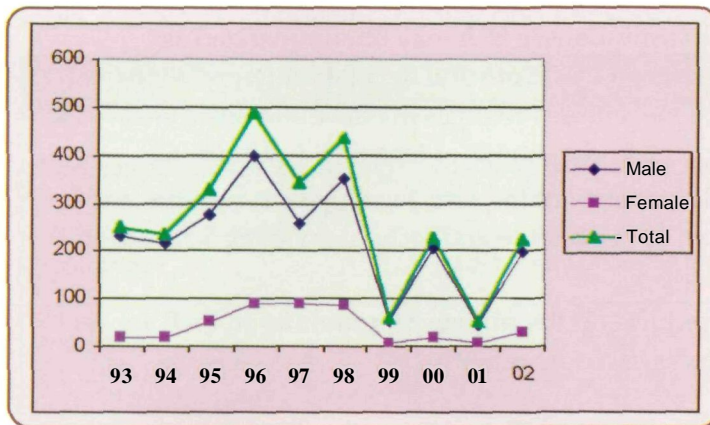


Figure 4b. Forestry certificate and diploma graduation by gender in the period 1993 - 2002

The female forestry technician graduation seemed to take an upward trend from 1994 but suffered a serious fall from 1998 and has since then not recovered. This is particularly bad news as we move towards greater participation of women in development activities. The clear conclusion from this analysis is that Africa has entered the 21st century with less technical capacity in forestry in general, and a drastically reduced female capacity, in particular. Yet we are expecting tree planting to be scaled-up. The success of such ambitions will be strongly undermined by weaknesses in training policies and low investment in technician training. A cursory examination of trends will reveal a similar picture in agriculture. So, while the number of university graduates is increasing, that of

technical college graduates is falling sharply.

The Task Force on Higher Education and Society (World Bank 2002) identified the following desirable features for higher education: good contacts and relations with research, adequate and long term funding, flexibility, well-defined standards, immunity from political manipulation, well-defined links to other

sectors, and supportive legal and regulatory structures. If TAE institutions and governments considered all these aspects, there would be significant improvements in both quality and relevance of TAE.



Working with farmers in Ethiopia

The specific challenges facing TAE institutions in SSA may be summarized as:

- *Managing relevance:* Proper interpretation of rural development goals into suitable TAE programmes. This requires changes in education objectives, strategies and curricula content, and methods of teaching and learning.
- *Training farmers:* Building the capacity of farmers, farming communities and institutions to appreciate and apply science and technology to agriculture and natural resource development
- *Managing quality:* Both the public and the private programmes in TAE are yet to develop mechanisms and tools to assure quality
- Overcoming fiscal stress:
 - Teaching and learning resources: general inadequacy of facilities (offices and laboratories); and teaching and learning materials (books, computers, and ICT support)
 - Remuneration of staff: low salaries and incentives for technical and academic staff (hence intra- and extra-country brain drain)

The statements in table 2 summarize the status of TAE from both national and institutional perspectives. The flip side of each of the problems is in fact an opportunity that can be considered in developing appropriate reforms.

In addition to the challenges cited, HIV/AIDS is also impacting on tertiary education institutions, causing loss of young as well as senior educators. Unless serious actions are taken to mitigate the impacts of HIV/AIDS, African colleges

and universities will fail to produce the future generations of scientists and development workers. Here lies the truly long-term impact of the pandemic on social and economic development. Target 7 of the Millennium Development Goals is aimed at halting and reversing the spread of the disease. This must start with tertiary education institutions where highly trained experts are directly and indirectly affected, reducing their effectiveness to run quality educational programmes.

Table 2: Factors influencing quality and relevance of TAE in SSA

Problem	External factors	Internal factors
Declining standards in teaching and learning programmes, infrastructure and staff incentives	Low level of financial support and political pressure to accept larger numbers of students into universities	Lack of creativity and a dependency syndrome - that government would cover all university expenses
Institutional isolation (scientifically and in communications)	<ul style="list-style-type: none"> • Restrictions on the mandates of institutions • Remote location of institutions, especially with respect to access to ICT infrastructure 	<ul style="list-style-type: none"> • Failure of TAE to adjust to multidisciplinary needs of a changing sector and to seek gainful alliances • Lack of initiative to secure communication capability
"In-breeding" in staff appointments	* Absence of or failure to enforce recruitment standards	Hiding behind academic freedom and autonomy
Declining employer confidence in the competence of graduates, resulting in high rates of unemployment	<ul style="list-style-type: none"> • Poor monitoring of TAE programmes • Lack of inter-sectoral linkages 	Failure of TAE to carry out market analyses for graduates; inadequate contacts with potential employers and education stakeholders
Low levels of adoption of information communication technologies (ICTs)	Inadequate funding to enhance ICTs utilization	Weak ICTs skills among TAE institutional leaders and educators
Inadequate contacts with farming communities	Unclear links between TAE and development	Short-sighted view of the objectives of TAE

Source: modified from van Lierop *et al.* 2003



Signs of Change

Improving curricular content

African educators have recognized the need for changes in the content and delivery of tertiary agricultural education (TAE), to improve effectiveness. Guided by the African Network for Agroforestry Education (ANAFE), which is hosted at the World Agroforestry Centre (ICRAF), 67 colleges and universities have reviewed their curricula to incorporate multi-disciplinary approaches to natural resources management (NRM). The network has also established re-training programmes for educators and supported the development of locally contextualized teaching materials. Similar initiatives by other networks and organizations can be observed across the continent. That these activities are generated and managed by the educators themselves is a powerful testimony of their commitment to change. However, for these initiatives to be better integrated and successful, there is need for all stakeholders to provide moral, material and financial support.



Institutions of learning can catalyse positive change in NRM

Improving the delivery of tertiary agricultural education

Information and Communication Technologies (ICTs) are radically changing the way we do business in almost every facet of human endeavour. The possibilities offered by ICTs are a real opportunity to improve the delivery of tertiary education in Sub-Saharan Africa (SSA). These technologies readily provide access to databases, libraries and information sources (for example, through web sites); resources which can improve education delivery.



However, in Africa (excluding South Africa), the total number of computer hosts permanently connected to the Internet is between 25 000 and 30 000 serving a population of about 780 million (about 13% of the global population). South Africa is rated number twenty in the world classification of Internet access with points of presence (PoPs) in about 100 cities and towns. Only 3% of the SSA population has access to a working telephone (AAU 2002).

Therefore, tertiary education in SSA can only be competitive if affirmative action will be taken to improve the ability of institutions to access and use modern ICTs, and to transform the academic systems from *"chalk and board"* teaching to *"modern learning processes"*, where access to information is the same for both the teacher and the learner, and knowledge flows in all directions. To achieve this, concerted efforts must be made to invest more in information and communication facilities. Private enterprises have a role to play, especially as access providers. The acquisition and use of ICTs would fulfill the UN Millennium Summit declaration of September 2000 to *"ensure that the benefits of technologies, especially information and communication technologies are available to all"*.

New frontiers

Enterprise education

Graduates of TAE in SSA are increasingly finding it difficult to secure employment. This problem is at least partially attributable to the fact that, for decades, the curricula taught at TAE institutions were meant to prepare graduates for public sector service so very little effort was invested in equipping them with entrepreneurial skills, which are vital for creating self-employment. This situation has recently been recognized, and through ANAFE, colleges and universities are being encouraged to

Anthony Njenga



Baraka Agricultural College in Kenya helps students and farmers to engage in value adding enterprises

review their programmes to incorporate entrepreneurial and income generating activities. Aspects such as the production of fodder, herbal medicines and a wide range of post harvest processing activities (for example, honey processing and packaging) are increasingly becoming popular. To strengthen this approach, more resources would be needed for student praxis. The ultimate goal is to produce graduates who are *job creators* rather than *job seekers*.

Focus on youth

As already explained in figure 2, the largest flow of labour into agriculture is from youth completing primary and secondary education. In Kenya for example, of the 80% of the population engaged in agricultural activities in rural areas, 44% are less than 15 years of age, while about 60% are less than 18 years old. Considering the overall situation in SSA, such young people are not particularly prepared to take up farming or business enterprises in the agricultural sectors. The capacity to provide practical basic education to eligible youth in many countries is severely limited (FAO 1997; UNESCO 1992).

Several global, regional and national institutions have recognized this

problem, and are working to strengthen the youth either at school or after leaving school with life skills relevant to agriculture and NRM. It is in this light that ICRAF, in partnership with national institutions and the Regional Unit for Land Management (RELMA-Sida), launched a new initiative dubbed *"Farmers of the Future"*, which supports contextualization of teaching and learning at basic education level in agriculture and natural resources management (Vandenbosch 2003). In addition, at the World Summit for Sustainable Development (WSSD) in 2002, FAO and UNESCO jointly launched a new partnership programme on *"Education for Rural Youth"*. These initiatives have the potential to interest the youth in taking up higher education in agriculture and NRM and thereby playing a role in development.

Understanding climate change

Sufficient evidence is now available from a variety of studies to indicate that climate changes are already impacting on agricultural productivity, positively in most countries in the North, and negatively in many tropical countries. Predictably, global precipitation characteristics are also expected to change and for many species,

precipitation and soil moisture are more important determinants of survival than temperature. For Africa, predictions for the year 2020 clearly show significant reductions in agricultural productivity (Hansen *et al.* 1981; Kellogg and Schwarz 1981; Manabe and Wetherald 1987; Schlesinger and Mitchell 1987). It is important for Africa to prepare itself for the impact of climate change. TAE institutions must work closely with advanced research institutions and universities in the North to generate different scenarios and possible mitigating effects. Such scenarios must be part of teaching and learning as well as graduate research.

Education in biotechnology

Advances in biotechnology, especially genomics are beginning to produce genetically modified crops and animals. Debates abound on the safety of these crops and animals for human consumption. Outside South Africa and Egypt, few countries in Africa have competent institutions to contribute to this discussion, much less to advise their governments on the appropriate course of action. TAE institutions should be enabled to teach these new scientific areas and undertake research which can provide policy and technical support to their countries.

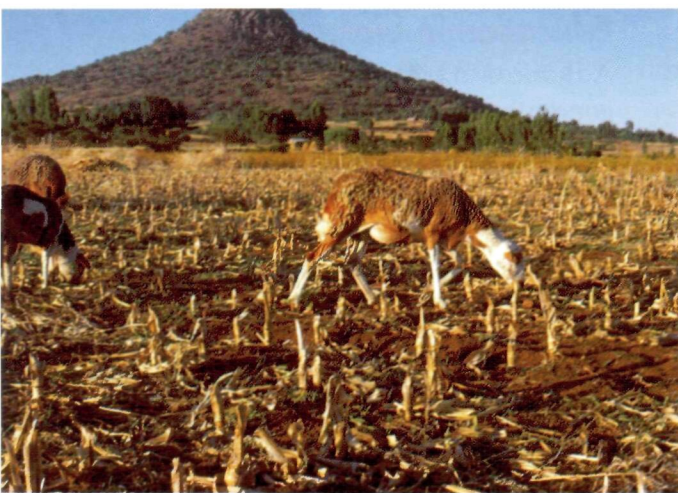


Storm water from heavy rains eat away farmland

The need for a systemic change

In SSA, agriculture has been narrowly focused on production. This has influenced the way it is taught. In this book, three major perspectives are proposed. The first addresses the importance of agriculture to social and economic development by incorporating into it, a major thrust on enterprise





After the harvest

development. The second is the recognition of **agriculture as an integral part of broader land use**, by teaching it as a part of NRM. The third is the recognition of the potential of agriculture to impact on and be influenced by **global environment and ecological changes**. These three perspectives are crucial in determining the way agriculture and NRM can contribute to sustainable development.

Given the highlights on rural development concerns raised in the foregoing discussion, TAE institutions in Africa and their partners have

recognized the need and are making efforts to lead changes in content, quality, and relevance of agriculture and NRM education. An example of such efforts is the *International Symposium on Building Agricultural and Natural Resources Capacity in Africa: quality and relevance of tertiary education*, held in Nairobi, Kenya in April 2003. The main areas of discussion were:

- Integrated land use education
- Enterprise education
- Agriculture and NRM education policies.

Participants at the Nairobi symposium agreed that fundamental changes are necessary at all levels - from policy makers to institutions, institutional arrangements, teachers and students. However, the key change is that of recognizing TAE as a driver of social and economic development in Africa. Such recognition should translate into effective policies and actions that would facilitate systematic and rapid growth of related industries and businesses. TAE institutions should take full advantage of these signs of change.



The Way Forward

Framework for the future

Despite rapid growth in the number of tertiary agricultural education (TAE) programmes in Sub-Saharan Africa (SSA), their impact on the lives of farmers and on the resilience of the farming environment is clearly limited. Land continues to be degraded, poverty persists, and food and nutritional insecurity are still present. This trend is at least partly attributable to the quality and relevance of TAE programmes to social, economic and environmental development. In particular, the importance of integrating aspects of agriculture, forestry and livestock production in educational programmes will ensure that graduates of TAE institutions are holistic in their approach to problem solving. The effects of HIV/AIDS on capacity of institutions exacerbate the problems and must be included in the change agenda.

There is a need to ensure that investments in TAE programmes do yield commensurate benefits to society. In this book, we have analyzed the

context of TAE programmes in Africa, the linkages between education and development, and the signs of change. The emerging issues presented in the preceding chapters have clearly pointed to internal as well as external factors affecting the effectiveness of TAE in SSA.

In this chapter we are proposing changes that will make TAE programmes more responsive to the needs of society. To attain the envisaged impact, institutions have to re-examine their programmes as well as methods of delivery, and learn to work in a different way. There is also a need for institutions to facilitate change in the attitudes of staff and students towards agriculture and natural resources management (NRM). The changes articulated above would not succeed without a companion change to review agriculture and NRM policies, institutions and institutional arrangements, with a focus on the role of these institutions in rural development. Strategies of collaboration within and amongst institutions and countries would add great value to achieving and sustaining the change.

The desire for change is acknowledged by educational institutions. In subsequent sections we present proposals of responsive programmes and an action plan. It will be the task of institutions, governments and stakeholders, individually and collectively, to work towards achieving the proposed changes. It is clear that for these changes to take place resources will be required. We invite stakeholder institutions, national governments and the global community to participate in realizing the envisaged goals.

Towards responsive agricultural education programmes

The symposium identified seven areas in which specific actions are to be taken as indicated by the specific resolutions below:

Integrating agriculture and NRM education

- Reviewing and enhancing high standards in teaching and learning methods that encourage suitable and integrated planning and management of agricultural and

natural resources

- Developing new and reviewing current curricula to make them responsive to local development needs, while recognizing national, regional and global implications. In particular, field practical exercises contextualized in the local society and environment will strengthen relevance. This includes proper design and management of integrated educational programmes.
- Developing *centres of excellence* in various specialized fields as a way of cutting down duplication, unproductive competition for resources and as a mechanism for Africa to catch up in certain specialized scientific areas
- Strengthening links and collaboration across disciplines, institutions and among nations by recognizing and setting common standards for existing TAE programmes, and installing mechanisms for exchanges and sharing of resources
- Creating incentives for graduates of TAE to work in rural settings
- Forming partnerships with advanced institutions and especially the CGIAR

Education for agricultural entrepreneurship

- Building entrepreneurship (self-employment) into training curricula. This involves a significant change of attitudes among educators as well as students registering for TAE programmes. The students will have to be interested in a future as farmers, natural resource managers or business persons in these areas. Entry requirements may need to be reviewed.
- Retraining educators and providing facilities to carry out effective programmes for the development of entrepreneurial skills among students
- Investing in new and up to date teaching and learning materials and techniques, specially designed to impart business skills to TAE graduates
- Supporting private sector development in agricultural enterprises through appropriate policies and land tenure arrangements, especially for TAE graduates with no collateral resources to secure loans
- Encouraging private sector

participation in tertiary agricultural education. This is very likely to produce demand driven graduates.

- Developing effective and reliable marketing systems for agricultural and natural resources products. Governments should consider establishing mechanisms to buffer market fluctuations that tend to damage small and young enterprises. This may require strengthening the management of local institutions.
- Investing in public awareness campaigns to promote the concept of "making money" from agriculture and natural resources at the local, national and regional levels
- Strengthening links between educational institutions and industries
- Formalizing the role of TAE as an engine for social and economic development, especially in rural and peri-urban settings

Improving policies and institutional arrangements

- Establishing policies that promote, rationalize and enhance integrated spatial development of agriculture and NRM by incorporating TAE institutions into local, national and

regional development plans

- Restructuring and re-orientating existing education policies and programmes administered by separate ministries to facilitate better interaction and coordination. Currently, the separation is a cause of conflicts in mandates and functions of various institutions.
- Clarifying the jurisdictional mandates of rural development agencies and government departments responsible for agricultural activities and the use of natural resources, especially land and forestry resources, and assessing and clarifying all legislation (formal and customary) relating to access to such resources
- Establishing rationalized and harmonized policies that promote bilateral and multilateral training relationships among countries of Africa, and between these countries and the rest of the world
- Increasing funding for agriculture and NRM education
- Synchronizing regional economic policies, institutions and markets to create business opportunities for young TAE graduates and entrepreneurs

- Eliminating existing legal and institutional constraints for changing curricula, missions, visions, and so on, in tertiary educational institutions
- Synergising education, with research and extension - artificial separation of the mandates of these three kinds of institutions have rendered communication among them weak and consequently reduced their effectiveness. Through appropriate mechanisms, it is possible to develop and actualize a new paradigm promoting Research and Education for Application to Development (READ).

Improving teaching and learning

- Adopting innovative and interactive methods of teaching and learning processes, especially experiential learning and practices within the local environment
- Reinforcing the use of information communication technologies (ICTs) such as Internet, teleconferencing, e-mail, computer-based learning, and satellite transmission of learning materials, among others. Support to teaching and learning would



expand the reach of programmes and improve availability of learning resources.

Preparing the youth

Recognizing the fact that most youth end up undertaking farming and natural resources management, a strategy should be devised to equip them with appropriate skills, especially in generating value-adding agricultural enterprises. There is also a need to develop and adapt training materials for primary and secondary schools, which help to contextualize learning to local agricultural and NRM conditions.

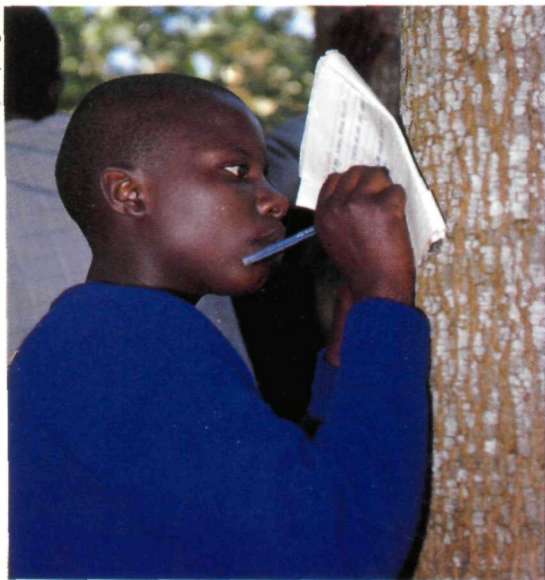
Educating women

Despite the huge roles played by women in agricultural production in Africa, it is estimated that their proportion in TAE is about 12% to 15%. This is far too low. It is proposed that through affirmative action, this proportion be raised to at least 50% by the year 2015. It is clear that to achieve this, there has to be a vigorous and focused campaign to encourage young girls to take science subjects at secondary school level.

Mitigating the effects of HIV/AIDS on capacity

HIV/AIDS and related diseases are taking a toll on the capacity of TAE institutions in two ways: First, infected staff members are not able to deliver or support educational programmes as expected, and when they die it is a huge loss of the investment in their training. Second, the institutional expenses in terms of staff time and resources devoted to support the sick are high. Fortunately, there are indications that the rates of infection are dropping, but these impacts will be there for some time. In this regard, there is a need to consider launching major efforts to revamp the capacity of TAE institutions for the coming 20 years to maintain the desired levels of teaching and learning capacity.

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How best can we prepare the youth?



Action plan

The participants at the Nairobi symposium recognized efforts made so far towards reforming tertiary education in agriculture and NRM in Africa, and encouraged all concerned to accelerate the process. The roles played by ICRAF (through ANAFE), UNER, IPGRI, RELMA, Sustainability Education and the Management of Change in the Tropics Seminars, EARTH University, FAO and UNESCO, among others,

towards the development of tertiary education in Africa were acknowledged. Considering the importance and enormity of the tasks ahead, and in view of the recommendations made on necessary actions, the participants unanimously endorsed the action plan elaborated in table 3. Stakeholders are expected to play their roles to actualize the plan. ANAFE will follow-up and report at future international symposia and other related fora.

Table 3: Schedule for proposed action plan

Recommended actions	When desired ²	Responsibility	Comments
Linking tertiary agricultural education (TAE) with rural and NRM development objectives			
1. Adjust policies at all levels to recognize agriculture and NRM as the true engines of rural development	Short term	Policy makers at the local and country levels plus investors	A fundamental change which will affect resource allocation to agriculture and NRM
2. Review the content of agriculture and NRM education to make it locally relevant	Short term	Colleges and universities teaching agriculture and NRM with participation of stakeholders	Contextualizing education in local conditions will justify public and private investment in TAE
3. Support educators to produce and use locally relevant teaching materials	Short term	Colleges and universities teaching agriculture, and NRM and investors	Absence of or weak local content makes TAE irrelevant

² Short term is 0- 5 years, medium term is 5 - 10 years and long term is beyond 10 years.

4. Incorporate enterprise development into teaching and learning programmes, particularly aspects of value adding and marketing	Short term	Colleges and universities, governments, private sector, and investors	This will help to address the issue of unemployment of graduates
5. Create policy, institutional and financial conditions favourable for graduates of TAE to engage in and develop agri-industry enterprises	Short to medium term	National policy makers and investors	This is a strategy to mobilize the enterprising capacity of graduates and spur industrial development
6. Encourage private sector participation in TAE education	Medium to long term	Governments, investors, and private sector	This is essential in order to spur demand-driven education
7. Develop institutional arrangements to link education with research and extension	Short to medium term	National governments	Coordination of actions among these institutions is essential for true impact on development
8. Institute measures to ensure that students enrolling for TAE programmes are truly interested in careers in these fields	Medium to long term	Governments, colleges, and universities	The practice of enrolling students who have no interest in agriculture or NRM wastes educational investments

Table 3 continued

Recommended actions	When desired	Responsibility	Comments
Improving the teaching and learning capacity, methods and use of technologies			
1. Introduce experiential teaching and learning methods with adequate practical content	Short term	Colleges and universities teaching agriculture and NRM, and policy makers	It is still hard for local experiences to enter college and university classrooms
2. Retrain TAE educators in effective teaching and learning methods	Short to medium term	Colleges and universities, and investors	Many existing educators were trained long ago and have limited pedagogic skills
3. Create conditions and mechanisms that encourage inter- and multi-disciplinary approaches to TAE	Short term	Colleges and universities	Integrative approaches expand the scope of graduates in developing and applying holistic solutions to problems
4. Provide E-learning support to teaching and learning	Short to medium term	Governments, investors, and private sector	Modern ICTs will provide better access to educational resources and can expand the reach of TAE
5. To maintain the desired levels of teaching and learning capacity, develop and implement strategies to mitigate the effects of HIV/AIDS and other causes of staff attrition at TAE institutions	Medium to long term	Governments and investors	There is a need to lift the restrictions imposed on staff recruitment at colleges and universities as a consequence of structural adjustment programmes

Table 3 continued

Recommended actions	When desired	Responsibility	<Comments
Addressing women and the youth			
1. Encourage young girls to take science subjects at secondary school level and subsequently to enroll in TAE programmes	Medium term	Governments, investors and parents	Women are the major contributors to agricultural production and NRM in Africa
2. Develop and implement policies and programmes that promote agriculture and NRM in primary and secondary schools	Medium to long term	Governments, investors, schools and local communities (parents)	Rural youth are largely involved in farming and agricultural enterprises. Their schools do not equip them with skills in these fields
Inter-institutional and regional collaboration			
1. Rationalize and harmonize policies that promote bilateral and multilateral training relationships among countries of Africa, and between these countries and the rest of the world	Medium to long term	Governments, regional bodies, and TAE institutions	Linking within the region globally will allow sharing of resources and exchange of information and expertise
2. Broaden and/or establish sustainable funding for agriculture and NRM education	Medium to long term	Governments and investors	There is a need to eliminate the episodic funding of TAE programmes, as it impacts heavily on economies

3. Synchronize regional economic policies, institutions and markets to create business opportunities	Medium to long term	Governments, global institutions, and investors	It has to be acknowledged that agricultural and NRM in one country have impacts on other countries
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Conclusion

The main purpose of agriculture and NRM education should be to improve the well being of society. Because of this, the old **paradigm** of seeing agriculture as a separate entity dedicated to producing food should be discarded. To achieve food production and environmental protection, there must be radical changes in TAE programmes and the **way** they are implemented, especially the integration of scientific disciplines to bridge the gap between mining of land and efficient utilization and conservation of natural resources for sustainable development.

There is a need to re-examine our socio-political paradigms on poverty reduction and economic growth, with the aim of establishing **progressive** and responsive technological innovations and advancement, good communication and

involvement of stakeholders in education, research and development. This approach should help put to productive use, graduates from TAE institutions, thereby avoiding wasteful investment in agricultural and natural resources education.

For many years, African educators and educational institutions have enjoyed the support of international organisations to build their capacity. In the majority of



Joan Baxter

Living off the land sustainably

cases, the capacity building agenda were formulated with limited participation of the recipients. This book builds on past achievements, but also heralds a new beginning in which Africa is taking the leadership for change in agriculture and NRM education.

As demonstrated in preceding chapters, this book is about **strengthening Africa's capacity to build and sustain its human and institutional capacity in agriculture and natural resources management**, and through that, increase in a significant way, the contribution of these resources to social and economic development.

African stakeholders with links to TAE have expressed their experiences and vision. They invite all Africans in the diaspora to understand the analysis, embrace the attendant recommendations and work together to achieve social and economic development through better management of agriculture and natural resources. While the proposed *action plan* provides opportunities for all sections of society to play a role, the drivers of the envisaged change are expected to be educators, educational institutions, policy makers and investors. To this end, the international community should join hands with Africa.



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