

**POST-PRIMARY AGRICULTURAL EDUCATION AND TRAINING
IN SUB-SAHARAN AFRICA:
ADAPTING SUPPLY TO CHANGING DEMAND**



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Executive summary

Post-primary agricultural education and training in sub-Saharan Africa has generally been very unresponsive to rapidly changing patterns of demand for trainees and failed to adapt and respond to new realities. This is putting serious pressure on post-primary agricultural education and training systems, especially because the change in demand profiles is much faster today than ever before. This rapid change in demand profiles is due to radical transformations in the agricultural environment combined with the fast alteration of rural and urban labour markets. As a result, post-primary agricultural education and training in sub-Saharan Africa finds currently itself very much in an “adapt-or-perish” situation.

African agriculture is indeed going through significant changes and it is clear that this has major implications for post-primary agricultural education and training. The extent of scientific advances in the fields of biotechnology and information and communications technology (ICT) allows shorter assimilation periods. In a global economy, food processing, storage and marketing are aspects of the production process that have become increasingly important to agricultural producers, and thus to agricultural education. The increasing concern with environmental protection and the preservation of natural resources makes topics such as crop protection and integrated pest management, rational use of fertilizers, and soil and water conservation more pressing.

Labour markets are also evolving rapidly. The public sector used to absorb the large majority of graduates of post-primary agricultural education in sub-Saharan Africa. This is no longer the case. Educational reform has not kept pace with new and emerging requirements of rural young people and has not been linked to overall sectoral and macro-economic agenda or with local agricultural needs. Post-primary agricultural education and training has not been re-oriented towards entrepreneurship and the private sector. As a result, it is increasingly difficult for many graduates to find employment.

In addition to its unresponsiveness to changing patterns of demand, post-primary agricultural education and training is facing numerous other key challenges. Curricula and teaching, training and learning methods and materials are very often outdated and not adequate. Many agricultural education and training institutions are not linked to each other even though it is obvious that their activities and overall goals are closely interrelated and interdependent and that the activities of each necessarily affect those of others.

Addressing these numerous challenges will make post-primary agricultural education and training more relevant and effective. And fortunately, there is indeed considerable hope as interesting and promising new models of post-primary agricultural education and training are emerging in different countries in sub-Saharan Africa. These include

programmes in which substantial parts of the practical agricultural education or training are delivered in real work environments, e.g. through combining school-based learning with apprenticeship training.

Based on this study, the following conclusions and recommendations are made :

1. A reorientation of post-primary agricultural education and training will contribute to increased rural productivity and economic growth.
2. Closer links to labour markets and greater attention to learners' needs will make post-primary agricultural education and training much more relevant and effective.
3. More diversified funding mechanisms will ensure quality and sustainable post-primary agricultural education and training.
4. Enhanced support to educators and trainers will make post-primary agricultural education and training more resourceful.
5. Improved school-community linkages will transform post-primary agricultural education and training institutions into multi-functional agricultural learning centres.
6. Action-research and more effective monitoring and evaluation will allow a better understanding of post-primary agricultural education and training in sub-Saharan Africa.

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Acronyms and abbreviations

AAPP	Africa Agriculture Productivity Programme
ADLI	Agricultural Development-Led Industrialization (Ethiopia)
AET	Agricultural Education and Training
ATVET	Agricultural Technical and Vocational Education (Ethiopia)
BEAT	Certificate in Tropical Agriculture (<i>Brevet d'Études en Agronomie Tropical</i> , Benin)
BTVET	Business, Technical, Vocational Education and Training (Uganda)
CeRPA	Regional Centre for Agricultural Promotion (<i>Centre Regional de Promotion Agricole</i> , Benin)
CETA	College of Technical Agricultural Education (<i>Collège d'Enseignement Technique Agricole</i> , Benin)
CIEA	International Centre for Agricultural Education
CM2	Sixth Grade of Primary School (<i>Cours Moyen niveau 2</i> , Benin)
COL	Commonwealth of Learning
CPR	Centre for Rural Promotion (<i>Centre de Promotion Rurale</i> , Benin, Burkina Faso)
CPFR	Centre for the Promotion of Rural Women (<i>Centre de Promotion de la Femme Rural</i> , Benin)
CPFRO	Centre for the Promotion of Rural Women of Ouémé (<i>Centre de Promotion de la Femme Rural de l'Ouémé</i> , Benin)
CSA	Central Statistical Authority (Ethiopia)
DA	Development Agent (Ethiopia)
DAETVET	Department of Agricultural Extension and Technical and Vocational Education and Training (Ethiopia)
DEAT	Diploma in Tropical Agriculture (<i>Diplôme d'Études en Agronomie Tropical</i> , Benin)
DfID	Department for International Development (UK)
EAV	Agricultural and Veterinary School (<i>École Agricole et Vétérinaire</i> , Rwanda)
EDI	Education for All Development Index
EP2	Primary Education – 2nd cycle (<i>Escola Primária do 2o grau</i> , Mozambique)
ESG	General Secondary Education (<i>Escola Secundária Geral</i> , Mozambique)
ESR	Education for Self-Reliance (Tanzania)

FAO	Food and Agriculture Organization of the United Nations
FET	Further Education and Training (South Africa)
FFS	Farmer Field Schools
FLS	Farmer Life School
FoF	Farmers of the Future
FTC	Farmer Training Centre (Ethiopia, Kenya)
GDP	Gross Domestic Product
GMO	Genetically Modified Organism
GPA	Grade Point Average (Ethiopia)
GTZ	German Technical Cooperation Agency (<i>Deutsche Gesellschaft für Technische Zusammenarbeit</i>)
ICRAF	World Agroforestry Centre (formerly: International Centre for Research in Agroforestry)
ICT	Information and Communication Technology
IPM	Integrated Pest Management
ISST	In-Service Training Trust (Zambia)
JLT	Junior-Level Training (Ethiopia)
KCSE	Kenya Certificate of Secondary Education
KIE	Kenya Institute of Education
LAMS	Agricultural College Medji of Sékou (<i>Lycée Agricole Medji de Sékou</i> , Benin)
MADER	Ministry of Agriculture and Rural Development (<i>Ministério de Agricultura e Desenvolvimento Rural</i> , Mozambique – not existing anymore)
MAEP	Ministry of Agriculture, Livestock and Fishing (<i>Ministère de l'Agriculture, de l'Élevage et de la Pêche</i> , Benin)
MEC	Ministry of Education and Culture (<i>Ministério de Educação e Cultura</i> , Mozambique)
METFP	Ministry of Technical Education and Vocational Training (<i>Ministère de l'Enseignement Technique et de la Formation Professionnelle</i> , Benin)
MINAG	Ministry of Agriculture (<i>Ministério de Agricultura</i> , Mozambique)
MINEDUC	Ministry of Education, Science and Technology (Rwanda)
MLT	Mid-Level Training (Ethiopia)
MOARD	Ministry of Agriculture and Rural Development (Ethiopia)
NCDC	National Curriculum Development Centre (Uganda, Rwanda)

NCE	National Commission of Education (Botswana)
NEPAD	New Partnership for Africa's Development
NETP	New Education and Training Policy (Ethiopia)
NGO	Non-Governmental Organization
ODI	Overseas Development Institute (UK)
PA	Peasants Association (Ethiopia)
PASDEP	Plan for Accelerated Sustainable Development to End Poverty (Ethiopia)
PSA	Primary School Agriculture
SEIA	Secondary Education in Africa
SMICT	Science, Mathematics and ICT
SRC	Science Resource Centre (Ghana)
SSA	Sub-Saharan Africa
SVT	Life and Earth Sciences (<i>Sciences de la Vie et de la Terre</i> , Burkina Faso)
ToR	Terms of Reference
TVE	Technical and Vocational Education
TVET	Technical and Vocational Education and Training
UCE	Uganda Certificate of Education
UNDP	United Nations Development Programme
UNEB	Uganda National Examinations Board
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEVOC	International Centre for Technical and Vocational Education and Training
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WFP	World Food Programme of the United Nations

1 Introduction

Current and emerging trends such as globalization and trade liberalization, rapid advancement of technologies, population growth and urbanization have a significant impact on agriculture in sub-Saharan Africa. In this rapidly changing agricultural environment, post-primary¹ agricultural² education and training³ in sub-Saharan Africa is being asked to play a crucial role because it is supposed to provide skilled and competent people for socio-economic development in rural areas. Labour markets are also evolving rapidly. This study looks at the changes and adaptations that post-primary agricultural education and training institutions need to make to face new challenges and to become more responsive to the needs of a demand-driven and market-driven agricultural sector.

Too little is currently known about the type, amount and content of education and training for agricultural and rural livelihoods development that should be provided at the post-primary education level in sub-Saharan Africa. The current study aims to contribute to a better understanding of these issues by suggesting answers to key questions such as: What are the extent and characteristics of local demand for post-primary level educational content in agricultural and rural livelihoods development? What are the extent and characteristics of the present supply of such education or training, and how is their provision organized institutionally? To what degree are post-primary agricultural education and training programmes relevant to the main existing problems in the agricultural and rural sector in sub-Saharan Africa? How do students, parents, communities, teachers, agricultural extension workers, agricultural researchers, university instructors, and rural policymakers evaluate the relevance and effectiveness of post-primary agricultural education and training as currently provided? What noteworthy innovations have been introduced into post-primary agricultural education and training with regard to student preparation for contribution to agricultural and rural development? And finally, what action seems indicated by an analysis of the above responses?

¹ In this study, **post-primary** education and training refers to various forms of education and training available to primary education graduates, including vocational education, technical training, and general secondary education.

² In this study, **agricultural** refers to the broad agricultural sector, including livestock, fisheries and forestry.

³ The main focus of the current study is on formal **education and training**, whether provided by the Ministry of Education or another ministry (e.g. Labour, Agriculture). We realize however that there are many other (non-formal and informal) providers of post-primary agricultural education and training which play very important roles, including private providers, employers, NGOs and traditional knowledge transfer systems and an attempt has been made to include some references to these.

2 Demand profiles of post-primary agricultural education and training in sub-Saharan Africa

2.1 African labour market context and developments

Overview

Most people in sub-Saharan Africa are employed in agriculture, mostly in non-wage subsistence agriculture. Reaching the agricultural and rural development sectors with skills development is therefore very important to poverty reduction.

A principal challenge for African economies over the next decade is to find productive employment for the 7 to 10 million annual new entrants to the labour force – a consequence of historical rapid population growth and a swelling of the labour force by today's school-leavers. Currently, as many as 500,000 young people enter the labor force each year in Kenya, and as many as 700,000 in Tanzania and 250,000 in Zimbabwe.

While real wages have fallen in many countries, wage employment in the modern sector has been largely stagnant, except in isolated cases. Most entrants to the labour market have no alternative but to seek work in the informal economy. Employment in the informal sector has risen sharply since the 1970s.

The informal sector today absorbs most of those unable to find wage employment. No reliable data are available, but Figure 1 offers a rough estimate of the main segments of Sub-Saharan Africa labor markets (excluding South Africa and Mauritius). Most people are employed in **agriculture**, mostly in non-wage subsistence agriculture. Except for South Africa and Nigeria, agriculture occupies two-thirds to three-quarters of the labour force. About one-third of the labor force is situated in urban areas, of which about 60 percent are self-employed in the informal sector, 20 percent are in wage employment in the formal sector, and another 20 percent are unemployed. Employment in the agricultural sector dominates African labour markets. Reaching the informal sector with skills development will be increasingly important to poverty reduction. (Johanson and Adams, 2004)

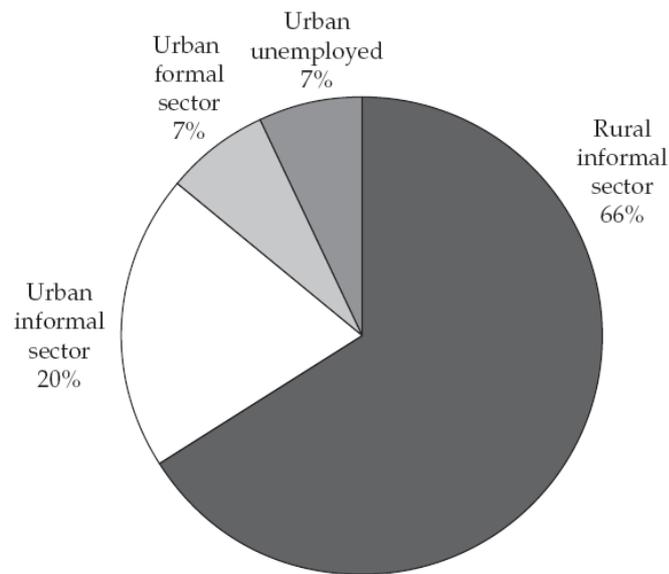


Figure 1: Sub-Saharan Africa: Estimated proportions of formal and informal sector employment (Johanson and Adams, 2004)

2.2 New demand profiles emerging from a changing agricultural environment in sub-Saharan Africa

Overview

Agriculture is playing a critical role in the overall development of most African economies. African agriculture is currently going through significant changes and it is clear that this has major implications for post-primary agricultural education and training. The extent of scientific advances in the fields of biotechnology and information and communications technology allows shorter assimilation periods. In a global economy, food processing, storage and marketing are aspects of the production process that have become increasingly important to agricultural producers, and thus to agricultural education. The increasing concern with environmental protection and the preservation of natural resources makes topics such as crop protection and integrated pest management, rational use of fertilizers, and soil and water conservation more pressing.

2.2.1 Importance of agriculture in sub-Saharan Africa and current challenges

Agriculture, providing 60 percent of all employment, constitutes the backbone of most African economies; in most countries, it is still the largest contributor to GDP; the

biggest source of foreign exchange, still accounting for about 40 percent of the continent's hard currency earnings; and the main generator of savings and tax revenues. The agricultural sector is also still the dominant provider of industrial raw materials with about two-thirds of manufacturing value-added in most African countries being based on agricultural raw materials. Agriculture thus remains crucial for economic growth in most African countries.

The rural areas, where agriculture is the mainstay of all people, support some 70-80 percent of the total population, including 70 percent of the continent's extreme poor and undernourished. Improvement in agricultural performance has potential to increase rural incomes and purchasing power for large numbers of people. Thus, more than any other sector, agriculture can uplift people on a mass scale. With greater prosperity, the consequent higher effective demand for African industrial and other goods would induce dynamics that would be a significant source of economic growth. (NEPAD, 2002)

Agriculture has, therefore, traditionally played a critical role in the overall development of most African economies. During the early stages of economic growth, the agricultural and rural populations of Africa comprise a substantial component of the markets for the products of domestic industries, including the markets for producer and consumer goods. As economic growth and incomes rise over time, agriculture is expected to transfer surplus capital and labour to the non-agricultural sectors through a proportionate decline in the agricultural sector's contribution to national output and total employment and a proportionate increase in the non-agricultural sector's (industry and manufacturing) contribution to national output. The agricultural sector is also expected to contribute to the balance of trade either by augmenting the country's export earnings and/or by expanding the production of agricultural inputs. (Abalu, 2001)

Achievement of a productive and profitable agricultural sector requires Africa to address a complex set of challenges, including the following (NEPAD, 2003):

- Low internal effective demand due to poverty
- Poor and un-remunerative external markets (with declining and unstable world commodity prices and severe competition from the subsidised farm products of industrial countries)
- Vagaries of climate and consequent risk that deters investment
- Limited access to technology and **low human capacity** to adopt new skills
- Low levels of past investments in rural infrastructure (such as roads, markets, storage, rural electrification, etc.) essential for reducing transaction costs in farming and thereby increasing its competitiveness in serving production, processing and trade
- Poor governance and institutional weaknesses for service provision to the entire agricultural chain from farm to market.

2.2.2 Current and emerging trends in agriculture in sub-Saharan Africa and implications for post-primary agricultural education and training

In most parts of Africa food security is still a critical issue and therefore food production will continue to be a major focus of agricultural education and training institutions for some time to come. But African agriculture has gone through considerable changes since colonial times and a number of changes are still unfolding. In this section, we list what changes have taken place so far in African agriculture as well as emerging trends and developments that affect African agriculture and agricultural education and training.

On-going and emerging trends which are having and will continue to have important implications for agriculture and agricultural education and training in Africa include the following (FAO, 1997; Maguire, 2000; Abalu, 2001; NEPAD, 2003):

- Shift in focus from agriculture to rural development
- Rapid population growth rates and urbanization
- HIV/AIDS
- Environmental degradation, unsustainable water use, unpredictable weather and climate change
- Increases in incomes and wealth
- Globalization, trade liberalization, and market deregulation
- Scientific progress including developments in biotechnologies
- Rapid developments in information and communication technologies (ICTs).

Some of the changes outlined above pose major threats, others emerging challenges, and others yet, key opportunities. Some of the needed responses will rely on efficiency considerations in overall national budgetary allocations. Others will call for the removal of institutional weaknesses. Yet others will require changes in the political economy calculus of the national agricultural knowledge system. It has been noted that public sector agricultural education institutions are not always autonomous enough to make the bold and rational decisions required for effective responses to the changes outlined above. (Maguire, 2000)

In the sections below we take a more detailed look at these on-going and emerging trends in agriculture in sub-Saharan Africa and their implications for post-primary agricultural education and training.

Shift in focus from agriculture to rural development

One of the current challenges to post-primary agricultural education is how to meet the challenge of providing education and training for rural development rather than for agriculture alone. It is clear that the older curricula which concentrated on production agriculture only are no longer able to produce educated people who can deal with the wider problems of rural development.

To effectively address agricultural and rural development problems, post-primary agricultural education and training needs to be applied and practical rather than purely theoretical. Learning needs to emphasize inductive reasoning skills so that students can interpret problems and devise solutions.

Rapid population growth rates and urbanization

Excessive population growth and its problematic distribution in a number of countries pose one of the greatest challenges for successfully addressing the food and agricultural problems of sub-Saharan Africa.

An inevitable fact that is not always recognized is that the rapid rate of urbanization in sub-Saharan Africa is bound to make urban food insecurity and poverty major problems. The rates of urban population growth in sub-Saharan Africa are among the highest in the world. It is generally agreed that rural-urban migration is the single most important cause of the explosion in the growth of the continent's urban population. As the overall population of African countries has increased at an accelerated pace, agricultural productivity has declined as the absence of appropriate technologies force farmers to start cultivating marginal lands. The results have been rapid degradation of the environment and increasing levels of food insecurity and poverty. This is resulting in a strong push out of the rural areas into the urban centres. Furthermore, because of the well known urban bias in national policies, the provision of physical, social and economic services in many rural areas is often either non-existent or extremely appalling. On the other hand, the provision of these services in the urban centers, although inadequate, appears in the eyes of the rural population, to be much better. As a result, the pull of the cities becomes irresistible for many rural people, particularly the youths. In some instances prolonged drought and incessant political conflicts in the countryside further aggravates the situation and forces more rural people to migrate to the urban centers.

Post-primary agricultural education and training institutions need to incorporate population education concepts and principles into their curricula. Learners need to understand the dynamic inter-relationships between food, population, the environment and national socio-economic development. Learners need knowledge of the substantive content of population education – for example, the impact of population growth on agriculture and natural resources, basic demography and gender issues as related to population and agriculture. Furthermore, students being

trained to work as extension agents need to be able to engage farm families in dialogue about population issues and to effectively communicate population messages to rural people. (FAO, 1997)

It has always been the ambition of many farming families to educate their children so that they can attain a better standard of living away from the farm and from rural areas. As they develop, virtually all countries of the world have decreasing proportions of the economically active population dependent on agriculture. This again has implications for post-primary agricultural education and training.

HIV/AIDS

At the rate at which the HIV/AIDS pandemic is still spreading in some countries in sub-Saharan Africa, there is a real risk that agricultural production will be drastically reduced. The short-term effects on production and income are staggering in the labour-based economies of the poor. While production and incomes decline, families concurrently experience dramatic rises in health and death-related expenditures. The longer-term effects on the inter-generational transfer of knowledge, on traditional social security mechanisms, and on basic demographic and socio-economic characteristics of these societies are likely to be even greater. Agricultural educators and trainers need to analyze the challenges posed by this phenomenon and to make institutional changes to meet the replacement human resources needs and provide the education and training required by those left behind in the rural areas. The influence of HIV/AIDS on skills development is devastating. It reduces productivity while driving up the cost of labour. It deskills the work force while reducing incentives for investing in skills.

Environmental degradation, unsustainable water use, unpredictable weather and climate change

Available evidence suggests that environmental degradation caused by soil erosion, desertification, deforestation and environmentally damaging agricultural practices is seriously undermining the very resource base on which many African farmers and their families depend for increasing their agricultural productivity.

Environmental constraints are already posing serious limitations to food security in several African countries particularly in areas where population densities are increasing rapidly. Today, virtually no inhabited area of Africa is unaffected by environmental degradation of one sort or another. The problem is being compounded by reduced levels and erratic patterns of rainfall and accelerated by destructive cultural practices leading to severe soil problems and loss of valuable agricultural land. Rangelands are being destroyed as a result of overgrazing and wasteful and inadequate management of available water resources.

The degradation of the land resources of Africa is not occurring because farmers and rural people are not aware of its consequences but because of sheer necessity. Unable to increase productivity from their limited resources, farmers and rural inhabitants in Africa are often forced to adopt practices that amount to ecological suicide: shortening the fallow period in shifting cultivation systems and extending cultivation into marginal lands, expanding cultivation to forested areas needed for wood and non-wood products as well as essential ecological services, burning dung for fuel instead of using it to rebuild soil fertility, planting annual crops on erosion-prone slopes, and grazing more animals than natural rangelands can support.

Water shortages pose serious problems in many African countries. Annual fresh water resources per person per year dropped from more than 20,000 m³ in 1950 to slightly above the basic need (danger point) level of 1,000 m³ in the late 1990s. The demand for water in the continent is increasing as economic development takes place in co-basin neighbouring states, leading to stiffer competition and increased costs of supply augmentation. Irrigated agriculture is limited in the continent and it is not expected to grow by much in the foreseeable future. Irrigation agriculture may, therefore, not presently be in a position to make the kind of contribution to increased productivity and food supply as is the case in Asia, where 60 percent of total crop value is produced under irrigation, compared to only 9 percent in sub-Saharan Africa. The continent does not appear to have the water needed for the type of intensive farming (e.g. double cropping) that ushered in the green revolution in other parts of the world. There is, therefore, the potential for major destabilizing outcomes if effective water-sharing and allocation arrangements are not established for the continent's water basins.

Since the early 1970s major droughts have occurred in many regions of Africa with devastating consequences on food security and the environment. Several localized and less severe droughts have also occurred throughout the period resulting in localized food shortages. These droughts which are resulting in increasing levels of desertification are becoming quite frequent. There is evidence to suggest that the rains are not falling as much or as evenly these days as in the past in many areas.

Since many countries in Africa are prone to drought, the consequences of these increasingly frequent dry spells have and will continue to be severe. Furthermore, the drought prone areas of the continent also contain large concentrations of the people. What this means is that drought resulting in serious harvest failures will result in severe food insecurity accompanied by poverty and environmental degradation. Because the effects of droughts usually linger on over time, the impact of increased harvest failures on food security, poverty and sustainable development could be felt for years.

Climatologists attribute these reductions in rainfall in the drier areas of the Africa to long-term climatic cycles as well as to changes in ocean surface temperatures and wind patterns over Africa brought about by changes in global atmospheric

temperatures. It is believed that global warming may be resulting in drastic changes in the climate with adverse effects on food systems in Africa. The big question relates to the probable impact of these potential changes on the food systems of the region. In particular, the concern must be on the extent to which these changes will result in more frequent droughts in the arid and semi-arid areas as well as on the extent to which areas close to the oceans would be affected.

Post-primary agricultural education and training institutions need to incorporate sustainable development issues in their programmes. A holistic approach should be applied when incorporating the concept of environmental and sustainable development since it relates not only to technological concerns, but also to economic, social, cultural, ecological, and public policy matters. It will necessitate a change in attitudes, practices, policies, goals and resource allocations. In particular, an open-mindedness and willingness to innovate should be fostered with attention paid to bringing in all participant groups (students, farmers, agribusinesses, researchers, youth and others) at all relevant levels (local, regional, national and international). There is a growing belief that one of the more effective means of protecting the environment and agricultural resources is to empower local people and others directly involved in the management of natural resources to make their own analyses and decisions of what should be done.

Environmental problems clearly require an interdisciplinary research and teaching approach. Learners and trainers need to observe first-hand the physical and social environment through practical activities that are problem-focused. Post-primary agricultural education and training needs to incorporate new skills, such as environmental economics and appraisal, as well as recognize the validity of different kinds of knowledge, including the site-specific and time-tested knowledge that farmers have of the environment. (FAO, 1997; Vandenbosch et al., 2002)

Increases in incomes and wealth

Ironically as the continent's resources are used to create wealth, the resulting growth in the per capita income of the poor will increase their purchasing power, upgrade the quality of their diets and create additional challenges for more food, aggravate the competition for land between agriculture and construction of cities, factories and roads, and increase the demand for wood-based products, including fuel wood, lumber for construction, poles, furniture, and paper. National and sub-regional markets will play more important roles due to the high population increases in cities and urban centres. This will also have implications for the continent's forests, soils, wildlife habitat, and biodiversity.

Globalization, trade liberalization, and market deregulation

Much reference to sub-Saharan Africa has been made in recent international forums focusing on the benefits that the continent can reap from globalization, trade liberalization, and market deregulation. The expectation is that, these initiatives will offer opportunities to working and poor people around the world, including Africa. However, very little is known about how globalization, trade liberalization and market deregulation might impact African agriculture and the environment in areas such as forest destruction, over-fishing, rapid depletion of minerals, and excessive use of agro-chemicals.

Scientific progress including developments in biotechnologies

New developments in science and technology have increased the number and the depth of subjects important to an understanding of agriculture. Food processing and post-harvest technologies, biotechnology, agri-business management and farming systems development are some of the new areas which have been or need to be incorporated into agricultural education and training curricula. These areas may attract increasing numbers of students as new employment opportunities are created. Although agriculture and agricultural education have generally kept pace with scientific progress in the past, the pace of change is much faster today, requiring continual updating of curricula. Scientific knowledge is changing very quickly as modern communication technologies facilitate the sharing of information among scientists. It is, therefore, important that learners develop the skills and attitudes that will allow them to continue to learn effectively and to develop their own competencies during the rest of their working lives. (FAO, 1997)

Today's new biotechnology revolution is being pioneered, financed, commercialized, regulated, and hotly debated mostly in the United States, Europe, and elsewhere within the rich industrial world. Yet it is in the developing world where the greatest human and food promise – or some would say peril – lie. There are those who are concerned that biotechnology in the form of genetically modified organisms (GMOs) can have serious consequences for man and for the flora and fauna of the world; and others who worry that a small number of global companies will hold the patents for the most important products of biotechnology and force farmers to pay dearly for seeds, improved animal strains and for certain inputs. These viewpoints have to be weighed against the scientific evidence for proponents of biotechnology believe that the only way to feed a growing world population is to use the products of biotechnological research. Post-primary agricultural education and training institutions must join with scientists to provide learners and the public at large with answers to the perplexing questions raised by promising scientific advances.

Rapid developments in information and communication technologies (ICTs)

Revolutionary developments in information and communication technologies (ICTs) have drastically reduced the cost of processing and transmitting information. These technologies offer tremendous opportunities for attaining and maintaining a dynamic agriculture in African countries by facilitating communication and making it possible to reach a large number of the rural poor quickly and cheaply. The so-called “digital divide” is closing rapidly, also in sub-Saharan Africa. Farmers and rural communities throughout sub-Saharan Africa are having increased access not only to national radio but also to local and community-based radio stations. The extraordinary evolution of mobile telephony and Internet services is transforming communication across sub-Saharan Africa. This increased access to information technology is opening up new opportunities for agricultural education, agricultural extension and agricultural research as well as opportunities for conveying information on markets, transport options, road conditions, and employment opportunities.

Farmers and agricultural education and training institutions increasingly have access to electronic information even in remote areas. Village internet terminals and cyber-cafes are appearing with access to market and weather information and it is obvious that even in the small-scale farming sector the flow of information will grow.

2.3 Demands from the employment market

Rapid changes in African agriculture also imply changes in the employment market for graduates of post-primary agricultural education and training. This section deals with the dynamic demands from the employment market and is structured into two parts:

1. Demands from the public service sector: These include demands from agricultural research institutions, agricultural extension providers and agricultural education institutions
2. Demands from the private sector: These include demands from formal, informal and self-employment.

2.3.1 Demands from the public service sector

Overview

Demands from the public service sector for post-primary agricultural education and training include demands from agricultural research institutions, agricultural extension providers and agricultural education institutions.

In many countries in sub-Saharan Africa, the public sector used to absorb the large majority of graduates of agricultural education and training at the post-primary education level. This is no longer the case. Economic crises and structural adjustment programmes in most countries have not only halted recruitment of new civil servants, but have led to the dismissal of many public-sector employees. Some countries have been producing far more technical staff than the employing ministries were able to absorb.

In general, the demand from the public service sector for post-primary agricultural education and training graduates is decreasing in sub-Saharan Africa. However, in some cases, the demand is increasing because of specific government programmes, such as the Agricultural Technical and Vocational Education (ATVET) programme in Ethiopia.

Some examples from selected countries in sub-Saharan Africa of demands for post-primary agricultural education and training from the public service sector are given below.

At the outset of the ATVET programme in **Ethiopia**, demand was taken as a given. The ATVET programme consists of junior and middle-level training components. The programme is a public investment conceived as a tool for the attainment of objectives of the government's economic development programs. The current ATVET programme in Ethiopia was initiated based on the assumption that it is a necessary condition to provide for (Alemayehu, 2006):

- (a) A sufficient number of field-level development workers with the necessary knowledge and practical skills for the delivery of effective agricultural advisory services that are decentralized to the most local levels possible.
- (b) The promotion of business-oriented and environmentally conscious rural youth who wish to be employed or self-employed in farming.
- (c) A nucleus for the development of community-owned and community-managed multipurpose centres for raising the capacity of rural people cope

with their vulnerability, make major productivity leaps, and thrive toward commercialization and increased household incomes.

In **Kenya**, students who only have post-primary agricultural education and training are not qualified for formal employment in agricultural extension and research. Students are, therefore, expected to undergo post-secondary training in agriculture to qualify for employment in the Ministry of Agriculture or the Ministry of Livestock and Fisheries Development. (Ngesa, 2006)

In **Mozambique**, there is a lack of trained technical extension specialists serving rural populations. The extension system is small and most of the extension agents have a low technical education level. The government recognizes the many constraints to an effective service and, as a partial solution, has begun to outsource extension services to some NGOs in rural areas. Nevertheless, extension remains an area where capacity building activities especially through short-term knowledge building and methods courses, could make a significant difference.

The public extension service under the National Directorate of Rural Extension in the Ministry of Agriculture (MINAG) – formerly under the Ministry of Agriculture and Rural Development (MADER) – is beset with staffing problems. Its mandate is to assist in organizing farmers' associations and cooperatives, to introduce improved agronomic practices, technology and livestock practices in order to increase the production and productivity of small-scale farms and promote integrated rural development. The public extension service was started in 1988 and had between 600 and 700 extension agents in 2003⁴, most with low academic and professional training. An important institutional problem is that as extension agents become trained, they are quickly hired away by one of the NGOs who offer better salary and equipment. Though the need for better trained extension agents has been recognized, there is little or no motivation for getting an additional qualification, since neither salary nor status within the Ministry changes.

In addition to an overall need for improved educational level among extension agents, expertise is needed in myriad special topics: soil fertility and conservation, plant breeding, specific commodity crops (sunflower, sorghum, pulses) and poultry diseases. Techniques are needed to help farmers to establish prices and to balance their planting between cash crops and food crops. Basic communication techniques are needed for dealing with farmers who themselves have low literacy and undeveloped technical farming skills. Agricultural technical schools could be the venue for teaching specialized courses in agribusiness and extension services. (Skelton et al., 2003; Gemo et al., 2005; Givá, 2006)

⁴ As a point of reference Tanzania had around 5,000 and Zimbabwe about 8,000 extension agents.

In **Rwanda**, central and local governments as well as government projects and institutions have been for many years the main employers of graduates from post-primary agricultural schools. However, employment patterns have changed since 2005 when 7,000 people (all degree holders) were dismissed from central government and from government institutions as a consequence of ongoing administrative reforms. Graduates of post-primary agricultural education and training cannot secure their employment in government institutions anymore. The unemployment or under-employment of agricultural fields' graduates is now high in the country. It is hoped that the private sector will now become the most important employer of post-primary agricultural graduates in Rwanda. (Ndejuru and Gatali, 2006)

2.3.2 Demands from the private sector

Overview

In general, the present climate requires a post-primary agricultural education and training approach based on labour-market studies and the assessment of actual education and training needs, especially in the private sector. With a few exceptions, labour-market studies have been absent, or have been delayed to the extent that they have not been available in time to inform programme and curriculum reviews (Wallace, 1997).

Vandenbosch et al. (2005) documented the skills needed for agricultural production, food security and sustainable rural development (summarized in Table 1), many of which are very relevant for employment in the private sector or self-employment. These include entrepreneurial skills, business skills, income-generating skills and marketing skills. Most of the skills are interlinked and are used simultaneously in practice. It should be noted that not all of these skills can be addressed directly through post-primary agricultural education and training, but a solid foundation in primary and post-primary education and training will allow for these skills to be developed through non-formal, informal and further education.

Table 1: Skills needed for agriculture, food security and sustainable rural development (Vandenbosch et al., 2005)

<p>Basic skills needed for agricultural production</p> <ul style="list-style-type: none">• Literacy (reading and writing)• Numeracy• Basic decision-making and problem-solving skills; results-orientation abilities• Technical and vocational skills in agriculture; land and water management
<p>Additional skills needed for food security and sustainable rural development</p> <ul style="list-style-type: none">• Planning skills• Management skills• Social, interpersonal and communication skills• Negotiation skills• Facilitation skills• Critical thinking (necessary for fostering innovation and change)• Food preservation and processing skills• Marketing skills• Leadership skills• Business skills• Income-generating skills• Entrepreneurial skills• Awareness about social, political and legal institutions (necessary for the development of skills for effective participation in civil society)

Some examples from selected countries in sub-Saharan Africa of demands for post-primary agricultural education and training from the private sector are given below.

Attempts have been made in **Ethiopia** to estimate the projected demand for skilled agricultural labor. A recent study report has, based on an in-depth analysis of past, present and future growth rates of the Ethiopian economy, given an indication of the likely direction of future demand for Mid-Level skilled human resources in Ethiopia (Moleke, 2005). On the basis of three alternative assumptions about future trends in the country's overall economic growth including the performance of its agricultural sector, i.e. under assumptions of pessimistic, realistic and optimistic growth scenarios, the study has estimated the future Mid-Level skilled labor needs for the various occupation classifications used by the Central Statistical Authority (CSA). Table 2 shows the projected Mid-Level skilled human resource demand for two occupational categories in agriculture and fishery: market-oriented skilled agricultural

and fishery workers (category A) and skilled subsistence agricultural and fishery workers (category B).

Table 2: Projected Mid-Level Skilled Labor Demand in Ethiopia of Agriculture and Fisheries (Moleke, 2005)

Years	Occupation category – Scenarios – Number of workers					
	Category A: Market-oriented skilled agricultural and fishery workers			Category B: Skilled subsistence agricultural and fishery workers		
	Pessi- mistic	Realistic	Opti- mistic	Pessi- mistic	Realistic	Opti- mistic
1999-2003	14,991			128,871		
2004	-450	1,049	1,049	-3,866	5,155	5,155
2005	-459	1,081	1,199	-3,943	5,309	10,310
2006	-468	1,124	1,349	-4,021	5,522	15,465
2007	-477	1,159	1,499	-4,098	5,696	20,619
2008	-486	1,197	1,649	-4,175	5,879	25,774
2004-2008	-2,340	5,610	6,745	-20,103	27,561	77,323

The ATVET Project Office has also reported an estimated future demand of 150,000 Mid-Level skilled agricultural workers for the period between 2005 and 2010 (MOARD, 2005). However, the impartiality of the projection is doubtful as the bases for the projected labour demand are not clearly spelt out and the report was apparently prepared by the very same people who would like to see the programme to continue regardless of its economic viability. (Alemayehu, 2006)

Notwithstanding their limitations, however, the two reports cited above do indicate that the demand for Mid-Level skilled agricultural labour in Ethiopia is likely to increase over the next five years under the realistic growth scenario. This is consistent with the envisaged 7-8 percent GDP growth rate and 7 percent agricultural GDP growth rate in Ethiopia over the same period (Plan for Accelerated Sustainable Development to End Poverty – PASDEP). Similar studies are rarely available in other countries in sub-Saharan Africa.

The relationship between the employment market and education is very weak in **Mozambique**, or almost non-existent. The few available studies explicitly indicate that employers are not satisfied with practical skills of post-primary agricultural graduates and are especially argumentative about the lack of knowledge of basic

management and problem-solving tools, innovative leadership, and lack of rural development integrated concepts. Moreover, the business sector emphasized the need for extensive and basic business skills at all levels. They go further arguing that “*businesses need employees who know how to do things*” from hands-on to decision-making, and basic numeracy and literacy, simple bookkeeping, carpentry and mechanics as well as orientation to running a business are essential aspects to improve private sector performance. Business leaders in Mozambique feel there is an absence of practical workplace skills among recently graduated employees, even those from the technical agricultural schools.

These observations have led to suggestions for practical training models like internships or larger scale industry-led training. The concept of internships has appeal in that it provides the possibility of transmitting highly focused workplace skills as well as elements of positive workplace behaviours like punctuality and a positive business ethic. The challenge, however, is to construct internships with real learning experiences and to find enough placements for many interns. Workplace learning for significant numbers of students demands a large-scale operation or a larger number of business placements. An interesting South African model is one in which the government provides financial incentives to companies to encourage employers to scale up internships (called learnerships⁵ in South Africa). Employers are encouraged to take on more interns than they need for their own operations through a system of financial bonuses. A cross border dialogue between Mozambique and South Africa to see how such internships are designed, managed and funded would be useful.

The absence of an entrepreneurial tradition due to the colonialist and socialist past is frequently explains the weak private sector in Mozambique. Educated people have generally been groomed in professional areas and are not oriented to the notion that business ownership or self-employment is a real and viable option. The uneducated or poorly educated population that represent the vast majority of Mozambicans have little exposure to a model of successful business ownership and thus do not aspire to ownership and, even less, entrepreneurship. The private sector is of the opinion that

⁵ **Learnerships** are learning and training programmes that lead to an occupational qualification. They combine classroom and theory-based learning at a college or training centre with on-the-job training in the workplace. Learnerships are based on legally binding agreements between an employer, a learner and training provider. This agreement is intended to spell out the tasks and duties of the employer, the learner and the training provider. The person or organisation that provides the theory part of the training also signs the agreement. Anyone can apply for a learnership. It is open to both employed and unemployed people and to young people leaving schools and colleges. The length of learnerships vary, but are normally not less than one year. Learners are assessed against occupational standards that have been agreed in advance by industry stakeholders. At the end of a successfully completed learnership learners receive a nationally recognised qualification. A certificate is awarded to the learner describing the skills learned.

courses in business development should be incorporated into the educational system. The idea has wide currency in Mozambique and should be explored further.

Though many aspects of entrepreneurship and self-employment cannot be inculcated through a formal course, there are aspects of ownership that can be incorporated into curricula. These include topics on business management, administration, marketing, returns on investment, decision-making, planning for the future, risk-taking, how to develop an enterprise and many others. (Skelton et al., 2003; Givá, 2006)

Ndejuru and Gatali (2006) indicate that self-employment of graduates of post-primary agricultural education and training in **Rwanda** encounters different limitations such as:

- The capital and recurrent investments required to maintain the economic viability of a farm are out of reach for most students after they leave school in part because of low access to bank credit (high interest rates).
- Non- availability of land: land reform is going on.
- The curriculum and books do not emphasize entrepreneurship skills and small-scale farming. The agricultural courses emphasize intensive farming systems.
- High costs of agricultural inputs.
- Organization of market.
- There are limited national programmes designed to assist interested school-leavers to take up farming as source of livelihood.

The main demand for post-primary agricultural graduates in Rwanda now comes from the private sector and self-employment. It would be therefore important that their training emphasizes technical aspects related to agriculture especially practical as well as entrepreneurial skills (farm management, accounting, marketing, ICT, etc.) for successful employment in the private sector or self-employment. (Ndejuru and Gatali, 2006)

2.4 Demands from higher education institutions

Overview

In most countries in sub-Saharan Africa, there are no specific demands from higher education institutions for post-primary agricultural education and training. Little or no attention is paid to student performance in post-primary agricultural education and training for admission into higher or tertiary agricultural education and training. Agricultural education provided at the primary and secondary levels should be further synchronized with those of the intermediate and higher levels.

Some examples from selected countries in sub-Saharan Africa of demands for post-primary agricultural education and training from higher or tertiary education institutions are given below.

In **Botswana**, the colleges of education try to take performance in vocational subjects into consideration when they screen applicants for teacher training specialties in the same subject areas. On the other hand, the college of agriculture pays little or no attention to performance in agriculture from secondary school, preferring instead to go by marks in the natural sciences, English and mathematics. (Weeks, 2005)

In **Kenya**, secondary school Agriculture is not essential for admission into an agricultural Degree or Diploma programme. It however can be used for admission into Certificate programmes, but again it is not a primary requirement. (Ngesa, 2006)

In **Mozambique**, entry exams for Mid-Level or higher agricultural education are based on the general education curriculum and not on technical or specific agricultural issues. This fact breaks the essence of continuous agricultural education and training. (Givá, 2006)

In **Rwanda**, access to higher education is limited for graduates of post-primary agricultural education. There are different reasons for this limited access (Ndejuru and Gatali, 2006):

1. Agricultural technical education does not give automatic access to higher education. Admission criteria take into account leaving school score obtained by the graduate, work experience, etc.
2. The score required for enrolment in higher education is very high for technical agricultural sections compared with scientific sections.
3. Graduates of agricultural technical fields do not have the required skills in basic sciences such as Mathematics, Chemistry and Physics required for

accessing scientific options at university level such as Agriculture, Biochemistry, Pharmacy etc.

2.5 Reasons to choose agriculture at post-primary education level

Overview

Reasons to choose agriculture and numbers of students choosing agriculture as a subject in general secondary schools are indications of the demand for post-primary agricultural education and training. Factors positively affecting the choice of agriculture as a subject in secondary school include prospects to study agriculture at higher and tertiary education level and employment in agriculture.

Reasons to choose agriculture at post-primary education level as a subject in secondary schools in selected countries in sub-Saharan Africa are explained below.

Apori et al. (2003) looked at factors that influenced student's choice of an agricultural science programme at the senior secondary level in Cape Coast in **Ghana**. They found that a student's decision to choose agricultural science subjects is influenced by:

1. Gender and socio-economic background of student such as occupation of parents, communities, towns, or cities in which they live.
2. The level of knowledge about prospects in choosing agriculture as vocation.
3. The terminal nature at agricultural colleges, where trainees are awarded Certificates in Agriculture.
4. The influence of parents, guardians, and peers who accord agriculture low recognition compared to other professions such as pharmacy, law, architecture, engineering, medicine, and accounting.
5. Facilities (man and material) for the teaching of agriculture and the mode (pedagogy) used in teaching agriculture.

Agriculture is an optional subject at the secondary school level in **Kenya**. All public secondary schools, however, offer the subject. The number of students who participate in the Kenya Certificate of Secondary Education (KSCE) examination in Agriculture is an indication of the demand for Agriculture at the secondary school level. Comparative data on candidature by subjects in the KSCE examination for 2005 show that agriculture at the secondary school level attracts over 40% of the high school students (106,437 students out of a total of 260,665 have chosen Agriculture as a subject). Apart from the three compulsory subjects (Mathematics, English and Kiswahili) there are 29 other subjects from which students are expected to choose an

additional four to six subjects. Among these 29 subjects, agriculture was ranked fifth in popularity. (Ngesa, 2006)

A survey carried out in secondary schools in Kenya in 1988 (Ngumy, 1988) indicated that very few secondary school students aspire to take up farming as a full-time career on completion of secondary education (Table 3). The students who preferred part-time farming claimed that farming would not be able to sustain them if they had no other source of income. The 8.1% who preferred full-time farming were those likely to acquire large-scale commercial farms and had access to capital. Therefore, the lack of interest in full-time farming did not indicate disinterest in farming *per se* but an awareness of the likely correspondence between economic possibility and student aspiration. It is noteworthy that a majority of the students interviewed in the survey considered taking up part-time farming.

Table 3: Kenyan secondary school students' preferences for careers in agriculture (Ngumy, 1988)

Preference of agriculture career	Number	Percentage
Full-time farmers	19	8%
Part-time farmers	196	84%
Not at all	14	6%
No response	5	2%
Total	234	100%

A more recent survey (Ngesa, 2006) of 1,073 secondary school students in Kenya indicates that students who study agriculture in general secondary schools do so as a preparation for advanced studies in the area (Table 4). There is, however, a significant proportion who study the subject as a preparation for employment and farming.

Table 4: Reasons for choosing to study Agriculture as a subject in secondary schools in Kenya (Ngesa, 2006)

Main reason for studying agriculture	% (n = 1,073)
Plan to study agriculture in university	42%
Plan to study agriculture in Mid-Level institutions	17%
Plan to be employed in agricultural NGO	12%
I perform well in the subject	9%
Plan to go into farming	7%
Plan to be employed on a farm	7%
To meet requirements of Kenya National Examination Council	3%
No reason	2%
Agriculture is an easy subject	1%
Parents want me to study subject	1%

Ngesa (2006) concludes that the content included in the school syllabus, methods of teaching agriculture and the teaching-learning resources available to learners should reflect these needs of learners. First, post-primary agricultural education and training programmes should adequately prepare those who wish to pursue advanced studies in agriculture in tertiary level institutions. Secondary, the significant proportion of students who wish to go to farming and seek non-formal employment should be adequately factored in curriculum development.

Dlamini et al. (2004) determined the reasons for girls to choose agriculture or other science and technology programs in high school (and tertiary levels) in **Swaziland**. The overall reasons for girls to choose agriculture or other science and technology programs were found to be, in mean rank order:

1. Economic
2. Personal
3. Educational
4. Family
5. Social.

On the whole, respondents only slightly agreed with school reasons and peer pressure reasons.

3 Supply of post-primary agricultural education and training in sub-Saharan Africa

3.1 Aims and objectives of post-primary agricultural education and training in sub-Saharan Africa

Around sub-Saharan Africa, different models of post-primary education and training have evolved resulting from the attempts to find a balance between educational objectives and social and economic objectives. Most commonly, post-primary agricultural education and training systems refer to different aspects of all these objectives. In the next section, educational objectives of post-primary agricultural education and training in sub-Saharan Africa have been summarized. This part is then followed by a section on social and economic objectives.

3.1.1 Educational objectives

Overview

The educational objectives of post-primary agricultural education and training in sub-Saharan African countries most commonly quoted in policy papers, curricula and studies include the following:

- Giving learners knowledge and skills for better agricultural productivity: This objective gives post-primary agricultural education and training a vocational orientation.
- Making the teaching of sciences more relevant, effective and practical: This objective is to overcome the common lecturing and rote-learning of science facts unrelated to the students' environment and to make teaching and learning more relevant to the local situation.
- Influencing learners' attitudes, giving a positive motivation towards agriculture and rural development: Based on the view that education is an important factor in development, this objective assumes that school curricula play a dominant role in the formation of attitudes among students.
- Preparing students for entry in higher and tertiary education institutions teaching agriculture: Commonly quoted as an educational objective of secondary school agriculture to provide background for further studies in agriculture.

The educational objectives of post-primary agricultural education and training in selected countries in sub-Saharan Africa are summarized in Table 5 and described in the paragraphs below.

Table 5: Educational objectives of post-primary agricultural education and training in selected countries in sub-Saharan Africa

Country	Junior Secondary Level	Senior Secondary Level
Benin	<ul style="list-style-type: none"> • Capacity for successful farming • Capacity for employment as a skilled technician. 	<ul style="list-style-type: none"> • Capacity for commercial farming • Capacity middle management of agricultural services.
Botswana	<ul style="list-style-type: none"> • Employment in agricultural services • Self-employment in agricultural production or farming • Pursuance of higher education at tertiary levels 	
Ghana	<ul style="list-style-type: none"> • Skills for paid and self-employment 	
Kenya	<ul style="list-style-type: none"> • Capacity to value farming as an occupation • Understand the role of agriculture in the economy and national development • Provide background for further studies in agriculture. 	
Malawi	<ul style="list-style-type: none"> • Equip learners with requisite knowledge, skills and attitudes for them to engage in agriculture as an occupation in their communities • Provide a foundation for those proceeding to tertiary levels of agricultural education and related fields 	
Mozambique	<ul style="list-style-type: none"> • Upgrade worker qualifications for more productive farming and for sustainable employment. 	
Swaziland	<ul style="list-style-type: none"> • Positive attitudes towards agriculture. 	<ul style="list-style-type: none"> • Preparation of students for entry into the university's college of agriculture.

In **Benin**, the 3 Colleges of Technical Agricultural Education (CETA) train students to acquire *“competencies of a farmer intervening as a general-purpose skilled professional in vegetable production, livestock production and agriculture – able to employ himself, to take up duties and responsibilities in various subdivisions of an integrated farm and to ensure the provisions of agricultural services”*. In addition to the profession of farmer, possible employments are: skilled worker on a farm of integrated agriculture and technician of rural development.

At the level of the Agricultural College Medji of Sékou (LAMS) in Benin, students should acquire “*capacities of a farmer intervening in the capacity of a general-purpose contractor in vegetable production, livestock production and agriculture*”. A student must become “*a general-purpose technician of agriculture able to employ himself because of his capacity to create and manage a small or average farm, to ensure the provision of services and to assume specific responsibilities on an intensive farm*”. In addition to the profession of farmer, possible employments are: head of agricultural enterprise, distributor of plant health products and/or rural equipment, and controller of rural development.

At the privately-run Songhaï Centre in Benin, the goal of training is to promote an agricultural, entrepreneurial spirit in young Africans by developing and transmitting the human values capable of bringing about behavioral changes. Through this training, the students can then become agents of their own development. The final goal is to train a new breed of leaders capable not only of conceiving and carrying out entrepreneurial activities, but of equally blending individual and communal interests.

In **Botswana**, theoretical and practical agricultural training at the Junior Secondary and Senior Secondary School levels prepare students for employment in agricultural services, self-employment in agricultural production or farming and for pursuance of higher education at tertiary levels (Hulela and Miller, 2003).

In **Ghana**, a key feature of the 1987 Education Reform Programme was the provision of vocationalized education at both the 3-year Junior and the 3-year Senior Secondary School level in order to equip students with the skills for paid and self-employment. Formal agricultural education is offered at the Junior and Senior Secondary School levels (Annor-Frempong et al., 2003).

In **Kenya**, the educational objectives of teaching Agriculture as a subject in general secondary schools are set out in the secondary school syllabus of Agriculture and include the following:

- To develop an understanding of agriculture and its importance to family and nation
- To provide a background for further studies in agriculture
- To create awareness of the role of agriculture in industrial and technological development
- To enhance understanding of the role of technology and industrialization in agricultural development
- To promote consciousness of health-promoting activities in agricultural production.

Similarly, teaching of Agriculture as a subject in general secondary schools in **Malawi** aims to equip learners with requisite knowledge, skills and attitudes for them to engage in agriculture as an occupation in their communities. The curriculum also provides a foundation for those proceeding to tertiary levels of agricultural education and related fields.

In **Mozambique**, agricultural technical education is aimed at training qualified workers and technical staff to respond to the demand of the labour market in agriculture. It intends to provide students with knowledge and skills for increasing agricultural production and productivity. It is also expected to provide students with the skills they need to obtain employment and earn a sustainable livelihood. Vocational training is considered an essential element to create skilled workforce that is relevant to strengthening economic growth and lifting individuals and communities out of poverty. (Givá, 2006)

At the secondary education level in **Swaziland**, the goal of junior-level agricultural education is to develop in students an appreciation for and a positive attitude toward agriculture, while the goal of the senior-level agricultural education programme is to prepare interested youth to gain entry to the College of Agriculture at the University of Swaziland. (Dlamini and Miller, 1996).

3.1.2 Social and economic objectives

Overview

The social and economic objectives of post-primary agricultural education and training in sub-Saharan African countries most commonly quoted in policy papers, curricula and studies include the following:

- Strengthening agricultural development through agricultural extension: Some post-primary agricultural education and training programmes have the objective of producing skilled extension workers. It is at the post-primary education level that most of Africa's field-level agricultural extension workers are prepared. The training of extension workers should emphasize skills and knowledge for sustained crop production and strategies for the prevention of food losses during harvest, storage, marketing and processing.
- Improving students' nutritional status by providing school meals: Numerous research findings suggest a relationship between students' malnutrition and poor school performance. In some cases, school farms are used as a supply source for school meals.
- Lowering the unit costs of schooling: Some schools rely on agricultural projects to maintain teachers and students. Students contribute to the costs of schooling with their labour on the school farm, as an indirect school fee. In some cases, this economic objective counteracts pedagogical objectives, as the poorly paid and unmotivated teachers are tempted to use the proceeds of the school farm as an additional income for themselves. This situation, coupled with an authoritarian school climate where students have little or no participation in the management of their agricultural produce, easily generates a teacher-student relationship of mutual mistrust and bitterness, where students feel exploited as cheap labour for the teachers' benefit.

The social and economic objectives of post-primary agricultural education and training in selected countries in sub-Saharan Africa are summarized in Table 6 and illustrated in the paragraphs below.

Table 6: Social and economic objectives of post-primary agricultural education and training in selected countries in sub-Saharan Africa

Country	Social and economic objectives
Benin	<ul style="list-style-type: none"> • Improving the living conditions and livelihoods of farmers • Employment creation in rural areas • Improvement of agricultural productivity in rural areas • Support to agricultural extension systems.
Ethiopia	<ul style="list-style-type: none"> • Increase the productivity and profitability of the agricultural sector • Produce Mid-Level skilled frontline extension agents.
Kenya	<ul style="list-style-type: none"> • Develop self-reliance in agriculture • Enable schools to take an active part in national development through agricultural activities.
Mozambique	<ul style="list-style-type: none"> • Agricultural development • Poverty reduction • Income generation for education and training institutions.

In **Benin**, the Centres for Rural Promotion (CPR) and the Centres for the Promotion of Rural Women (CPFR) were set up in 1989 by the Ministry of Rural Development with the intension of training in agriculture and entrepreneurship (CPR) and agriculture and crafts (CPFR). Generally, these centres aim at improving the living conditions and livelihoods of farmers and have the following objectives (Hyl and Bosio, 2002):

- Revalorization of careers in farming
- Employment creation in rural areas
- Improvement of technologies in rural areas through the introduction of animal traction and mechanization
- Reduction of unemployment and rural-urban migration
- Revamp of agricultural extension systems
- Improvement of agricultural productivity in rural areas
- Improvement of living standards of farmers.

In addition to these general objectives, individual centres can also have their own specific objectives, e.g. the Centre for the Promotion of Rural Women of Ouémé (CPFRO) of Kouti has the following specific objectives (Ogoudedji, 2006):

- To equip out-of-school girls with the knowledge and skills necessary for agriculture and agriculture-related activities with a sustainable use of natural resources.

- To facilitate the access of young people to new technologies, credit and technical support to guarantee the practical application of the course.
- To ensure follow-up of the girls who have completed the course.
- To train members of rural women groups and other individual members in management and diversification of income-generating activities.

In **Ethiopia**, the development objective of the ongoing Agricultural Technical and Vocational Education (ATVET) programme is to increase the productivity and profitability of the agricultural sector in Ethiopia through investments to raise the human capital of farmers and extension agents. More specifically, the programme was designed based on the government's perceived demand for 55,000 Mid-Level skilled frontline extension agents and the establishment of 15,000 Farmer Training Centres (FTCs) with the necessary facilities where ATVET graduates will give modular training to primary school leavers on demand, especially to meet the needs of a more market-oriented and diversified agriculture. It is expected that an estimated 4 million young farmers will receive skill training over the programme period. Apart from providing employment and income opportunities to individual ATVET graduates, the programme hence also has the social objective of contributing to human resource capacity building for improving the productivity of the country's agricultural sector. (Alemayehu, 2006)

In **Kenya**, the social and economic objectives of teaching Agriculture as a subject in general secondary schools are set out in the syllabus:

- To promote interest in agriculture as an industry and create awareness of opportunities existing in agriculture and related sectors
- To demonstrate that farming is a dignified and profitable occupation
- To enhance skills needed in carrying out agricultural practices
- To develop self-reliance, resourcefulness and problem solving abilities in agriculture
- To develop occupational outlook in agriculture
- To enable schools to take an active part in national development through agricultural activities
- To promote agricultural activities which enhance environmental conservation.

The main social and economic objective of post-primary agricultural education in **Mozambique** is to involve schools in agricultural development, contributing to improve people's life and school conditions. Moreover, it aims to reduce the absolute poverty rate, not only benefiting from the income generation but also improving students' diets, particularly in the case of orphans and vulnerable children.

Agricultural activities can also provide schools autonomy through financial innovative models and encouraging self-sufficiency and self-sustainability in order to move out from external funds dependence such as WFP support. (Givá, 2006)

3.2 Post-primary agricultural education and training contents in sub-Saharan Africa

A great diversity of teaching and learning experiences in post-primary agricultural education and training in sub-Saharan Africa is taking place in secondary schools, in technical and vocational education and training systems, in non-formal and informal learning contexts, and in the world of work itself.

The contents of post-primary education and training in sub-Saharan Africa is discussed in the following sections. The discussion is organized in the following way:

1. Agriculture as a subject in general secondary schools
2. Agriculture in post-primary technical and vocational education and training
3. Other forms of post-primary agricultural education and training.

3.2.1 Agriculture as a subject in general secondary schools

Overview

Vocationalization of secondary education – with a curriculum structure which remains overwhelmingly general or academic in nature, but which includes vocational or practical subjects such as agriculture as a minor portion of the students' timetable, without by so doing closing their prospects for higher education – is a long-standing controversy in development planning (Lauglo and Maclean (Eds.), 2005).

In some countries in sub-Saharan Africa, agriculture has been introduced in general school curricula at secondary education level as a compulsory subject or as an optional subject. The rationale for offering agricultural subjects to secondary school students is sometimes to counter the apparent negative attitude to farming by many secondary school pupils whose occupational choices are often limited and to expose them to the knowledge and skills that they would require in agricultural production, should they choose to become farmers. (Abalu, 2001)

Experiences with agriculture as a subject in general secondary schools have been mixed. There seems to be some agreement however that agriculture as a subject in general secondary schools should continue to exist, but with the understanding that most students who complete general secondary education do not become active small-scale farmers. Secondary school agriculture has provided many students with an understanding of agricultural principles and practices, but only a few of these young people become active agricultural producers. Many of these secondary school students have gone on to higher education and their agricultural knowledge and appreciation, though not wasted, has not been put into direct practice at the field level. (Lindley, 1993)

Curricula, syllabi, and timetables at secondary education level are almost always overloaded with classroom lessons on factual knowledge, at the expense of practical applications, especially if the subject is examinable. Unfortunately, topics are mostly related to agricultural production and only in very few cases include aspects of agricultural entrepreneurship, income-generating activities and agricultural processing and marketing.

The offer of agriculture as a subject in general secondary education in selected countries in sub-Saharan Africa is summarized in Table 7 and illustrated in the paragraphs below.

Table 7: Agriculture as a subject in general secondary education in selected countries in sub-Saharan Africa

Country	Junior Secondary Level	Senior Secondary Level
Botswana	Compulsory	Optional
Burkina Faso	Not offered, limited integration in Life and Earth Sciences	
Ethiopia	Not offered	Separate ATVET system
Ghana	Compulsory	Optional
Kenya	Optional	Optional
Lesotho	Optional	
Malawi	Compulsory	
Mozambique	Not offered, limited integration in Natural Science	
Namibia	Optional	
Nigeria	Optional	
Rwanda	Not offered, being piloted in some schools	
South Africa	Not offered	Optional
Swaziland	Optional	
Uganda	Optional	
Zimbabwe	Optional	

In **Botswana**, Agriculture became one of the compulsory core subjects of the 3-year Junior Secondary School curriculum in 1986, and each student must take a second practical subject. The introduction of Agriculture as a subject in secondary schools was in line with the recommendations made by the National Commission of Education (NCE) of 1977, which emphasized the need for inclusion of practical subjects in the school curriculum. At first, Agriculture was a science subject that involved only theoretical classes and laboratory practical. Today, participatory curriculum development has transformed Agriculture from a more theoretical to a more field practical subject in the schools. Teachers and policy makers are aware that agriculture needs to be locally relevant in terms of curriculum content, teaching techniques and assessment methods for the schools agriculture programme to be a useful strategy for transforming the knowledge, skills and attitudes of young people into abilities and habits for a more sustainable agriculture and rural development. The effective teaching of Agriculture in the schools has been possible due to government commitment to provisions of the necessary facilities like small animal houses, garden area with an orchard, tool rooms and store rooms. Funds are made available for the provision of the needed human and materials resources, maintenance of the facilities and operations of different agricultural enterprises. (Dlamini et al., 2004; Dlamini and Dingwa, 2004)

In 2-year Senior Secondary Schools in Botswana, more practical and work-related subjects have been introduced as options. Agriculture is one of the popular options.

In Botswana, the secondary school curricula in Agriculture currently include basic knowledge on the following topics (Hulela and Miller, 2003):

- Agricultural economics
- Animal management and husbandry
- Farm engineering
- Field crops
- Fruit and vegetable production
- Environmental education
- Developmental issues affecting agriculture

In **Burkina Faso**, agriculture is not being taught as a separate subject at the general secondary school level. Some agriculture-related topics are integrated in the subject of Life and Earth Sciences (*Sciences de la Vie et de la Terre – SVT*) which is being taught in secondary schools and deals with biology, botany, ecology, geology and zoology.

In **Ethiopia**, the teaching of agriculture in secondary schools was phased out and gave way to the launching of the Agricultural Technical and Vocational Education (ATVET) programme under the larger Technical and Vocational Education and Training (TVET) wing of the country's education sector. It is argued that education in primary and secondary education will focus on shaping the foundation for latter skills development provided by the ATVET programme. As stated in the Education Sector Strategy, the objective of general secondary education (grades 9-10) "*is to give a graded general education in mathematics, language and the biological, physical and social sciences*"; and "*A vocational technical education and training system parallel to the academic system shall be established and will have its independent structure but with appropriate linkages to the academic system.*" And according to Ethiopia's draft National Technical and Vocational Education and Training (TVET) Strategy: "*The TVET system will explicitly address the occupational requirements in all segments of the labour market, target all population groups in need of skills development and thus incorporate and coordinate all kinds of TVET in Ethiopia.*"

In **Ghana**, Agricultural Science is a compulsory subject at the Junior Secondary School level (Ampiah et al., 2004). Agricultural Science is offered as an elective subject in Senior Secondary Schools (Apori et al., 2003). Agricultural and environmental topics are also integrated in Integrated Science courses (Ottevanger et al., 2003). A student studying at the three-year Senior Secondary School level can choose from 6 programmes:

1. Agriculture
2. Business (Accounting & Secretarial)
3. General (Science)
4. General (Arts)
5. Vocational (Home Economics & Visual Arts)
6. Technical

All students studying at Senior Secondary School level take four examinable core subjects (English, Mathematics, Integrated Science and Social Studies) and two internally examinable subjects (Religious and Moral Education, and Physical Education). Depending on the programme offered students might also study three or four elective subjects. (Ampiah et al., 2004)

In 1995, the Ministry of Education accepted a proposal for the establishment of 110 Science Resource Centres (SRCs) by Phillip Harris Company of Britain. It involved the rehabilitation and refurbishment of laboratory facilities in selected Senior Secondary Schools in almost all the districts. The Centres are to serve as teaching centres to supplement existing facilities in the schools and promote science practical activities. Other schools in the neighbourhood can use the facilities for running in-service training programs for science teachers. The Science Resource Centres (SRCs) have offered schools the opportunity to engage in practical work, particularly for those schools that are less endowed with laboratory resources. The SRCs have been well equipped and for example have manuals for Biology, Physics and Chemistry with many suggestions for carrying out practical work and written in a manner simple enough for teachers to use and accompanied with separate handouts for the students. However, anecdotal evidence suggests that generally, the SRC concept has not benefited satellite schools, which have to travel to the centres for practical work. Schools hosting the centres appear to benefit the most from its use. In Integrated and Agricultural Science, schools are recommended to farm chickens, ducks, turkeys, goats, sheep, cattle and fish as agricultural practical work. Visiting of farms, agricultural research institutes and other institutes to observe scientific work and their application are encouraged. However, it is doubtful whether most schools are able to organize such field visits due to large student populations. Nevertheless, its emphasis in the curriculum shows the value being placed upon opportunities for observing the application of science. (Ampiah et al., 2004)

In 1985, there was a fundamental change in the education system in **Kenya** when the 8-4-4 system of education was introduced. The Government of Kenya attempted to vocationalize the curriculum by incorporating subjects in the curriculum, which would improve the skills needed in the world of work. The primary education cycle of eight years and the secondary education cycle of four years were supposed to be complete in themselves. Graduates of the primary and secondary education cycles were, therefore, supposed to be able to enter the world of work, either through employment or self-employment. Agriculture was one of the subjects which was given prominence in the new initiative. All public primary and secondary schools were to offer Agriculture as a subject to their students. This continued until 2002 when the Ministry of Education initiated reforms to rationalize school curricula. Agriculture became an optional subject in secondary schools. Despite these changes, all public secondary schools in the country continue to offer Agriculture as a subject to their students.

In Kenya, primary and secondary school curricula for various subjects are developed by the Kenya Institute of Education (KIE). The Institute has subject officers who oversee the curriculum development in their areas. Panels to develop curriculum for each subject are constituted when there is a change in government policy on education or as requested by the Ministry of Education.

The secondary school agriculture curriculum panel usually includes the agriculture subject officer at the Kenya Institute of Education (KIE), Agriculture Subject Officer at the Kenya National Examinations Council, the Quality Assurance and Standards Officer in-charge of Agriculture in the Ministry of Education, and selected specialists from educational institutions. According to the Subject Officer at the Kenya Institute of Education (KIE), the panel has in the past not included officials of the Ministry of Agriculture and Ministry of Livestock and Fisheries Development. (Ngesa, 2006)

Broadly, secondary school agriculture consists of the following topics :

- Environmental factors influencing agricultural production
- Soil and water conservation
- Water supply, irrigation and drainage
- Soil fertility
- Farm tools and equipment
- Crop production
- Livestock production and health
- Agroforestry
- Farm structures
- Farm power and machinery
- Agricultural economics

Co-curricular Young Farmers' Clubs in secondary schools are a critical ingredient of quality school agriculture in Kenya. But among the students who are members, more than 50% are not engaged in any club activities apart from school farm projects and participation in agricultural shows. The range of activities (Table 8) is too narrow as Young Farmer' Clubs could be one of the main channels for preparing young people for leadership in agriculture. (Ngesa, 2006)

**Table 8: Activities of Young Farmers' Clubs in Kenya (teachers' responses)
(Ngesa, 2006)**

Activity	% of respondents (n = 42)
Participating in agricultural shows	52.4%
School farm projects	52.4%
Participating in debates	26.2%
Visit local farms	14.3%
Raising tree seedlings	11.9%
Visit Farmer Training Centres (FTCs)	11.9%
Visit research stations	11.9%
Individual home projects	2.4%
Visit agri-businesses	2.4%

In **Lesotho**, general secondary education extends over five years, comprising the three-year Junior Secondary and the two-year Senior Secondary (High School) cycles. Agriculture is offered as an optional practical subject.

In **Malawi**, secondary education lasts four years, divided into two stages of two years duration each. The first stage (Forms I-II) prepares students for Junior Certificate Examination. The second stage (Forms III-IV) culminates in the Malawi School Certificate Examination. Agriculture is a core subject at both stages.

The rationale for the inclusion of Agriculture as a core subject in secondary schools in Malawi is that agriculture forms the backbone of Malawi's economy. It is therefore likely that the majority of secondary school graduates will end up participating directly or indirectly in the agricultural sector. In order to participate meaningfully they should be prepared scientifically and practically.

Clear learning objectives have been set in the teaching syllabus for Agriculture as a subject. At the end of the secondary school cycle learners should be able to:

1. Understand the importance of agriculture in Malawi's economy
2. Know the various food and cash crop production practices and methods
3. Understand the various livestock production practices and methods
4. Apply the various animal production practices
5. Know the importance of diversified agriculture to Malawi's economy
6. Understand the impact of current intermediate and advanced agricultural technologies
7. Apply scientific and technological skills in order to improve agricultural productivity
8. Know Malawi's environmental resources
9. Understand the impact of rapid population growth on natural resources
10. Understand the various methods of conserving natural resources
11. Acquire basic scientific and research skills
12. Apply problem-solving techniques
13. Use the various crop production practices and methods
14. Observe farm safety rules
15. Apply the various conservation measures to Malawi's natural resources
16. Practise afforestation and agroforestry
17. Development management skills in agriculture as a business
18. Process crop and animal products
19. Market crop and animal products profitably
20. Acquire positive attitudes towards agriculture and manual work
21. Develop an interest in land, crop production, animal husbandry and aquaculture
22. Appreciate the importance of conserving natural resources for sustainable use

To achieve this, the agricultural curriculum has been divided and subdivided into the following topics and sub-topics:

- Agriculture and the environment: Natural resources, Conservation of natural resources, Soil formation, Maintenance of soil fertility, Soil properties, Soil management, Environmental degradation and agriculture.
- Crop production: Crop requirements, Agronomic practices, Seed, The plant, Cropping systems, Pasture production, Food for self-sufficiency, Crop improvement, Crop storage, Crop processing, Role of estates in food production, Drought-resistant varieties.
- Animal production: Classes of farm animals, Livestock management, Broiler production, Egg production, Pig production, Feeds and Feeding, Anatomy

and physiology of digestive systems, Livestock improvement, Anatomy and Physiology of Reproductive Systems, Beef production, Dairy production.

- Agricultural marketing: Market forces, Market functions, Problems of agricultural marketing and suggested solutions, Marketing, Management, Effects of population distribution on market, Trade of agricultural commodities.
- Farm business management: Basic business concepts, Cooperatives, Farm Records, Risks and uncertainties, Decision-making
- Agricultural technology: Farm structures, Irrigation, Farm safety, Farm power, Farm energy, Land drainage, Farm mechanization, Food technology
- Agricultural experimentation: Basic principles of agricultural experimentation (theory), Agricultural experimentation (practicals)
- Challenges in agricultural development: Population increase and natural resources, Population increase and food supply, Gender roles in food production, Food security, Contribution of smallholder farms to food supply, Ways of achieving self-sufficiency in food for the increased population, Population increase and physical environment, Scientific and technological innovations that ensure food security.

General secondary education in **Mozambique** does not include agriculture as a course or a subject. Some related topics however are covered in subjects like Natural Science, Biology, Chemistry and Craft, but not in a systematic way. Some agricultural activities have been reactivated since 2004/2005 either as part of curricular activities (in some revised curricula, especially at primary level) or as extracurricular activities. Schools with boarding facilities are giving more emphasis to these activities, though public schools depending on government funds, which are limited, have difficulties to turn the idea into reality. An example is given in Box 1. (Givá, 2006)

In **Namibia**, agricultural and environmental topics are integrated in Science courses (Ottevanger et al., 2003). In addition, Agriculture is offered as an optional pre-vocational subject at the Junior Secondary School level (grades 8-10). At the Senior Secondary School level, Agriculture is offered as one of five options. (Clegg and van Graan, 2004).

In **Nigeria**, Agricultural Science is an optional subject in Junior Secondary Schools. Agricultural Science is also a vocational elective at Senior Secondary School level. (Adewale et al., 2004) The Agricultural Science curriculum in Nigeria is primarily concerned with academic preparation for entry into university studies while neglecting vocational or occupational education. Students lack the opportunity to apply classroom instruction.

Box 1: Special Agricultural Programme: Vocational skills in general primary and secondary schools in Mozambique (Givá, 2006)

An initiative was developed in order to promote environmental, agricultural, livestock, craft production and food preparation knowledge. This initiative emerged in order to contribute to HIV/AIDS impact mitigation through providing school children with a provision, practical knowledge and skills around the options available for improved livelihood and food and nutritional security in areas that are highly vulnerable due to impact of food insecurity and HIV/AIDS. Accordingly, 36 pilot schools were selected in Tete, Inhambane and Gaza provinces.

The programme promotes labour-saving technologies, water and soil conservation methods, organic methods, compost production, and Integrated Pest Management (IPM). In addition, it intends to identify and promote a variety of micronutrient-rich horticultural crops (indigenous and exotic), and raising small livestock such as chicken and rabbits, which are being promoted to improve dietary diversity. Apart from skills building, the programme also wishes to create institutional auto-sustainability before the WFP pulls out of the project.

According to the School Production Department at the Ministry of Education and Culture (MEC), the effective implementation of this programme has not taken place yet due to impossibility to allocate a farming technician to those schools. In the meantime, FAO has referred to a dilemma that emerged, where, on one hand, it is seen as a way of building a new agricultural skilled generation, but on the other hand, it is seen as child labour.

The programme was established under the recent primary school curriculum reform where 20% of the curriculum is decided at local level and a new subject “*ofícios*” (vocational skills) was introduced. It allows schools to participate in community development and would therefore also be adapted and implemented at secondary school level.

In **Rwanda**, agriculture is not being offered as a subject in general secondary schools. The Ministry of Education is currently piloting an education project based on gardening and animal husbandry with practical training in feeding, nutrition and promotion of proper diet and safe life styles, including HIV/AIDS and environment protection. The four-year project (which started in 2006) entitled “Support to the promotion of school gardens, farms and nutrition education in Rwanda Schools (extension phase)” (MINEDUC, 2006) is being implemented by FAO in collaboration with the Ministry of Education with funding of USAID and is expected to provide an opportunity to improve practical education and training in primary and secondary schools in general and in post-primary agricultural schools in particular. (Ndejuru and Gatali, 2006)

The curriculum for Grades 10, 11 and 12 in **South Africa** (also known as the Further Education and Training phase or FET) offers Agricultural Science as an elective subject.

Agriculture is offered as an optional subject in secondary schools in **Swaziland**. Mbingo et al. (2002) determined areas considered important for inclusion in the Swaziland secondary school agriculture curriculum to make it more relevant and effective. They proposed the composite secondary school agriculture curriculum represented in Table 9. This includes new areas such as entrepreneurship, information and technology, business management, agroforestry and food processing.

Table 9: Proposed composite secondary school agriculture curriculum (Mbingo et al., 2002)

Existing areas	New areas
1. Broiler production	1. Honey bee keeping
2. Egg production	2. Baby vegetable production
3. Indigenous poultry production	3. Mushroom production
4. Hatchery enterprise	4. Floriculture
5. Beef production	5. Entrepreneurship
6. Goat production	6. Information and technology
7. Sheep production	7. Business management
8. Dairy production	8. Fish production
9. Pig production	9. Agroforestry
10. Rabbit production	10. Food processing
11. Vegetable production	11. Landscaping
12. Nursery enterprise	
13. Sugar cane production	
14. Field crops production	
15. Fruit production	
16. Farm machinery	
17. Water harvesting, irrigation and storage	
18. Farm structures	

At 'O'-level in secondary schools in **Uganda**, students study at least 12 subjects which must include Sciences, Mathematics, and a choice of others depending on availability. The full list of generic 'O'-level subjects is as follows: Kiswahili, English,

Physics, Mathematics, Additional Mathematics, Chemistry, Biology, History, Geography, Home Economics, Technical Drawing, Woodwork, Metalwork, Music, Religious/Moral Education, Political Education, Art, one other language (Ugandan or Foreign), Agriculture, Computer Science, Oral Literature and Literature in Kiswahili or English.

At 'A'-level, students usually pursue three to four subjects, which are often those best performed at 'O'-level national examination (Uganda Certificate of Education (UCE)) by the Uganda National Examinations Board (UNEBC). These include a combination of Biology, Agriculture and Chemistry with Subsidiary Mathematics. (Olukia, 2004)

Agriculture is offered as an optional subject in secondary schools in **Zimbabwe**.

3.2.2 Agriculture in post-primary technical and vocational education and training

Overview

Under technical and vocational education and training (TVET), a student's timetable is often dominated by practical skills learning and by directly related theory.

Agricultural curricula in post-primary technical and vocational education and training do in many cases not adequately address the needs of current and future labour markets. Topics are mostly related to agricultural production and only in isolated cases include agricultural entrepreneurship, income-generating activities and agricultural processing and marketing.

In most post-primary technical and vocational education and training programmes in agriculture, there is insufficient examination and discussion of the roles of rural women in agricultural production and rural development. Too little time, if any, is devoted to gender analysis and addressing the question of how extension work can be carried out effectively with rural women.

Interesting and promising new models of post-primary technical and vocational education and training in agriculture are emerging, such as combining school-based learning with apprenticeship training.

In **Benin**, there are four institutions of technical agricultural education at post-primary education level: three Colleges of Technical Agricultural Education (CETA) and the Agricultural College Medji of Sékou (LAMS), attached to the Ministry of Technical Education and Vocational Training (Ogoudedji, 2006).

The curricula of the Colleges of Technical Agricultural Education (CETA) and the Agricultural College Medji of Sékou (LAMS) are developed in a participatory way by the Ministry of Technical Education and Vocational Training (METFP), the Ministry of Agriculture, Livestock and Fishing (MAEP), inspectors and teachers.

Teaching at the Colleges of Technical Agricultural Education (CETA) is 25% theoretical and 75% practical. Teaching at the Agricultural College Medji of Sékou (LAMS) is 40% theoretical and 60% practical.

The curricula of the Colleges of Technical Agricultural Education (CETA) and the Agricultural College Medji of Sékou (LAMS) contain subjects related to the following areas:

- Vegetable production
- Livestock production
- Environmental conservation and nature conservation
- Processing
- Equipment
- Economy and management
- General education (French, English, Mathematics, General, Physical and Chemical Sciences)

In **Ethiopia**, the Mid-Level Training (MLT) component of the Agricultural Technical and Vocational Education (ATVET) programme started implementation in 2001/2002. The objective of the MLT component of the ATVET programme is to produce Mid-Level skilled, competent and motivated agricultural practitioners through the provision of pre- and in-service training. Trainees admitted to this programme are students who completed 10th grade and also those already working as frontline extension agents. This training is carried out on boarding basis in 25 colleges distributed over the regional states. Training is provided in five major areas of study, namely:

- Animal Husbandry
- Animal Health
- Crop Production
- Natural Resources Development & Conservation
- Cooperatives Development.

The duration of the training is 3 years (which includes 2 years in school and one year apprenticeship training) aimed at providing practical-intensive training in agriculture. A diploma is awarded to those who successfully complete the training programme. On completion of their studies, graduates are based at Farmer Training Centres (FTCs) and work as trainers for rural school leavers and as general extension agents.

The training is composed of 30 percent theory and 70 percent practice, each complementing and strengthening the other. The development of a positive and desirable attitude toward rural life and development is as important as the acquisition of skills and knowledge. Since the majority of students trained at agricultural colleges will live and work in rural communities, they must be able to communicate with and be accepted by these communities. Such attitudes and motivation are encouraged and developed during training. Though the Mid-Level Training (MLT) is terminal, it provides for the possibility of sequential higher training in the same field. It is also flexible in that it accommodates students who come through the non-formal education system.

In 2001, a task force and discipline-based technical committees were formed to prepare the curriculum framework, structure, and content of the Mid-Level Training (MLT) curriculum of the Agricultural Technical and Vocational Education (ATVET) programme. Based on the larger context of Agricultural Development-Led Industrialization (ADLI) and the New Education and Training Policy (NETP), the task force identified the five broad areas (departments) of training mentioned above. Following a specification of graduate profiles (see Box 2 for an example of one of the graduate profiles), the technical committees developed curricula for 89 courses to be offered under the five departments over a period of three academic years.

Initially, the curricula for the Mid-Level Training (MLT) component of the Agricultural Technical and Vocational Education (ATVET) programme consisted of two sets of course work:

- 32 credits of course work in basic and common courses (Mathematics, English, Computer Application, General Business, Cooperatives, Farm Management, Agricultural Extension and Communication, Physical Education). The basic courses are important to create an adaptable workforce with capacity for sustainable learning over the lifecycle.
- 36-39 credits of course work in each of the five major fields of study.

The skill testing and qualification system has been developed to strengthen practical training and evaluation. The system identified the most essential skills under 65 professional courses; and the corresponding qualification standards and test methods have also been established. After the first year of programme implementation, the theoretical and practical contents of 46 courses have been revised and a new curriculum has been developed. Apart from national and expatriate ATVET

instructors, a number of other resource persons from various stakeholder institutions participated both in the development and revision of the curricula.

Beyond the short- and medium-term objectives of the Mid-Level Training (MLT) component of the Agricultural Technical and Vocational Education (ATVET) programme – i.e. putting in place the physical and human resource required for the training and producing some 55,000 Development Agents (DAs) – however, its long-term future remains uncertain to many who are involved in the implementation of the programme. This remains so even among its core department staff and college principals who participated in the interview-based discussions for the current study. (Alemayehu, 2006)

Box 2: Graduate profile for the Mid-Level Training (MLT) component of the Agricultural Technical and Vocational Education (ATVET) programme in Ethiopia – Natural Resources Development Department

The Natural Resource Development Programme gives basic courses on conservation, development and sustainable use of natural resources including forests, soil, non-timber forest products, alternative energy sources and water harvesting technologies. The programme also offers the courses with more emphasis on the practical skills, water harvesting techniques, irrigation, nursery establishment and alternative energy sources courses.

After successful completion of the training programme in ATVET-Natural Resources Development Programme, the graduates will be able to:

- Prepare a participatory management plan to conserve, develop and sustainably utilize the soil, water resources, forest and wildlife.
- Construct structural and biological soil conservation measures, plant tree seedlings, conserve and manage wildlife.
- Prepare, organize and offer training, give necessary advice to the community members and private investors on the construction of water harvesting devices, ponds, irrigation schemes, spring development, nursery establishment and management, tree plantation establishment and management.
- Organize and offer training on soil and water conservation, forest and non-timber products extraction, processing and marketing and wildlife utilization to community members.
- Demarcate, inventory, estimate and map the natural resources of the communities and indicate these resources on the geographic and cadastre maps based on the interest and collaboration of the surrounding people.
- Apply his/her knowledge and skills to arrange and offer training to junior level work force at the Farmer Training Centres (FTCs).
- Can be employed as Development Agent (DA) at *Kebele*⁶ level and would be responsible for natural resources activities of the kebele.
- Make him/herself ready and aware to proceed for further training at higher education level.

⁶ *Kebele* is the smallest administrative unit in Ethiopia.

The agricultural Basic-Level education in **Mozambique** recruits graduates from the 7th grade (EP2) and lasts three years. The graduation level is equivalent to the first cycle of secondary education, meaning that graduates from Basic-Level are qualified for the Second Cycle of Secondary Education (ESG2). Currently, agricultural Basic-Level comprises four options for specialization:

1. Agriculture: deals specifically with agricultural issues, agricultural practices, stages of crop cycles for all crops grown in Mozambique
2. Farming (livestock and agriculture): combines agriculture and livestock, apart from teaching about crops also deals with the whole process of animal production
3. Agro-mechanics: consists of learning to repair all kind of farming equipment
4. Machinery: graduates should know about the different components that make up farming equipment, their usage and maintenance.

Unfortunately, the curriculum was introduced more than 20 years ago and has not been through any major reviews since then (in fact, the curriculum was reviewed only once to remove subjects such as political education and political economy). The curriculum would need a major reform to satisfy both the graduates expectations and the employment market. The low levels of practical skills are also a major impediment to graduates if they want to pursue self-employment.

Mid-Level agricultural schools in Mozambique offer three main avenues of specialization:

1. Farming
2. Forestry
3. Fauna.

All specializations have a duration of three years. This level recruits 10th grade graduates (students who have completed the First Cycle of General Secondary Education – ESG1), through an admission exam based on general secondary education subjects. This aspect puts technical students in disadvantage during the admission process.

The Mid-Level agriculture curriculum was reviewed twice since it was first introduced in 1982/1983: there was a review in 1994 and another one in 2005 (approved in 2006). The new curriculum is trying to respond to concerns expressed by the agricultural production sector, NGOs and other stakeholders. For example, the agricultural production sector claimed that graduates from agricultural technical schools had very limited computer skills and very little extension knowledge, and other stakeholders found that concepts of food security should be included. Those issues have now indeed been included in the new curriculum. However, two aspects which came up in the consultation process were unfortunately not included at this stage of curriculum review, namely agro-processing and entrepreneurship. The non-

inclusion of these is due to equipment and teacher qualifications constraints. (Givá, 2006)

Post-primary agricultural education and training in **Rwanda** is provided in 22 schools including government schools, government schools sponsored in partnership with the private sector, and private schools.

The post-primary agricultural curricula in Rwanda are currently being reviewed. The proposed curriculum content and teaching load of post-primary agronomic and veterinary professional education are presented in Table 10 and Table 11. The curriculum for the forestry section has not been reviewed. The new curriculum aims at harmonizing course contents and teaching methods of all technical schools while the old one was specific for each school. The new curricula are a major improvement but unfortunately, they do still not emphasize ICTs, entrepreneurial skills, small scale farming, and mathematics and basic sciences such as chemistry and physics. (Ndejuru and Gatali, 2006)

In **Uganda**, “*Comprehensive Secondary Schools*” (sometimes referred to as Vocational Secondary Schools) offer a combination of academic subjects with some skill-oriented subject (agriculture, carpentry and joinery, metal work, technical drawing, home economics, building and construction or computer science). Some Business, Technical, Vocational Education and Training (BTVET) institutions, namely technical schools, farm schools and community polytechnics, admit students who have completed primary education. There are 29 technical/farm schools which have been in existence for many years. They have been offering three year courses using curricula developed by the National Curriculum Development Centre (NCDC) in different subjects, including tropical agriculture. Community polytechnics are new innovations whose establishment is meant to expand and ensure equitable access to quality training for, principally, primary school leavers but also for other individuals in a given community. Communities are expected to actively participate in management, monitoring and utilization of the available facilities which are provided according to their demands. Modularized courses – including agriculture – were developed resulting from a nationwide survey of the courses demanded by different communities. A community polytechnic may select from these any course(s) desirable to the community in that area.

Table 10: Proposed curriculum content and teaching load of post-primary agronomic professional education in Rwanda (based on data from NCDC)

Subjects	4th year	5th year	6th year	Total (hours)
	25 weeks	25 weeks	17 weeks	67 weeks
General courses				
Mathematics	3	3	0	150
French	2	2	2	134
English	2	2	2	134
Chemistry	2	1	0	75
Physics	2	1	0	75
Physical education	1	1	1	67
Political education	1	1	1	67
Religious education or ethics	1	1	1	67
Computer science	0	0	1	17
Total	14	12	8	786
Professional courses				
Special agriculture	4	8	12	504
Animal husbandry	4	3	5	260
Agricultural economics	2	3	2	159
Plant protection	0	3	4	143
General agriculture	5	0	0	125
Pedology and fertilization	5	0	0	125
Rural hydraulics	0	4	0	100
Agricultural extension and education	0	1	4	93
Agricultural products processing	0	3	0	75
Rural construction	0	3	0	75
Agricultural mechanization	0	0	4	68
Ecology	2	0	0	50
Plant biology	2	0	0	50
Topography	2	0	0	50
Deontology and legislation	0	0	1	17
Total	26	28	32	1,894
Field days (hours)	200	200	120	520
Professional training (hours)	0	0	400	400
TOTAL	40	40	40	3,600

Table 11: Proposed curriculum content and teaching load of post-primary veterinary professional education in Rwanda

Subjects	4th year	5th year	6th year	Total (hours)
	26 weeks	27 weeks	18 weeks	71 weeks
General courses				
Mathematics	3	3	0	159
French	2	2	2	142
English	2	2	2	142
Chemistry	2	1	0	79
Physics	2	1	0	79
Physical education	1	1	1	71
Political education	1	1	1	71
Religious education or ethics	1	1	1	71
Computer science	0	0	1	18
Total	14	12	8	832
Professional courses				
Veterinary medicine	0	7	15	459
Animal husbandry	3	4	3	240
Firm conception and management	2	3	1	151
Microbiology and infectious pathology	1	3	2	143
Hygiene and animal products industry	1	2	2	116
Animal nutrition	2	2	0	106
Anatomy and physiology	4	0	0	104
Pharmacology and toxicology	4	0	0	104
Extension and education	0	1	4	99
Entomology, parasitology	1	1	2	89
Surgery and pathology	0	3	0	81
General agriculture	3	0	0	78
Semiotics	3	0	0	78
Obstetrics	0	2	1	72
General pathology	2	0	0	52
Deontology and legislation	0	0	2	36
Total	26	28	32	2,008
Professional training (hours)	0	0	400	400
Field days (hours)	160	120	80	360
TOTAL	40	40	40	3,600

3.2.3 Other forms of post-primary agricultural education and training

Overview

Various delivery paths of post-primary agricultural education and training exist beyond the formal education system and play an ever-increasing role. Most of these other forms of post-primary agricultural education and training are very practical in nature and put less emphasis on theoretic lessons than more formal programmes.

There are young people who may be better helped by being relieved from formal learning and allowed to experiment through alternative learning methodologies. In fact, where upper-secondary education has created partnerships with non-formal vocational skills providers, such alternatives seem to be potentially able to break circuits of educational failure, poverty and exclusion. The great potential of some of these alternative delivery mechanisms and learning systems is still to be fully exploited. (Dada et al., 2006)

A noteworthy innovation is the provision of micro-credit by providers of post-primary agricultural training, which helps graduated trainees to start-up their own agriculture-related businesses after training.

In **Benin**, the Centres of Rural Promotion (CPR) and Centres for the Promotion of Rural Women (CPFWR) – which depend on Regional Centres for Agricultural Promotion (CeRPA) under the supervision of the Ministry of Agriculture, Livestock and Fishing – accommodate young men and women who have completed primary education. Training at these centres lasts for 18 months, after which trainees receive a certificate. On-demand short term training is also being offered at the centres. There are currently 22 functional centres with a total capacity of 660 students, but only 390 places are currently occupied, mostly due to the high school costs. Training at these centres is 95% practical and 5% theoretical. Before the curricular reform in 2003, training was 75% practical and 25% theoretical.

At the Centre for the Promotion of Rural Women of Ouémé (CPFRO) of Kouti for example, the training comprises of three steps:

1. Eleven (11) months general training
2. A one-month training orientation course. At the end of this course, trainees choose their topic for specialization.
3. Six (6) months specialized training.

The curriculum at the Centre for the Promotion of Rural Women of Ouémé (CPFRO) of Kouti puts emphasis on the following areas:

- Processing of agricultural products
- Crafts: Knitting, weaving, braiding
- Vegetable production
- Agricultural business management
- Livestock production

After the training, alumni are invited for refresher courses once a year. (Ogoudedji, 2006)

Also in Benin, Songhaï Centre is a centre for training, for production, research and development of sustainable agricultural practices. It is a private initiative. Songhaï Centre seeks to augment the standard of living of Africa's populations using the following methods for the creation of viable agricultural enterprises:

- Through the use of local resources, traditional and modern methods
- Through the hybridization of traditional and modern agricultural practices
- Through the instruction and implementation of effective management
- Through the encouragement of individual and communal responsibility and initiatives
- Through the inclusion of diverse opinions.

The three fundamental principles of training in Songhaï are:

1. To create the desire in youth, underprivileged groups, and women to participate in entrepreneurial activities and in so doing empower themselves. To teach them values, which will lead to a change of attitude will thus make them agents of their own development.
2. To improve trainees' skills in the areas of analysis and socio-economic awareness, coordination, leadership, organization and management of sustainable community development activities.
3. To teach "know-how" for the student in farming: in agriculture, animal husbandry, fish farming, processing, marketing, craft industry, and business management through productive and profitable learning workshops. And for the student in mechanics, teach on welding, turning, tinsplate, foundry..

At Songhaï, there are 3 levels of training:

1. Level I (basic training): Students are trained in techniques of agricultural production, in agro-industry and in management of agricultural enterprises through the Songhaï production workshops. Underlying all training is the basic philosophy of moral and ethical development (taking responsibility,

courage, family and community values, etc). Training is in three stages: (i) a common-core training, (ii) a specialization stage, and (iii) a practical period preceding the creation of the student's own farm:

- i. Stage 1: Duration of 9 months, during which the trainees work in all areas of the farm.
 - ii. Stage 2: Initiation continues, along with the learning of techniques, knowledge and skills, progressing towards self-sufficiency. The students, based on their ability, choose a maximum of 3 workshops. This stage also lasts 9 months and is followed by a training period aimed at allowing the student familiarize himself or herself with the realities of his or her natural surroundings.
 - iii. Stage 3: Practical Stage. Students are trained in management and decision analysis. The top five students in each set, set up individual projects that can be implemented in 6 to 12 months. The projects are fully financed by Songhaï but managed by the students. Students have to pay back the initial capital investment. The students ranked 6th to 9th are each put in charge of 4 groups into which the remaining students are distributed. They carry out at least 2 activities in one of the practical workshops in Songhaï.
2. Level II: This involves continued training and collaboration with the students in creation and management of an agricultural enterprise (write-up and follow-up of personal documents required for setting up a business) through the application of what has been learnt at level I on the farms. This stage allows the young farmers to validate their entrepreneurial skills with a Certificate after 1 or 2 years on the field. They are visited every month or every quarter by the facilitators of the Songhaï network who offer them support at all levels (technical, organizational, planning, management, accounting, local installation, and moral). Financial support is given to some to enable their farms to become real pillars of success – capable of engendering respect and drawing the attention of the surrounding populations to the new type of agriculture.
 3. Level III: This level aims at empowering African executives so that, beyond their personal businesses, they may also become entrepreneurs in development. Its goal is to render them capable of encouraging and training their communities to seize new opportunities and to develop an economic mindset, taking into account all the variables of a particular setting. This training is not only for the executive officers of Songhaï, but also for young farmers with 2 to 3 years of experience, executives of NGOs, officials of the State, private entrepreneurs, project managers, etc. Based on the principle of research-action, the training is of a modular type centered around 3 main facets: becoming an economic leader, a training manager, and an agent of development.

Apart from the training of young farmers, the following training courses and modules are also available to the public:

- Market gardening, subsistence farming, fruit farming and forest management
- Animal production
- Fish farming
- Agricultural food processing
- Accounts management
- Raising of small animals
- Craft industry
- Renewable energy – biogas production
- Mechanization
- Marketing
- Establishment of agricultural and off-farm businesses

In **Burkina Faso**, Rural Promotion Centres (CPRs) organize vocational training of rural youth in agriculture, animal husbandry and cottage industry and assist them to set up their own businesses. Two types of training are on offer, namely long-term training lasting one year and short-term modular training for advanced skills and specialization. Modules and training hours at CPRs are summarized in Table 12.

Table 12: Modules at Rural Promotion Centres in Burkina Faso (Zonon, 2006)

Module	Hours allocated
Livestock	90h
Arboriculture	80h
Specialized agriculture	80h
Civics	70h
Cooperation	62h
Gardening	62h
Management	60h
Mechanization	60h
Fish livestock	40h
General agriculture	40h
Micro-projects	40h
Sports, Seasonal work, Permanent work, Field visits, Review and evaluation, Cultural activities	not determined

Although the physical design of the 15,000 Farmer Training Centres (FTCs) in **Ethiopia** has been completed, only between a third and half of them have been actually constructed. Even where completed, most facilities are quite rudimentary: budget limitations have constrained the provision of furniture, equipment, and other supplies. None of the FTCs has started operations as envisaged under the Junior-Level Training (JLT) component of the Agricultural Technical and Vocational Education (ATVET) programme. (Alemayehu, 2006; World Bank, 2006)

Trainees admitted to this programme will be young farmers who completed grade 8 or lower education level. The training will be carried out on non-boarding basis in all available Farmers Training Centers (FTCs). As FTCs are centers for training and demonstrations, it is planned to establish one FTC in each Peasants Association (PA) over the programme period. At each FTC, three ATVET graduates, one graduate each from Crop Science, Animal Science and Natural Resources Development disciplines, will be assigned as instructors. The training programme would be demand-driven to the extent that it is the trainee who decides on the nature and scope of the training. A training menu has been prepared for 26 job titles or occupational areas focusing on crop production, animal husbandry and natural resources development in which rural school leavers will be trained. The training is modular and would take 3 to 6 months, depending on the type of module. In terms of time allocation, the training will be provided on the basis of 80% practice and 20% theory. A "*Green Certificate*" will be awarded to farmer trainees upon completion of the training in a specific field of farm activity, which will certify the farmer for having acquired the required knowledge and skill in that particular field of activity. FTCs are expected to evolve into basic rural institutions for planning and implementation of numerous demand-driven development activities, including:

- Specialized skill training in modern farming techniques
- Providing agricultural extension services
- Provision of computer and telephone services
- Provision of information on input and output markets, entrepreneurship, meteorological conditions, quality and standards
- Serving as permanent exhibition centers.

FAO is working with WFP, UNICEF, NGOs and local institutions to establish **Junior Farmer Field and Life Schools** for children and young people in response to the growing numbers of AIDS orphans in the Southern Africa region. These schools aim to share agricultural knowledge, business skills and life skills with children between 12 and 18 years of age. In **Mozambique** for example, a Junior Farmer Field and Life Schools programme (see Box 3) was developed within the framework of a FAO, WFP, Ministry of Agriculture (MINAG) and Ministry of Education and Culture (MEC) partnership. (Givá, 2006)

Box 3: Junior Farmer Field and Life Schools in Mozambique (Givá, 2006)

The philosophy of the Junior Farmer Field and Life Schools programme was borrowed from two approaches: Farmer Field Schools (FFS) and Farmer Life Schools (FLS).

FFS was developed in Indonesia and facilitated by FAO and it is a dynamic learning and discovery process for helping adult farmers to better understand agro-ecologic concepts and their practical application. FLS was developed in Cambodia and facilitated by FAO and UNDP in order to assist FFS trained farmers for understanding health and life aspects and its relations with agricultural production.

In Mozambique (and other pilot countries), the two approaches have been combined and used in a different context: the focus is on the life quality of young farmers, households and communities. The programme targets orphaned and vulnerable children from 12 to 17 years old and support them in and outside schools. Initially the programme benefited 100 orphans and vulnerable children in four open centers, one in Manica and three in Sofala. The programme has now expanded to 28 districts, directly benefiting 1,000 children in the same provinces.



Picture 1: Junior Farmer Field and Life School in Mozambique

In the process, farmers analyze human ecosystems, looking at socio-economic factors that can be affected by disease, education level, HIV/AIDS and other types of vulnerability. In addition, the approach helps farmers to identify their own problems as well as the solutions in the local context.

The schools operate in the field, without physical structure in an informal education environment. Each school has 30 children and 3 facilitators, using an integrated curriculum, designed for a one-year programme with flexible content. Therefore, topics can be changed according to the specific needs as locally identified. For instance, the planned topic for a week can be tropical fruits, but in that week the community starts experiencing cholera problems, and thus, the week's programme will change and focus on aspects related to cholera prevention.

The curriculum consists basically of two components: farming and life skills. The curriculum content is structured in four main areas:

1. Agriculture, livestock, forestry, fruit production
2. Culture, social and sport animation
3. Protection, general education and basic children rights
4. Business skills.

During the learning process children follow the whole crop and animal raising cycle, looking also at management aspects that can constitute a risk for their life quality and that can compromise their future work. Children attend classes three

days a week. In the field they observe and take notes of everything they see. After that, they present what they have observed (they are oriented to look at every detail: plant growth, insects, diseases, weeds, infestation level, soil conditions, natural enemies, ratio between pests and natural enemies, temperature, etc.) and together with the facilitator they analyze, identify problems and discuss relevant issues. Finally, they search for the problem's solution and make decisions. In the whole process they apply participatory teaching methods and various games for keeping them active and interested.

The biggest challenge of the programme is to guarantee right interpretation of the curriculum, proper application of the work plan and usage of appropriate learning methodologies, which require qualified facilitators capable of interpreting and conducting the process correctly. Therefore, the replication of the project throughout the country will depend on the capacity of training facilitators as well as on financial resources.

The costs of the 2004/05 Junior Farmer Field and Life Schools programme were about US\$200 USD per child; in 2006 the target is to half this cost per child. In order to achieve this, several changes are taking place in 2006: the amount of inputs is reduced through decreasing plots sizes from 1,000 m² to 100 m² for cereals and from 400 m² to 50 m² for vegetables, the number of facilitators is reduced from three to two facilitators per school, there is a shift from chemical to organic inputs and the number of crops to grow is reduced.

3.3 Enrolment in post-primary agricultural education and training in sub-Saharan Africa

Overview

Due to the very diverse offer of post-primary agricultural education and training in sub-Saharan Africa, no data exist which give a complete overview of enrolment numbers and their evolution over time.

Enrolment in post-primary agricultural education and training has been increasing in recent years in some cases in some countries in sub-Saharan Africa (e.g. Benin, Ethiopia, Mozambique), while it has been stable or decreasing in other countries.

In **Benin**, the maximum enrolment numbers at the three Colleges of Technical Agricultural Education (CETA) and the Agricultural College Medji of Sékou (LAMS) are fixed at 960 and 1400 students respectively. This translates into a potential number of graduates of 240 for the Colleges of Technical Agricultural Education

(CETA) and 350 for the Agricultural College Medji of Sékou (LAMS) annually. Current enrolment rates are about 90% for the Colleges of Technical Agricultural Education (CETA) and 110% for the Agricultural College Medji of Sékou (LAMS). The number of graduates from these post-primary agricultural education institutions in Benin has significantly increased in recent years. The number of graduates from the three Colleges of Technical Agricultural Education (CETA) was doubled in 2002 from 120 to 240 per year. The Agricultural College Medji of Sékou (LAMS) had 40 graduates in 1998, 80 in 2000, 120 in 2001, 250 in 2002 and 350 at present. These numbers however do not give any indication about the training needs of farmers, because only about 10% of the graduates from the three Colleges of Technical Agricultural Education (CETA) venture into farming and about 75% of the students at the Agricultural College Medji of Sékou (LAMS) are civil servants. (Hyl and Bosio, 2002; Ogoudedji, 2006)

In **Burkina Faso**, enrolment numbers at the private agricultural college of Nanoro have been decreasing in recent years because of lack of job prospects for graduates of the college. (Zonon, 2006)

Over the past five years of Agricultural Technical and Vocational Education (ATVET) programme implementation in **Ethiopia**, enrolment has increased from 12,000 in 2001/2002 to almost 37,000 (out of which 91% are male students and only 9% are female students) at present (Table 13). Up to now, more than 34,000 students have graduated from the Agricultural Technical and Vocational Education (ATVET) programme (Table 14). If trends in number of enrolments and graduates over the first four years (2001/02 – 2005/06) continue, the programme is likely to exceed the target of producing 55,000 Development Agents (DAs) by the year 2007/08 – when the current first year students are expected to graduate.

Table 13: Enrolment numbers in the Mid-Level Agricultural Technical and Vocational Education (ATVET) programme in Ethiopia (Alemayehu, 2006)

Department	Year / number of students					
	2001 2002	2002 2003	2003 2004	2004 2005	2005 2006	Total
Animal Science	N/A	8,498	11,588	12,745	10,356	43,187
Plant Science	N/A	8,819	12,035	13,191	9,738	43,783
Natural Resources	N/A	8,234	11,629	13,325	9,994	43,182
Cooperatives	N/A	677	888	1,122	3,040	5,727
Animal Health	N/A	1,125	1,439	3,239	3,677	9,480
Total	12,000	27,353	37,579	43,622	36,805	145,359

Table 14: Number of graduates from the Mid-Level Agricultural Technical and Vocational Education (ATVET) programme in Ethiopia (Alemayehu, 2006)

Department	Year / number of graduates			
	2004	2005	2006	Total
Animal Science	3,104	3,893	3,507	10,504
Plant Science	3,508	4,680	3,229	11,417
Natural Resources	2,257	4,353	3,463	10,073
Cooperatives	211	408	277	896
Animal Health	354	669	361	1,384
Total	9,434	14,003	10,837	34,274

In **Kenya**, the number of students choosing Agriculture as a subject in general secondary schools has remained constant at around 100,000 since 1990. However, given the increase in the number of secondary school students since 1990, the proportion of students choosing agriculture has decreased from about 50% in the early 1990s to about 40% today. (Mwiria, 2005; Ngesa, 2006)

The number of students graduating from Mid-Level agricultural institutes in **Mozambique** has been increasing gradually in recent years (Table 15). In addition, Chókwè Agricultural Institute started offering Mid-Level courses in 2005. (Givá, 2006)

Table 15: Number of graduates from Mid-Level agricultural institutes in Mozambique (1998-2004) (Gêmo, 2004)

Institution	Course	1998	1999	2000	2001	2002	2003	2004	Total
Boane	Agriculture	38	37	35	32	45	58	49	294
Chimoio	Agriculture	26	33	38	33	46	40	59	275
Chimoio	Forestry	10	8	19	11	15	8	10	81
Chimoio	Wildlife	-	-	-	-	-	-	14	14
Total		74	78	92	76	106	106	132	664

It is unclear whether enrolment in agricultural and veterinary secondary schools in **Rwanda** is increasing or decreasing. According to the majority of the respondents (39%) in a survey by Ndejuru and Gatali (2006), enrolment is increasing despite the recent changes in recruitment policy within the Rwandan public service. Other respondents however felt that enrolments are decreasing (29%) or stagnant (8%) or had no information (25%).

3.4 Costs and financing of post-primary agricultural education and training in sub-Saharan Africa

Overview

There is currently a serious lack of relevant data and information about the costs of post-primary agricultural education and training in sub-Saharan Africa. There is a great variation between countries and programmes as available data suggest that recurrent costs per student per year vary between US\$150 and US\$600. In some countries (like Benin and Ethiopia), these costs are covered mainly by contributions of the government, while in other countries (like Rwanda), the costs are largely covered by school fees.

At the Colleges of Technical Agricultural Education (CETA) in **Benin**, the government spends around US\$300 per student per year (for students who got scholarships from the government). At the Agricultural College Medji of Sékou (LAMS), the costs for the government are approximately US\$550 per student per year. (Ogoudedji, 2006)

Financing of the Centres of Rural Promotion (CPR) and Centres for the Promotion of Rural Women (CPFR) in Benin is problematic. They depend on the goodwill of NGOs and local projects.

At the private Songhaï Centre in Benin, funds are collected from the sale of Songhaï's own products as well as grants from various partners. Most of Songhaï's resources are used to finance production activities while a small portion is allocated to administrative expenses. The ongoing objective is to attain 100% financial independence. Songhaï is an institution which seeks to exist via its own efforts and which finances its programs primarily from revenues generated by its own activities. In addition to the internally generated funds, several partners support Songhaï's investment projects.

In **Burkina Faso**, professional and technical training centres have opened up to private applicants who meet the entry requirements. The school fees paid by privately sponsored students are between US\$300 and US\$600 per year. This could be an indication of the annual recurrent costs per student.

In **Ethiopia**, cost effectiveness of the Agricultural Technical and Vocational Education (ATVET) programme was examined in terms of recurrent costs per student. The annual recurrent cost (food, accommodation, salary) is estimated at US\$10.3 million (MOARD, 2005). Considering a student enrolment of 43,622 in 2004/05, the annual

recurrent cost per student would be around US\$240, which is considerably lower than the estimated cost of similar training programmes operating elsewhere in the country – around US\$460 at the Nazareth College of Technical Teacher Education and approximately US\$570 at the Faculty of Dryland Agriculture and Natural Resources of Mekelle University (Alemayehu, 2006). According to World Bank (2006), US\$30 million is currently being spent annually on the ATVET programme, which translates into a total (recurrent and investment) cost of around US\$690 per student.

In **Mozambique**, the entire TVET system is seriously under-resourced. In 2003, the government spent 0.2% of GDP or 2.3% percent of the education budget on TVET institutions. Unit spending in public schools (both formal and non formal) is among the lowest in sub-Saharan Africa, negatively affecting the quality of training and capacity utilization. The unit costs of training – calculated as overall recurrent expenditure divided by number of students enrolled – are estimated at between US\$100 and US\$250 per student per year.

Per student household expenditure on TVET institutions is substantial in Mozambique: annual average per student expenditure is around US\$120 at the basic level and US\$290 at the medium level – making up for slightly more than half the of the total unit cost of TVET. (World Bank, 2004; World Bank, 2005)

The government allocated about US\$175 per student to the Boane Agricultural Institute (one of the Mid-Level agricultural schools) in 2004/05 to cover part of the operational costs such as water and electricity, students' accommodation and food, maintenance and repair of buildings and equipment, travel, fuel and lubricants, stationery, communication and insurance. The institute was however only able to spend slightly more than half of that available budget due to the complexity of the disbursement and financial control systems. (Givá, 2006)

As mentioned in Box 3, the costs of the 2004/05 Junior Farmer Field and Life Schools programme in Mozambique were about US\$200 per child; in 2006 the target is to half this cost per child. In order to achieve this, several changes are taking place in 2006: the amount of inputs is reduced through decreasing plots sizes from 1,000 m² to 100 m² for cereals and from 400 m² to 50 m² for vegetables, the number of facilitators is reduced from three to two facilitators per school, there is a shift from chemical to organic inputs and the number of crops to be grown is reduced.

In **Rwanda**, the government budgets about US\$15 per post-primary agricultural education student per year for meals. For other expenses, the schools rely on school fees. At the Agricultural and Veterinary School (EAV) of Kabutare, school fees are about US\$130 per year. The school fees are supposed to cover allowances for teachers, salaries of other staff, teaching aids, office materials, laboratory equipment, school farm inputs, field trips and local travel, books and library, water, electricity, maintenance and insurance. Strangely enough, these school fees are considered to

be high by school directors, teachers, extension agents and NGOs, but acceptable by students and parents! (Ndejuru and Gatali, 2006)

3.5 Teachers and trainers in post-primary agricultural education and training in sub-Saharan Africa

Overview

Teachers, trainers, facilitators and other educators are the key to effective learning and relevant post-primary agricultural education and training of good quality. Effective training and successful educational innovation lie largely with the teacher or trainer, as the interpreter and deliverer of the curriculum. Unfortunately, agricultural teachers and trainers are often inadequately prepared, trained, supervised and supported in their work. Teachers can not be blamed for their poor performance: pre-service and in-service training are in most cases unsatisfactory.

The many technicalities and skills involved in teaching of agriculture require specialized training and appropriate teaching and learning support materials. Equally important are the actual training methods used in pre-service and in-service teacher training. While lecturing and rote-memorizing is nowadays discouraged in principle, most training of trainers and teachers is still done in exactly that way. Teacher students are lectured, take some notes and regurgitate these in examinations. In fact, it would be naive to expect them to do otherwise with their learners, though much lip-service is paid to student-centred and experiential teaching and learning methods in curricula.

Most countries in sub-Saharan Africa still have severe problems in adequately staffing post-primary agricultural education and training. Staff turnover is generally high. Agricultural teachers and trainers need to receive incentives and be evaluated according to their work so as to allow for promotion possibilities. Governments and institutions also need to motivate post-primary agricultural education and training staff by providing adequate resources for them to keep informed of advances and developments in their specific disciplines. Involvement with research activities and development projects is also needed for staff to keep in contact with practical developments in their fields.

3.5.1 Pre-service teacher training

Mokgatle and Acker (2002) identified the induction support needs of beginning agriculture teachers in community Junior Secondary Schools in **Botswana**. Among the forms of induction support perceived by beginning teachers as important were:

- A mentor teacher
- Opportunity to observe other teachers teaching
- Feedback from the school head/senior teacher
- Provision of induction support throughout the first year of teaching.

The findings of this study also revealed that the forms of induction assistance that were offered most frequently were those that the beginning teachers did not perceive as important. The forms of assistance that were perceived by teachers to be of major or critical importance did not occur at all or occurred infrequently. The most fundamental forms of support needs were not being met, such as provision of a mentor teacher, evaluation feedback, lesson observations, reduced workload, beginning teachers handbook, in-service training on time management and most importantly, provision of continued support throughout the first year of teaching.

In **Ethiopia**, there are well over 1,000 lecturers at the Agricultural Technical and Vocational Education (ATVET) colleges of whom about 5 percent are expatriates, mainly Chinese nationals who support local instructors in transferring practical skills to the trainees and providing advisory services in programme development. In terms of teacher-student ratios, ATVET colleges are most probably in a far better position than other training institutions in Ethiopia. The quality of the teaching staff, however, leaves much to be desired. The indicators that are commonly mentioned to explain the inadequacy of the ATVET programme in teacher quality include (Alemayehu, 2006):

- Looking at the educational qualifications, more than 90% of both local and expatriate teachers are first degree or diploma holders.
- Most local teachers are products of the university-based education system that puts a premium on the mastery of technical facts rather than on organizing and effecting practical skills training in agriculture.
- The high rate of teacher attrition has posed a setback for the colleges to build their human resource capacity in terms of maintaining increasing number of teachers with the requisite experience in more interactive learning and participatory teaching methods and utilizing a greater variety of training methods. It was reported that between 250 and 350 new graduates are recruited annually just to replace those leaving their teaching posts.

As a means of maintaining a critical minimum number of qualified and experienced teachers and attracting new teachers, the ATVET programme has institutionalized a staff development scheme. Under this scheme, a considerable number of teachers

have been given the opportunity of pursuing post-graduate studies in agricultural universities and to participate in in-service training to improve their training skills. Yet, high staff turnover remains a major bottleneck to providing quality training in the ATVET colleges in Ethiopia.

In **Kenya**, teachers of secondary school Agriculture are trained at Egerton University and Kagumo Teachers' College. Egerton University offers Diploma in Agricultural Education and Extension, BSc in Agricultural Education and Extension. It also offers Masters and Doctoral degrees in Agricultural Education. Kagumo Teachers' College offers a Teachers' Education Diploma, with various specializations. Egerton University also provides a Post-Graduate Diploma in Education to professionals who have university degrees in agriculture, but lack professional education training. The University of Nairobi has also recently started a Degree programme in Agricultural Education and Extension.

Of the secondary school Agriculture teachers who were included in the study by Ngesa (2006), 24% had a Diploma in Agricultural Education and Extension, 17% had a Bachelors of Science Degree in Agricultural Education and Extension and 17% had a Diploma in Agriculture. Another 7% had a Post-Graduate Diploma in Education. Professional agricultural education graduates are therefore estimated at less than 50% of the teachers currently teaching Agriculture in secondary schools. This is perhaps one of the reasons why most of the teachers of Agriculture make only limited use of the school farm, hardly collect, prepare and use local materials for the teaching of agriculture, and rarely use learner-based practical instructional models.

In **Mozambique**, the majority of teachers at Basic-Level agricultural schools have been trained at general teacher training colleges and don't have any background in agriculture. This group teaches general subjects. Technical subjects are taught by teachers graduated from a Mid-Level agricultural college.

Teachers at the Mid-Level agricultural schools in Mozambique must be BSc Degree holders, a requirement which in most cases however is very hard to follow. Alternatively, the Ministry of Education and Culture (MEC) contracts unqualified teachers with long experience in agriculture or they try to provide short-term training through some projects.

This shortage of qualified teachers in Mozambique is expected to get worse for various reasons:

1. Economic growth has created new opportunities and many teachers leave the education sector for better paid jobs
2. Many teachers – including recently trained ones – accept non-teaching posts within the education system itself, in administrative areas in the provincial and district directorates.

Teacher motivation and quality are essential to good learning processes. Instruction tends to focus on the teacher rather than the learner, and thus gives pupils limited opportunity to apply and reflect on concepts. Many teachers do not know their subjects and lack the necessary skills for ensuring effective learning. In-service teacher upgrading programs have been launched, but their coverage is limited and conditions in schools hamper the application of new teaching strategies.

To compensate for the lack of teachers, class sizes and the number of shifts (especially in urban areas) have been increased resulting in student/teacher ratios of 60/1 to 68/1, and in some cases 80/1. (Givá, 2006)

The majority of the teachers in the Agricultural and Veterinary Schools (EAVs) in **Rwanda** received an A1 education. Only a small minority has an A0 level. There are doubts about the adequacy and relevance of teacher training in Rwanda. The majority of the teachers are trained at universities; however some of the teachers come from technical schools. The demand for qualified teachers of agriculture is very high. (Ndejuru and Gatali, 2006)

3.5.2 In-service training and support of teachers and trainers

In **Benin**, inspection of teachers at the agricultural colleges is looking at the following aspects (Ogoudedji, 2006):

- Conditions of the farm
- Planning of the teacher
- Pedagogy of the teacher
- Exercise books of the pupils
- Teacher production records

In **Kenya**, in-service teacher training and school inspection are generally weak. The inspection guidelines are general in nature, and therefore, are not specific to Agriculture as a subject in secondary school. The uniqueness of the subject – particularly in the use of school farms and the emphasis on learner-based instructional methods – are not captured during inspection. There are only a limited number of trained Agriculture teachers deployed at the Directorate of Quality Assurance and Standards. There is no structured in-service training available for teachers of Agriculture. The only in-service training programme currently available is for Mathematics and Science teachers. Agriculture teachers also attend these in-service training programmes as they also teach Science subjects, particularly Biology. This is an area that deserves urgent attention as new models of teaching Agriculture keep emerging. (Ngesa, 2006)

In **Mozambique**, in-service teacher training is not a common practice. The pedagogical deputy is responsible to check if the content has been taught. Another aspect assessed is whether the teacher is capable of involving students actively and whether he is using all available resources to enhance learning and teaching strategies. (Givá, 2006)

A distance learning programme for agricultural development has been piloted in some countries in **Eastern and Southern Africa**. The Commonwealth of Learning (COL) and the In-Service Training Trust (ISTT), Lusaka, Zambia initiated in 2001 a programme for agricultural extension agents in Eastern and Southern Africa to develop and deliver (print-based) distance learning materials. Specific objectives of the programme were to (Zachman et al., 2005):

- Train agricultural researchers, educators, and extension workers from governmental and non-governmental organizations in the production and use of distance learning materials aimed at frontline extension officers
- Produce a set of distance learning materials and cowpea and soybean as examples
- Introduce the materials in selected countries and support their delivery
- Verify the relevance of distance learning for agricultural development

Four collaborating institutions in Namibia, Tanzania, Uganda and Zambia recruited 20 learners each and conducted a pilot implementation of the distance learning programme. At several stages, the distance learning programme included residential training sessions, field exercises, and visits with farmers. In spite of logistical challenges with the distribution of materials and initial difficulties with learner support, in general, learners reacted enthusiastically. Conclusions from this pilot implementation include (Zachman et al., 2005):

- Distance learning is relevant and valuable for continued education of frontline extension officers, who otherwise would not have an opportunity to be updated scientifically and technically.
- Modern information and communication technologies (ICTs) are still out of reach in many places, access to additional reading is limited for most learners and Internet availability is difficult and costly.
- Certain distance learning units require specific adjustments. Field exercises and visits encouraged frequent interaction with farmers, which is often deficient.

3.5.3 Teacher and trainer turnover

Although **Botswana** has taken great strides in building the image of agricultural education, and training of teachers, the country is continuously faced with the shortage of agriculture teachers in secondary schools. This is not because there are few teachers graduating from institutions but because there is a significant proportion of teachers leaving from their teaching positions to join other job opportunities. A study by Mojaphoko (1999) revealed that the reasons for the attrition of agriculture teachers in Botswana secondary schools were:

- Remuneration factors:
 - No allowance paid to agriculture teachers for working after hours
 - Lack of benefits
 - Salary is low
 - Pay criteria used by teaching service are not appropriate
- Working conditions:
 - There are attractive conditions of service in other sectors of the economy
 - Class sizes are not ideal for teaching practical agriculture
 - Heavy teaching loads
 - Insufficient resources for teaching agriculture
- Advancement factors:
 - There is high demand of agriculture teachers in other sectors
 - There are limited opportunities for further studies
 - Lack of promotion

A study by Phenethi (1995) on the turnover of agriculture teachers in secondary and high schools of **Lesotho** found that major factors associated with turnover of agriculture teachers in secondary and high schools in Lesotho include the following:

- Lack of involvement of teachers in decision making
- Lack of support for teachers
- Poor working relationships between agriculture teachers and headteachers
- Limited mobility in teaching service
- Discriminatory practices against promotion
- High demand to attend class activities after normal working hours
- Headteachers failure to recognize outstanding performance of teachers
- Lack of in-service training for agriculture
- No provision for agricultural supplies and equipment by school administration
- Attractive conditions of service in other sectors of the economy

Similarly, Lukhele (1989) found the following major reasons for turnover of secondary school teachers in Swaziland:

- Inadequate career ladders
- Inadequate salary
- Attractive terms and conditions of service in the private sector

3.6 Teaching and learning methods used in post-primary agricultural education and training in sub-Saharan Africa

Overview

Agricultural education and training is special in comparison with other forms of education and training in that agriculture cannot be learned solely in the field nor solely in the classroom. Practical training – such as traditional apprenticeship training – should ideally be complemented by more formal learning to enable many aspects of agriculture and rural development to be seen in their true perspective.

Although post-primary agricultural education and training has been in existing for many years, teaching and training methods are still far from satisfactory. Teaching and training methods are largely focused on transferring knowledge which is judged to be useful in examinations. Most of the information is merely memorized and learners do precisely what they are told by their teachers or trainers.

Even where practical training is included as part of the teaching and learning processes, there are several challenges. In many cases, supervision and management of practical training is very poor. Learners are left alone without any guidance, little or no demonstrations or explanations are given by teachers or trainers during farm work and farm work is not linked with academic subjects⁷.

Some curricula and teaching and learning support materials resemble simplified versions of curricula of post-secondary and higher agricultural education and training institutes. Little help is given in appropriate teaching and learning methods for post-primary agricultural education and training.

⁷ Note that Riedmiller and Mades (1991) made similar observations related to Primary School Agriculture (PSA) in sub-Saharan Africa.

At the Agricultural Technical and Vocational Education (ATVET) colleges in **Ethiopia**, the most common ways of teaching agriculture range from formal lectures to practical classes on nearby farms and fields. Experienced teachers employ several methods in a single presentation, and are actively encouraged to do so by their curriculum guide. ATVET college instructors commonly use a combination of two or more types of teaching methods: lectures, discussions, demonstrations, field trips and assignments.

According to information that the ATVET project office obtained from college instructors, it was found that lecturing as a teaching method (Alemayehu, 2006):

- Is the most commonly used teaching method
- Is as effective as other methods for imparting knowledge up to comprehension level but less effective for higher cognitive levels
- Is less effective for teaching practical skills than demonstrations and laboratory work
- Is less effective than discussions for changing attitudes.

Many instructors are of the opinion that lecturing has a place in ATVET colleges, but is commonly supplemented by audio-visual aids, blackboard, models, actual objects and materials, and flipcharts

Most ATVET colleges also use group discussions as a teaching and learning method, namely because (Alemayehu, 2006):

- Learning is most effective when individuals participate actively
- Instruction is geared to the level of understanding of the group
- Practical experience of individuals is utilized
- Students are more inclined to do something about a solution that they have helped to formulate.

Typically, the instructor as the discussion leader clearly states the problem to be studied and elaborates it through asking questions. Students then attempt to solve the problem using their knowledge and experience. Data and information are presented as appropriate and evaluated by the students to determine possible alternative solutions. And finally, the group decides the best solutions and recommends follow-up action. Alemayehu (2006) revealed that for agricultural students, the discussion method is most valuable when dealing with problems concerning extension work in the community, and that the in-service trainees (Development Agents or DAs) have a lot to contribute to the discussions.

Demonstrations which combine observation and practice are not often used in ATVET colleges. This is mainly due to:

- The high cost of laboratory work, making it difficult to continue providing facilities and resources to the required standard
- Pressure on meeting overcrowded lecture timetables.
- Many instructors are not familiar with the equipment and methods of demonstration.

Field trips are extensively used as a teaching and learning method in ATVET colleges, particularly in the latter years of the programme. They have proved to be extremely useful in obtaining information and experience that break the routine of class room and practical classes. However, a number of instructors are of the opinion that field trips are not well-planned and scheduled. (Alemayehu, 2006)

Depending on the nature and type of courses offered, giving assignments to students is a common practice in ATVET colleges in Ethiopia. These assignments usually involve literature review and at times interviews or field observation. During a study of literature a student may be assigned, for example, to find out what the most important pulse producing countries are and how their yields compare with the yield in his home country. During such kind of study, students are not expected to undertake sophisticated literature review and write lengthy essays. By doing such kind of activity, students are assisted to learn how to extract facts and figures from books and reports and to prepare a brief written report on their findings. Alternatively, students are required for example to observe and document a dairy farm for a period of time as part of his/her training and to keep records of all that is done. Students can also be asked to collect information from people in a particular village about the kinds and quantities of fertilizers and seeds used. Assignments have become an excellent teaching aid that increases the students' communication skills. (Alemayehu, 2006)

Emphasis on practical training is the hallmark of the ATVET programme. The programme aims at providing quality and relevant practical training through a variety of practical work exercises, college farms, farmers' fields and apprenticeship that provides more comprehensive practical farm work.

Through college farms and farmers' fields, students are given the opportunity of practical training in actual farm operations. Practical training of this nature is fitted into the teaching timetable. All ATVET colleges possess at least 10 hectares of farmland (some colleges apparently have between 400 – 800 hectares of farmland) that they use as an outdoor laboratory.

Practical training on farmers' fields focuses on the teaching of extension in actual field situations. Meeting with farmers and rural community provides an excellent form of extension training. Students get a first hand knowledge of the problems that exist and

have an opportunity to help solve them. During these visits, students use and practice the extension methods and communication skills that they have been taught in class.

Apprenticeship training is a work-based method of learning and is an integral part of and prerequisite for the completion of the Mid-Level Training (MLT) component of the Agricultural Technical and Vocational Education (ATVET). It is based on agreement between ATVET colleges and an employer for the purpose of training of students. The 8-month apprenticeship training is given at agricultural production and service organizations after the trainees have completed two years of their residential training. Apprenticeship training does not only equip students with appropriate skills and enhance their employment opportunities, but it also builds up their working discipline and self-confidence. The full cost of the apprenticeship training, i.e. transportation, food and accommodation, and on-duty clothes, is covered by the ATVET programme. (Alemayehu, 2006)

In **Kenya**, Ngesa (2006) found that a major part of pre-serving training for teachers should be dedicated to selection, preparation and use of teaching and learning materials, skills of planning and teaching, and preparing and administering tests. In the study by Ngesa (2006), students and teachers were asked to indicate the extent to which various teaching and learning methods are used in the teaching of agriculture in secondary schools. A number of observations about the responses of the students were made:

1. There is emphasis on classroom instruction in the teaching of agriculture in schools.
2. Practicals are limited. This confirms the limited use of the school farms for instruction purposes.
3. There is minimal use of resource persons in the teaching of agriculture.
4. There are hardly any visits to local farms, research stations and Farmer Training Centres.
5. Library assignments are used only moderately.

Teachers of Agriculture generally agreed with the students. They indicate that they mostly use lecture, class discussion and group discussion methods. Demonstrations, practicals, experiments, projects and problem-solving are hardly used. Like the responses from students, they also indicated that library assignments are only moderately used.

In various group discussions with agricultural extension personnel and community groups, an attempt was made to determine the nature and degree of their relationships with secondary school Agriculture Departments. It emerged that there are minimal contacts between these groups and secondary school Departments of Agriculture. The recommendations of agricultural extension staff were the following (Ngesa, 2006):

1. Extension personnel could be invited to schools to talk to learners on various agricultural topics.
2. Teachers of agriculture should, as a matter of routine, attend functions organized by the extension service.
3. There should be annual forums for headteachers, Agriculture teachers, District Agricultural Officers and District Livestock Officers and other extension staff where secondary school Agriculture and extension service activities could be discussed and planned.
4. Co-curricular youth clubs should regularly contact agricultural offices for assistance.
5. School farms could be used for agricultural demonstrations for the surrounding communities.

Community members interviewed for the same study (Ngesa, 2006) also felt that there is need for a greater degree of interactions between communities and secondary school Departments of Agriculture. They felt that schools could organize short courses for local farmers and where possible make rare inputs available to the local farmers.

In **Malawi**, the secondary school syllabus for Agriculture not only provides the teacher with content, but also suggests appropriate teaching and learning strategies. These teaching strategies include descriptions, discussions, group work, observations, records and reports, visits, videos, brainstorming, demonstrations, project work and practicals.

The quality of teaching agriculture in technical schools is a concern in **Mozambique**. Poor teacher training, insufficient materials, and lack of pedagogical support, has meant that most teachers rely on teacher-centred didactic methods, emphasizing repetition and memorization over learner-centred approaches that encourage creative thinking and skills-based learning. Teachers are poorly equipped to deal with some of the challenges that the system poses, such as the reality of large class sizes, unavailability of didactic materials, and gender disparities. (Givá, 2006)

In **Rwanda**, theoretical lessons in post-primary agricultural education are sufficient whereas practical lessons are still insufficient; and competitions do not exist in the schools (Ndejuru and Gatali, 2006).

3.7 Teaching and learning support materials for post-primary agricultural education and training in sub-Saharan Africa

Overview

The availability of teaching and learning support materials is among the most important determinants of effectiveness of post-primary agricultural education and training.

Even if teachers are competent and well trained, they often find it difficult to teach effectively because of the lack of adequate teaching and learning support materials that are relevant to the local agricultural situation. In the absence of minimally adequate resource books, equipment, tools and materials, agriculture easily degenerates into being taught theoretically with inadequate attention to practical agricultural and related skills learning.

Several existing teaching and learning support materials do not differentiate sufficiently between the teaching of knowledge, and concepts and skills, which present important pedagogical differences. As opposed to the teaching of factual knowledge, the teaching of concepts and skills, be these scientific, management of production-oriented, is most effective, when taught through concrete examples for detailed application of these concepts and skills. This is essentially the pedagogical justification for project-based and experiential learning. Once measuring of planting distances, observing of plant-growth, checking crops thoroughly for pests and diseases, and calculating yields after harvest, have been done properly for one particular crop, these skills can be transferred to other crops and related situations. In contrast, the memorizing of standard planting distances or fertilizer rates for many crops, or of general principles of agriculture, as required by some syllabi, will give little help in applying this knowledge, when the related skills have not been practiced.

In **Benin**, some didactic materials exist, but they are only available in very limited numbers. The agricultural schools have large farms available (ranging in size from 10 to 100 ha). Agricultural plots and animal houses (see Picture 2, Picture 3, Picture 4 and Picture 5) are used as additional learning resources (Ogoudedji, 2006).



Picture 2: Poultry house (Songhai Centre, Benin)



Picture 3: Rabbit hutch (CETA Ina, Benin)



Picture 4: Ducks (CETA Ina, Benin)



Picture 5: Beehives (CETA Ina, Benin)

Dlamini and Dingwa (2004) showed that challenges in the management of agricultural enterprises (which are considered being important learning resources) in **Botswana** secondary schools relate to:

- Congested agriculture syllabus
- Lack of support by school administration
- Low competence in practical skills by the agriculture teacher
- Inability of agriculture teachers to solve practical problems
- Lack of creativity by agriculture teachers
- Unavailability of garden assistants
- Negative attitude of students toward agriculture
- Lack of support by parents
- Lack of supervision of teachers by the Ministry of Education.

In **Ethiopia**, the Department of Agricultural Extension and Technical and Vocational Education (DAETVET) is very well aware that teaching and learning materials are powerful tools for simplifying complex contents, processes and procedures in the teaching and learning process. The range of teaching and learning materials that could possibly be used at Agricultural Technical and Vocational Education (ATVET) colleges include printed media, handouts, study guides, manuals, visual aids, charts, real objects, photographs, overhead projectors, audio-visual aids such as slides, tapes, films, television, video and multimedia, static displays like blackboard and flip charts, and electronic media such as CD-ROMs, multimedia and computers. Considering the critical importance of imparting communication skills to students of ATVET colleges, efforts are made to stimulate interest among the instructors in developing and use of a wide range of teaching materials such as filmstrips, prerecorded tapes, maps, diagrams, self-instructional books, journal articles, and real objects. However, for a number of reasons including the most obvious reason of supply constraint, only few of such teaching and learning materials are used in the colleges (see Table 16).

Table 16: Reported types and frequency of use of teaching and learning materials in Agricultural Technical and Vocational Education (ATVET) colleges in Ethiopia (Alemayehu, 2006)

Type of teaching/learning material	Frequency of Use		
	Most frequently	Commonly	Rarely or never
Chalk and blackboard			
College farms			
Printed media			
Visual aids			
Audiovisuals			
Electronic media			
Multimedia			
Video and film			

Manuals and handouts are commonly used in most of the colleges. However, since production of printed media, handouts and manuals requires special skills and experience, the availability of this type of media is limited. This is because most of the instructors lack knowledge, skills and experience. To overcome the problem, such printed materials are prepared by the curriculum development and supervision teams of the Department of Agricultural Extension and TVET (DAETVET) and distributed to the colleges. The Department also collects and distributes relevant manuals and handouts prepared by other agricultural colleges for use in ATVET colleges.

ATVET colleges rarely show films using film projectors and rolls/reams of films because of the cost involved and the skilled personnel required. Showing videos in ATVET colleges is not that common either because few of them have invested in regular television monitors, video recorders and video cameras.

The current supply of computer-aided learning and multimedia to the colleges is limited. The major bottleneck with these media is not financial, but trained people with necessary skills and ability to develop programmes for use in teaching-learning process. Trainees' background experiences (e.g. rural versus urban) and instructors' skills have a direct influence on the use of electronic media. For example, students with rural background have difficulty in interpreting moods and emotions from photographs, films, and video clips. Likewise, some instructors who have difficulties with operating a film projector are inclined to avoid using it.

Considerable effort has been made under the ATVET programme to build the stock of library reading materials available for use by students and instructors. However, the amount of funds allocated for this purpose is not concomitant with the student numbers. (Alemayehu, 2006)

Ngesa (2006) did a survey and interviews with students and teachers on the availability of teaching and learning support materials for agriculture in secondary schools in **Kenya**. Students (Table 17) indicated that most secondary schools lack primary basic crop production tools and equipment, livestock, woodwork and metalwork tools. Farm machinery and implements are available in very few schools. Teachers (Table 18) on the other hand indicated that schools have sufficient land preparation and planting tools equipment. Teachers also indicated that there are sufficient basic workshop tools and equipment. However, there seems to be limited livestock tools and equipment. Other resources which teachers need – particularly models, slides and filmstrips – are not available in schools. Most of the resources which teachers indicated as not available in their schools could in fact be collected, preserved and prepared locally for use in teaching. Since this is not happening, there is a clear weakness in teacher education and training with regard to instructional material production and use.

In the same study (Ngesa, 2006), students and teachers were asked to use a five-point rating scale to indicate the extent to which the Agriculture textbooks available in schools are adequate and appropriate for teaching and learning. The students felt that the books were inadequate, while the teachers indicated that there are sufficient textbooks in schools. The difference may be because teachers have textbooks reserved for them.

Table 17: Availability of teaching and learning resources for Agriculture in secondary schools in Kenya (students' responses) (Ngesa, 2006)

Resource	Availability in school (n = 1,073)
Land preparation tools and equipment	64%
Planting tools and equipment	50%
Nursery preparation equipment	42%
Milking equipment	16%
Tools and equipment for treating livestock	15%
Plough	14%
Woodwork tools and equipment	12%
Harrow	9%
Planter	9%
Metalwork tools and equipment	5%
Tractor	2%

With regard to coverage of the subject matter in the Agriculture textbooks, the students indicated that the books adequately covered the content in the secondary school Agriculture syllabus. The teachers, however, observed that the quality of the textbooks was low. Over 90% of the teachers felt that the textbooks only provide moderate coverage of the subject matter in the secondary school Agriculture syllabus. Reference books were also insufficient in covering the syllabus according to the teachers. More than 80% of the teachers indicated that they had no or very few teacher guides.

A major teaching and learning resource in secondary school Agriculture in Kenya is the school farm. Of the 31 schools included in the study (Ngesa, 2006), only 7% had no school farm. The sizes of the school farms ranged from 0.40 to 60 acres. The extent and quality of use of the farms were quite low, with the students and teachers indicating that there are minimal activities on the school farms.

Table 18: Availability of teaching and learning resources for Agriculture in secondary schools in Kenya (teachers' responses) (Ngesa, 2006)

Resource	Availability in school (n = 42)
Land preparation tools and equipment	83%
Planting tools and equipment	79%
Cutting tools	71%
Measuring tools	69%
Planting tools	69%
Charts	60%
Hammers	57%
Milking equipment	48%
Holding tools and equipment	33%
Nursery equipment	33%
Livestock handling equipment	29%
Specimen	21%
Pruning tools	21%
Models	10%
Slides	7%
Filmstrips	5%

Analysis of students' responses on how school farms are used (Table 19) reveals that the farms are mostly used for growing crops on individual plots. Since the students included in the study were in Form III and IV, it is likely that the school farm was mainly used to meet the Kenya National Examinations Council requirement that all students who enroll for Agriculture in the Kenya Certificate of Secondary Education (KCSE) examinations undertake school farm projects. 33% of the students indicated that they use the school farms for projects designated by the Kenya National KCSE requirements. The teachers' views (Table 20) confirm the learners' responses that the school farms are mainly used for students' projects. Teachers' responses further indicate that the school farms are not optimally used as a teaching and learning resource. Teachers seem not to comprehend or understand that a valuable resource for teaching agriculture is the school farm. This shows another weakness in the pre-service and in-service training of Agriculture teachers. The curriculum for Agriculture teacher training will need to focus more on the proper use of school farms in particular as a teaching and learning resource, site for experiments, demonstrations and practicals. (Ngesa, 2006)

Table 19: Uses of school farms in secondary schools in Kenya (students' responses) (Ngesa, 2006)

Uses	% of students (n = 1,073)
Growing crops on individual plots	51%
Conducting Kenya National Examination's projects	33%
Young Farmers Club activities	22%
Growing crops on group plots	12%
Collecting learning materials	10%
Assisting Agriculture teacher	9%
Conducting experiments	8%
Planning school farms	5%

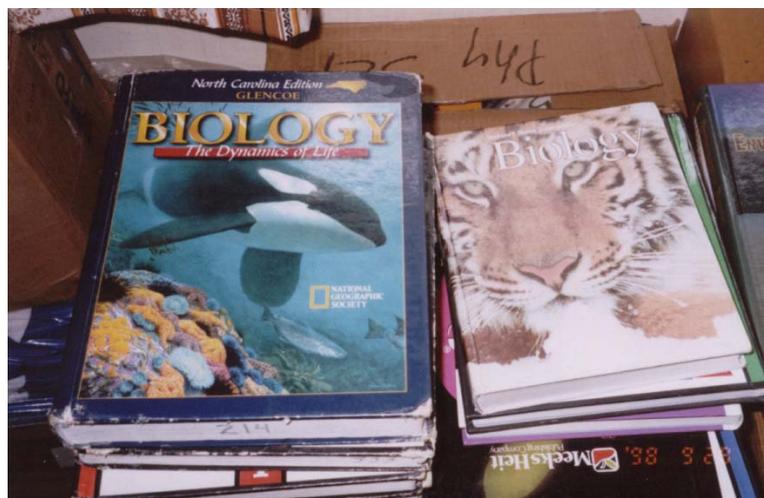
Table 20: Uses of school farms in secondary schools in Kenya (teachers' responses) (Ngesa, 2006)

Uses	% of students (n = 42)
Fences	86%
Students' projects	86%
Demonstration	38%
Stores	36%
Offices	29%
Soil conservation	26%
Commercial farming	24%
Dairy farming	24%
Goat farming	19%
Perennial crops	19%
Trees	19%
Sheep farming	12%
Poultry farming	10%
Pig production	7%

In **Malawi**, the secondary school syllabus for Agriculture not only provides the teacher with content, but also suggests appropriate teaching and learning resources. Suggested teaching and learning resources include drawings, pictures, charts, diagrams, samples, the local community and the local environment, case studies, the school garden, learners' experiences, resource persons, video films and statistical data

There are virtually no teaching and learning support materials for technical agricultural education in **Mozambique**. The shortage of teaching aids and facilities hampers adequate teaching. Most institutions have plenty of space for agricultural practices, but they have no appropriate equipment. In some cases, topics are not covered because of the lack of teaching aids. (Givá, 2006)

According to Ndejuru and Gatali (2006), teachers' guides and students' textbooks for post-primary agricultural education are not easily available in **Rwanda**, and specialized teaching and learning materials are not available. The available books are not always relevant to the local situation (Picture 6). However, school gardens, farms and basic agricultural inputs are available in most cases and can be used as practical learning resources.



Picture 6: Some of the books available at EAV Bigogwe in Rwanda

3.8 Learner assessment in post-primary agricultural education and training in sub-Saharan Africa

Overview

Examinations have a strong impact on syllabus coverage and affect the ways in which teachers and trainers teach post-primary agriculture. In some countries in sub-Saharan Africa, multiple choice questions have become a common examination format, as they facilitate the processing of examinations. In most cases, they ask for recall of factual information. Teachers would therefore tend to use many agriculture theory lessons for drilling agricultural principles and technical terms with their definitions or for written exercises, instead of building up the understanding of concepts and their relevance to agricultural projects, as well as preparing and evaluating field practicals. However, multiple choice questions can as well, if properly designed, be used for testing the understanding of agricultural concepts and their application to the solving of practical problems.

Testing of student's achievement in agriculture should emphasize how well students are able to apply scientific concepts they have acquired to practical agricultural problems.

Different countries in sub-Saharan Africa show great variation as to how students' assessment techniques give recognition to practical skills. Practical skills are more difficult to test in final examinations. Continuous assessment is therefore the most feasible alternative, with the results contributing to the student's final score.

In **Benin**, agriculture in the agricultural colleges is examined by two types of questions: open questions and multiple-choice questions. Each college decides independently the importance given to each type of question, but in general, 80% or more are open questions. (Ogoudedji, 2006)

At the Centres of Rural Promotion (CPR) and Centres for the Promotion of Rural Women (CPFR) in Benin, there are no formal examinations.

In **Ethiopia**, the assessment of students' progress is the most important evaluation exercise carried out in the Agricultural Technical and Vocational Education (ATVET) colleges. The most common method of assessing student performance in theory and practicals is a combination of continuous assessment, and end-of-semester programme testing. In continuous assessment, tests are given regularly throughout the training period, commonly as often as once a month. This has been found to be a

useful method among teachers and students as unsuccessful results are corrected immediately and students are kept aware of their current performance. On the negative side, however, this method is widely believed to take up a lot of teachers' time. Final semester testing allows students to take examinations at the end of semester. These tests, known as terminal examinations, cover all that students have been taught during a semester.

Assessment of students' performance is measured by means of marks or grades. The most common type of system used by ATVET colleges is the Grade Point Average (GPA). The system is convenient when using continuous assessment and, because it is cumulative, can also be used to assess a student's performance at any stage of his/her training. Since credit factors are awarded in proportion to the amount of time spent on a subject, subjects are automatically weighed according to their importance. To this effect, a letter grades system is applied. This grade is derived from the results of assessments carried during the course of the semester.

For written examinations, the ATVET colleges use two types of questions: descriptive (essay type) and objective (multiple choice). Each type serves a different purpose and both have a place in the evaluation system. The difference is the way student's knowledge and understanding are evaluated and the form in which questions are asked and have to be answered. Essay type questions test ability to recall, to organize knowledge and to express ideas. They measure the ability to think critically, to write concisely and to solve problems. Objective examinations take various forms (true/false, multiple choice). Because of language barriers, teachers are more inclined to use objective rather than subjective type of examination questions. Objective-type questions have an added advantage in that they can be quickly marked/graded.

Assessing students' ability to perform a specific skill is easier. They can either do it or they cannot; the latter is a fail. Those who can do it can either do it very well, or not so well but still at an acceptable level of performance. To arrive at a meaningful mark/grade for all the skills which are necessary for each qualification, attempts are made to break down a skill into a number of tasks. For example, if a student is required to spray a cow against ticks, the whole skill could be broken down into: (1) mixing the correct amount of chemical; (2) adding the chemical to the correct amount of water in bucket; (3) catching and restraining the cow; (4) spraying; and (5) cleaning the sprayer.

Assessment of trainees' performance in apprenticeship training is carried out both by the hosting institution and the colleges. Hosting institutions obtain measurements of student performance by observing the skill performance itself and/or products of the performance. On completion of their apprenticeship training, students are required to submit a report reflecting their experience gained from the training. Assessment of students' performance in the apprenticeship training by the colleges is based on this report.

By combining different types of tests and examinations, teachers are able to compile an assessment of individual students. During three years duration students are required to maintain a cumulative GPA of at least 2.00. (Alemayehu, 2006)

In **Kenya**, Agriculture as a subject is examined at the end of the secondary school cycle by three papers which are set and administered by the Kenya National Examinations Council:

1. Paper 1: Theory
 - a. Section A: Short answer items
 - b. Section B: Structured items
 - c. Section C: Essay items
2. Paper 2: Practicals: This is a written paper which attempts to test practical skills. Originally the paper was done practically in schools but since 2005 the paper has been tested using pen and paper.
3. Paper 3: Project: In this paper students undertake selected projects during the first two terms of their last year of secondary education (Form IV).

In **Malawi**, the secondary school syllabus for Agriculture not only provides the teacher with content, but also suggests appropriate modes of assessment. These modes of assessment include written reports and tests, exercises, oral tests, checklists, observations, checking students' books and practical assessments.

In **Mozambique**, students in post-primary agricultural education are assessed using questions for comprehension, argumentation, memorization and multiple choices. As practical tests are not legislated, teachers only teach what is possible with the available resources and they assess randomly to what they think is relevant. Accordingly, agricultural examinations are not yet well developed. For instance, entry exams for Mid-Level or higher agricultural education are based on the general education curriculum and not on technical or specific agricultural issues. This fact breaks the essence of continuous agricultural education. (Givá, 2006)

3.9 Access, equity and quality of post-primary agricultural education and training in sub-Saharan Africa

Overview

Major problems in terms of access, equity and quality of post-primary agricultural education and training in sub-Saharan Africa are related to gender issues. There are considerably more male teachers, trainers and learners than female teachers, trainers and in post-primary agricultural education and training in sub-Saharan Africa. There is a very urgent need to motivate women to attract them to teaching and training in agriculture.

Other problems in terms of access, equity and quality of post-primary agricultural education and training in sub-Saharan Africa relate to enrolment, costs, geographical distribution, relevance of the curriculum, training of the teachers, available resources and dropout and repetition rates.

At the Colleges of Technical Agricultural Education (CETA) in **Benin**, applicants are selected based on an entry test which is open to students with a Certificate of Primary Education. The duration of the training at the level of the is 4 years and leads to a Certificate in Tropical Agriculture (BEAT).

The entry test of the Agricultural College Medji of Sékou (LAMS) is open to graduates of the Colleges of Technical Agricultural Education (CETA) and holders of equivalent qualifications. The training leads to a Diploma in Tropical Agriculture (DEAT).

The three Colleges of Technical Agricultural Education (CETA) enroll each year 240 students in the first year. Out of these 240 new students, 90 are offered scholarships. School fees at the Colleges of Technical Agricultural Education (CETA) are relatively high (US\$170-240 per year for day school and US\$210-540 per year for boarding school for a middle-income Beninese). These relatively high school fees are restricting access by students from rural areas. Only 20% of the students at the Colleges of Technical Agricultural Education (CETA) are girls, while 80% of the students are boys. When we look at the teaching staff at the Colleges of Technical Agricultural Education (CETA), the situation is even worse: only 5% of the teachers are female, while 95% of the teachers are male.

The Agricultural College Medji of Sékou (LAMS) recruits 350 new students each year. Out of the 350 new students, 30 are offered scholarships. The school fees are

US\$40-200 per year for day school and US\$130-540 per year for boarding school. Two types of training are offered:

- A normal graduate training with a duration of 4 years.
- A discontinuous training for civil servants with a duration of 5 years (6 weeks per year)

Only 16% of the students at the Agricultural College Medji of Sékou (LAMS) are girls, while 84% of the students are boys. When we look at the teaching staff at the Agricultural College Medji of Sékou (LAMS), the situation is again even worse: only 4% of the teachers are female, while 96% of the teachers are male.

Repetition and drop-out rates at these colleges in Benin are very low.

There are 16 Centres of Rural Promotion (CPR) and 6 Centres for the Promotion of Rural Women (CPFR) in Benin, with a total capacity of 660 students, but only 390 places (59%) are currently occupied, due to the high school costs.

There is an entry test (which oddly enough does not have agriculture as part of the test) for applicants at the Centre for the Promotion of Rural Women of Ouémé (CPFRO) of Kouti and the entry requirements are the following (Ogoudedji, 2006):

- The candidate must be between 18 and 25 years old
- The candidate must have at least 0.50 ha of land
- The candidate must be able to read, write and speak French
- The candidate must be educated up to at least sixth grade of primary school (level CM2)
- The candidate must be single and may not have any children
- The candidate must be in good physical condition
- The candidate must be in good health (to be proven by a medical certificate)
- The candidate must be committed to strictly adhere to the discipline required for the study
- The candidate must be committed to settle at the end of the training and to undertake activities following the learned technologies
- The candidate must be sponsored by the Board of Management and Follow-up of the Centres for Rural Promotion, through farmers' organizations, local authorities and the Ministry of Rural Development.
- The candidate must have the support of her parents (parents have to contribute to the training by paying a symbolic amount of US\$0.20 per day during 18 months or 540 days, but the total amount is returned to the trainee at the end of the training together with a start-up grant)

Over the last five years of Agricultural Technical and Vocational Education (ATVET) programme implementation in **Ethiopia**, enrolment has increased from 12,000 in 2001/2002 to 36,805 – out of which 91% are male students and only 9% are female students – at present (Alemayehu, 2006). The total enrolment of the last four years was about 55,000 (approximately 12% women). Low female enrolment and higher than average attrition⁸ at ATVET colleges is attributed to weak academic background, adverse social conditions, physical violence, a curriculum that does not adequately address gender issues and an extremely low number of female instructors to provide support and serve as role models. More than 1,000 local instructors (only 2.7% women) are employed and about 50 expatriate instructors (approximately 2% women) are recruited from China, India and Kenya. (World Bank, 2006)

Consistent with policy emphasis on ensuring regional equity, substantial public resources have been allocated for the initiation and expansion of ATVET colleges in hitherto underserved regions in Ethiopia.

It is perhaps too early to judge the quality aspect of the ATVET programme in Ethiopia. However, considering the increased expansion of the programme on the one hand and the constraints pertaining to experienced teachers and teaching and learning materials on the other hand, it is not surprising that serious concern is being expressed about the quality of the ongoing ATVET programme. Data on dropout rates – particularly of female students – provide the validity of such concern. (Alemayehu, 2006)

In **Kenya**, there are regional differences in the popularity of Agriculture as an optional subject in secondary schools, with lower interest in Agriculture as a subject in urban areas and semi-arid and arid areas. The syllabus for Agriculture is not very relevant to semi-arid and arid areas. There are no big gender differences in students who choose Agriculture as a subject in secondary schools in Kenya. There is evidence that learners and teachers feel that most topics included in the Kenya Certificate of Secondary Education (KCSE) Agriculture are relevant. Students, however, tend to feel that agricultural economics topics should be removed. This may be due to the poor performance associated with agricultural economics. Teachers, on the other hand, are uncomfortable with agricultural machinery. This, also, seems to be due to their problems of effectively teaching the topics on farm machinery. (Ngesa, 2006)

In **Mozambique**, agricultural technical schools are not equally distributed along the country (there are eight Basic-Level agricultural schools and three Mid-Level agricultural schools). Therefore, the overall access to post-primary agricultural education is very low and largely competitive. Girls are under-represented in the

⁸ Every year more than 50% of female trainees drop out compared to less than 20% of male trainees (World Bank, 2006)

entire technical education system (only 25% of the students in technical education are girls).

In addition, significant geographical inequalities exist between and within provinces, and between districts. For instance, although the northern part of Mozambique has four Basic-Level agricultural schools, it does not have any Mid-Level agricultural school. Thus, graduates from Basic-Level schools who are lucky to be able to progress in agricultural education have to move to central or southern Mozambique, a difficult option for many families.

Quality is generally perceived to be very low in the general public training systems in Mozambique, notably technical schools, caused by under-qualified and insufficiently skilled teachers, shortage of teaching aids, partly dilapidated workshops for practical training and outdated curricula. As a result, internal efficiency in the formal technical education system is low as indicated by high repetition, dropout rates and long completion time. Furthermore, the above indicators also reflect low efficiency and effectiveness.

Since the early 1990s, no institution for technical teacher training has been in operation in Mozambique. Hence only very scattered upgrading of the qualifications and skills of technical teachers has taken place since then. Lack of qualified instructors is associated with a negative impact on the quality. Less than half of the teachers teaching academic subjects have adequate academic training; this is more prominent among teachers teaching practical subjects, who in general lack practical knowledge of their field.

Similarly, a substantial number of students (estimated at least 30% of the enrolments) enter technical and vocational education programmes because they are unable to find a place in regular secondary schools. Technical education is then used to provide them with equivalent academic qualifications. It would be more cost effective and more valuable to provide such students with secondary school places since the cost per technical student is relatively high.

There is an acute shortage of qualified women teachers and the absence of female role models contributes to low enrolments, higher dropouts and lack of completion for girls, particularly in rural areas. At the moment less than 14% of teachers are women and there are huge regional disparities (from 9% female teachers in Cabo Delgado, to 62% in Maputo City). Only 9% of teacher trainees are women.

There are differences in enrolment and completion between boys and girls. In general, girls represent about one third of the students enrolled in agricultural schools. In addition, drop-out rates for girls are significantly higher than those for boys. (Givá, 2006)

4 Relevance and effectiveness of post-primary agricultural education and training in sub-Saharan Africa

“Agricultural education has tended to live in its own sturdy but isolated ‘production only’ farmhouse but the era of production only and agricultural specialization is slowly giving way to the era of systems integration and sustainable agriculture”.
(White, 1990)

Overview

Post-primary agricultural education and training in sub-Saharan Africa has been unresponsive to changing patterns of demand for trainees, which are influenced by the changing roles of public and private sectors.

Reforms in post-primary agricultural education and training have not kept pace with the changing needs of rural young people and labour markets and have not been linked to overall sectoral and macro-economic agenda or with local agricultural issues. As a result, there is currently a major mismatch between the supply of post-primary agricultural education and training and the evolving needs of the labour market.

Curricula and teaching and learning methods and materials are often not relevant to specific development objectives of countries or regions, to the needs of farmers and to the labour market in general. Gender issues have not been adequately addressed in post-primary agricultural education and training in sub-Saharan Africa. Many agricultural education institutions are not linked to each other even though it is obvious that their activities and overall goals are closely interrelated and interdependent and that the activities of each necessarily affect those of others.

Although efforts have been made to deal with these issues, there remains a lot to be done in order to increase the relevance and effectiveness of post-primary agricultural education and training in sub-Saharan Africa.

In **Benin**, post-primary agricultural education and training is considered relevant because it is responding to a real training need of young people. It is however considered by some actors – including agricultural extension agents, researchers, private companies, university lecturers and decision makers – to be not enough effective because its aims are not achieved: very few graduates are able to solve agricultural and rural problems at the end of their training. The curricula of the first year and second year of the Colleges of Technical Agricultural Education (CETA) and the Agricultural College Medji of Sékou (LAMS) are considered insufficient and irrelevant with regards to rural and agricultural realities, while the curricula of the third and fourth year are considered to be relevant. (Ogoudedji, 2006)

A study on graduates of the College of Technical Agricultural Education (CETA) of Natitingou (GéCo, 2005) allowed an evaluation of the training given in the CETA Natitingou and indicated strengths, weaknesses and recommendations. The main strength identified was:

- Good preparation of students for continuation of studies (at LAMS)

The following weaknesses were noted:

- Insufficient practical courses and learning trips to accompany theory to be effective in the real life application.
- Lack of certain specialized courses such as:
 - Animal health and medication
 - Natural resource management
 - Data processing
 - Entrepreneurship
- Lack of support to graduates in their search for employment
- Insufficient teaching equipment and teachers
- Lack of financing of graduates to start-up an agricultural business
- Non-recognition of recruiters about the multidisciplinary of graduates

The following recommendations were identified:

- Increase and intensification of the time allocated to practical work
- Strengthening of certain specialty courses like forestry and animal health and medication
- Introduction of a course on data processing and analysis
- Increase the number of teachers
- Installation of a system of management of materials by students themselves
- Improve the provision of teaching and learning materials

Less than 1% of the graduates become farmers, 60% of them is employed, and 39% continues with studies (Debouvy, 2004; Ogoudedji, 2006).

Zonon (2006) found that the gap between demand for and supply of post-primary agricultural education and training in **Burkina Faso** is related to a combination of the following issues:

- Demographic issues and agricultural training demand
- Inadequacy of general education
- Training adaptation issues
- Training costs in public professional training centres
- Unbalanced supply between different categories
- Absence of a coordination mechanism for demand and supply of agricultural training
- Inadequacy of agricultural policy with training mechanism
- Recruitment quality of Rural Development Ministry.

In **Ethiopia**, the cost effectiveness of the Agricultural Technical and Vocational Education (ATVET) programme was examined in terms of recurrent costs per student. The annual recurrent cost (food, accommodation, salary) is estimated at US\$10.3 million (MOARD, 2005). Considering a student enrolment of 43,622 in 2004/05, the annual recurrent cost per student would be around US\$240, which is considerably lower than the estimated cost of similar training programmes operating elsewhere in the country – around US\$460 at the Nazareth College of Technical Teacher Education and approximately US\$570 at the Faculty of Dryland Agriculture and Natural Resources of Mekelle University (Alemayehu, 2006). According to World Bank (2006), US\$30 million is currently being spent annually on the ATVET programme, which translates into a total (recurrent and investment) expenditure of around US\$690 per student per year.

The ATVET programme has made too little progress in terms of the establishment and development of Farmer Training Centres (FTCs). This is an area of serious concern indeed because FTCs were envisaged as centers where graduates from the Mid-Level ATVET programme would be posted to work both as general extension workers and trainers. Since the Mid-Level Training (MLT) and Junior-Level Training (JLT) were envisaged as components of the same system serving a common purpose, there is concern that the slow progress in FTCs development has posed a setback to the productive engagement of graduates from the Mid-Level Training (MLT). (Alemayehu, 2006)

In the early years following the introduction of Agriculture as a subject in secondary schools in **Kenya**, good links existed between the schools, the surrounding farming communities, and extension agents (Maxwell, 1966). Members of Young Farmers Clubs in the schools maintained these links through field tours and participation in agricultural shows. The clubs competed in farm produce and livestock judging. During their heyday in the 1960s, the Young Farmers Clubs were well supported by the

Agricultural Society of Kenya. Their members' hands-on involvement in farming activities reinforced what they had been taught in school. These practical activities had a positive influence on students' perception of agriculture.

Secondary school agriculture in Kenya has been taught in isolation from the real farming situation since the introduction of the 8-4-4 system of education. This has been because financial support to schools has been declining. Teachers are isolated from the practical realities of farming because schools are unable to support travel to places agricultural interest such as farms, research stations and agricultural information centres, where the teachers can be updated on the state of agricultural knowledge. (Ngugi et al., 2002)

There is a major gap between demand profiles and supply responses in **Mozambique** in terms of academic level and in terms of knowledge and competencies. This situation needs to be corrected because the existing technical agricultural schools train graduates with little relevance for the employment market at relatively high cost (due to its low efficiency) and basic competencies such as management, agro-processing, agro-industry and entrepreneurship are not being taught. (Givá, 2006)

Graduates from the technical agricultural schools in Mozambique work primarily as extension agents, go into the private sector or go into an administrative position at the Ministry of Agriculture (MINAG). A frequently repeated criticism of the educational system is that students are prepared to be employees, not to initiate activities. It is important to note that most of these graduates have scant experience in the occupation of farming. Most do not even come from a farm background and, despite participation in internships, practical experience during their course work has been cited as a decided gap. (Skelton et al., 2003)

Reforms have now been initiated in the whole technical education system in Mozambique. These reforms will cover three main components: education approach, administration and curricula organization. The full implementation of the reforms is expected to take 15 years (from 2006 to 2020) but this is expected to result into a more responsive technical education system. (Givá, 2006)

In **Rwanda**, the supply of post-primary agricultural education is considered to be inadequate for the following reasons (Ndejuru and Gatali, 2006):

- Lack of qualified teachers in agriculture: the majority of the teachers in post-primary agricultural education were trained up to A1 or A2 levels. The demand for qualified teachers of agriculture is very high.
- The curriculum does not put enough emphasis on ICTs, entrepreneurial skills, small scale farming, and basic sciences such as chemistry, physics and mathematics.
- Teacher guides, student textbooks, specialized teaching and learning materials are not easily available.
- Laboratories, equipment, teaching aids, financial support, communication facilities, transport facilities and field-training sites are inadequate or not well equipped.
- Even where schools farms, school gardens and agricultural inputs are available, they are not adequate.
- Practical lessons are insufficient.
- The frequency of inspection and its quality are very low due to logistical factors.
- Conditions for access to higher education are not favorable to post-primary agricultural graduates.
- Available resources are insufficient.
- The supply of post-primary agricultural education and training does not respond to the demand: the programmes were not prepared in participatory manner, but rather following a top-down approach and as a consequence the supply does not take into account the real needs of end-users.

5 Conclusions and recommendations

5.1 A reorientation of post-primary agricultural education and training will contribute to increased rural productivity and economic growth

Agriculture in sub-Saharan Africa is undergoing rapid changes as a consequence of both technological progress and economic forces which call for an increased market orientation, competitiveness and higher productivity. Employment opportunities in the off-farm sector are increasing at a faster rate than in agriculture. Post-primary agricultural education and training in the continent has not been responding adequately to these changes and trends and will now have to adjust quickly.

In order to have a greater impact on increased rural productivity and economic growth, post-primary agricultural education and training should encompass much more than just the production of agricultural commodities, food, fiber, wood products, horticultural crops, and other plant and animal products. It should include entrepreneurship, financing, processing, marketing, distribution of agricultural products, health, nutrition, and food consumption, the application of science, information and communication technologies (ICTs), and the sustainable use and conservation of natural resources.

Although some of these issues have already been included in several post-primary agricultural education and training programmes in sub-Saharan Africa, major reviews are still required in most cases to better address these new and emerging needs. This reorientation should incorporate both the new role of market-oriented agriculture as well as issues of direct relevance to the improvement of subsistence agriculture and rural poverty.

The scope and content of post-primary agricultural education and training should be broadened so that it is not seen by learners as a terminal stage leading to a condemnation to perpetual residence in the rural areas but as a programme that provides vast opportunities for lifelong learning, leadership development, personal growth and career success. Agricultural education provided at the primary and secondary levels should be further synchronized with those of the intermediate and higher levels.

In order to achieve this, clearer and more coherent policy frameworks for post-primary agricultural education and training are needed in most countries in sub-Saharan Africa. Such policy frameworks should provide for coherence between different government ministries, NGOs, training and education institutions, community and producer organizations, the private sector, investors and donors.

5.2 Closer links to labour markets and greater attention to learners' needs will make post-primary agricultural education and training much more relevant and effective

Better links must be created between the local job market and post-primary agricultural education and training. Institutions responsible for post-primary agricultural education and training should urgently set up permanent mechanisms for observation of the job-market and adaptation of the courses offered.

The content, quality and delivery of post-primary agricultural education and training should effectively meet learners' needs and build-on and complement existing traditional informal learning arrangements. This means that learning will need to become much more learner-centred, experiential, active and practical. An approach that places learners at the centre of the teaching and learning process acknowledges their diverse characteristics, circumstances and learning needs. Strategies to improve quality and relevance of post-primary agricultural education and training draw on the strengths of learners and on their knowledge, interests and capacities.

Taking into account the decline in public sector employment in most countries in sub-Saharan Africa, post-primary agricultural education and training programmes need to shift their focus from theoretical to more practical, "hands-on" education and training and "real life" exposure in order to address agricultural and rural development problems. Shorter learning modules and courses on specific topics – which together add up to some form of certification – can be developed and used as a bridge between formal, non-formal and informal skills development in agriculture and related businesses.

For post-primary agricultural education and training to be more responsive to the changing demands of the labour market and to deliver relevant and up-to-date knowledge and skills, there is an urgent need for more dynamic curricula. Curriculum development needs to be much more participatory, involving not only agricultural education and training experts but also employers, farmers, teachers, trainers, and educators, learners and ex-trainees to accommodate the various stakeholders' demands and to be more responsive to the society's rapidly changing and emerging needs. Decentralized curricular interpretation and adaptation needs to be possible within prescribed curricula. Initiatives which combine common core content and supplementary content based on the local culture and economy – including traditional non-formal and informal learning systems – need more support.

Gender aspects need to be more explicitly included in post-primary agricultural education and training reforms. Women are still very strongly under-represented in agricultural education and training, particularly in proportion to their broad responsibilities in farming. Also there is little or no guarantee that men actually transfer agricultural information, knowledge and skills to women farmers and it is

therefore essential to train and recruit many more women in agricultural extension, who can approach women agricultural producers directly. In order to address gender imbalances, post-primary agricultural education and training programmes need to be gender-sensitized and more targeted recruitment policies should be developed to reach women. Some possibilities are special quota systems for women, recruiting more women into agricultural research, extension, training and policy making, and training existing staff at all levels in gender analysis and planning. (Wallace and Nilson, 1997)

5.3 More diversified funding mechanisms will ensure quality and sustainable post-primary agricultural education and training

Current resource constraints in post-primary agricultural education and training can be addressed by a combination of cost-saving mechanisms (without compromising quality and relevance), generation of external resources and diversification of funding sources for public programmes.

A major mechanism to sustainably generate additional resources for post-primary agricultural education and training is to encourage and stimulate private investment and enhance involvement of companies in post-primary agricultural education and training institutions.

Another mechanism to improve the resource base is cost-saving through increased efficiency in the delivery of education and training. There is some potential for increasing efficiency in post-primary agricultural education and training institutions by modernizing management structures and procedures, granting more financial management responsibilities to the institutions, and increasing capacity utilization in the institutions (e.g. through flexible recruitment rules). With regard to public institutions, mechanisms of performance-based allocation of resources and stimulation of performance-based management systems should be explored.

Some alternative modes of post-primary agricultural education and training are more cost-effective than the currently predominant type of school-based learning. Programmes in which substantial parts of the practical training are delivered in real work environments tend to be less costly. Further development of apprenticeship programmes will help to decrease unit costs in post-primary agricultural education and training and has the added advantage of making learning more practical and relevant.

Strengthening the income-generating capacities of post-primary agricultural education and training institutions is another way to supplement resources available. Already existing income-generating activities such as the sale of agricultural products produced by the students can still be expanded by improving management and marketing skills of institution managers and by easing regulations regarding the use

of generated funds. Budgetary procedures and incentive schemes may further encourage institutions to increase their income-generating efforts. However, income-generating activities should not deviate the attention of post-primary agricultural education and training institutions from their core business of providing quality education and training, neither should they distort local markets by offering goods and services at lower than market prices.

5.4 Enhanced support to educators and trainers will make post-primary agricultural education and training more resourceful

In most countries in sub-Saharan Africa, there is a lack of qualified teachers and trainers in post-primary agricultural education and training. In addition, the high rate of staff turnover has made it difficult to maintain experienced teachers and trainers. This is negatively affecting the quality of the education and training provided.

The teacher or trainer is the key actor in the provision of post-primary agricultural education and training. Teachers and trainers must strive to make post-primary agricultural education and training interesting and relevant through the use of appropriate teaching and learning methods and through interpretation of the prescribed curriculum in relation to the local context. In order to make post-primary agricultural education and training more relevant, teachers and trainers need knowledge of substantive areas and content related to agriculture, as well as pedagogical skills to use a variety of appropriate teaching and training strategies.

Increased efforts to reorient teacher training towards more relevant teaching and learning processes will empower teachers to play an important role in making agricultural education relevant and effective.

Institutional support is crucially important for agricultural teachers and trainers. Agricultural educators and trainers who are allowed and encouraged to participate in management and decision-making and to treat the curriculum with some flexibility and room for contextualization are usually better motivated.

Teaching and learning methods have to become more suitable to the technical content and learning objectives thereby achieving a more effective instruction. Teachers and instructors therefore need adequate training and support, especially in innovative teaching and learning approaches including participatory techniques, both pre-service and in-service. Continuous improvement in the quality and relevance of post-primary agricultural education and training entails permanent competence and skills upgrading for teachers and trainers. Awareness raising and training for educational administrators and training inspectors in leadership, managerial, motivation and supervisory skills are equally important. More flexible performance-based reward systems for teachers and instructors provide the opportunity for motivating and retaining experienced staff.

Teachers and trainers in agriculture need adequate teaching equipment and support such as reference materials and textbooks. Unfortunately, teachers' guides, students' textbooks and specialized teaching and learning materials in agriculture are not easily available in most countries in sub-Saharan Africa or are inadequate or irrelevant. Laboratories, equipment, teaching aids, communication facilities, transport facilities and field-training sites are often poor. Even when schools farms, school gardens or demonstration sites are available, they are not optimally used as a teaching and learning resource. Learning support mechanisms and materials should be linked to the local environment and learners' own experiences.

Teachers and trainers (as well as other stakeholders and experts) need to be involved in learning support materials development from the very start, to build on existing good practices.

Local resource people, experts and learning resources for teaching students about their environment, agricultural skills, and other practical skills and knowledge that complement the curriculum should also be made available to schools.

5.5 Improved school-community linkages will transform post-primary agricultural education and training institutions into multi-functional agricultural learning centres

Good practices in agriculture and rural development can be shared between post-primary agricultural learning institutions and local communities. Schools and other learning institutions can function as experimental grounds and agricultural development centres where scientific and local knowledge are exchanged through interaction and involvement of different actors. Strategically located agricultural learning centres in appropriate rural locations can provide for the delivery of formal post-primary agricultural education and training programmes, as well as support an expanding range of non-formal and informal programmes. Such centres may also serve other purposes such as a technology development centre and provide an information office for rural development.

Farmers and other local experts have a vast wealth of relevant knowledge and skills, can be invited as resource persons to learning institutions and can help trainers and students learn about agriculture. Parents and community members can learn new ideas, methods and techniques from their children and trainers and from demonstration plots.

Agricultural extension officers can assist teachers and trainers with technical knowledge, help with the establishment of demonstrations and link learning institutions to agricultural and rural development programmes and institutions.

Communities should be encouraged to use schools as centres for learning and social activities. Agricultural schools should be hospitable for adult literacy classes, extension activities, women's groups, community functions, and other activities and events. This not only brings parents into the school, it also helps transform the school into a multi-functional agricultural learning, development and meeting centre and puts it at the centre of the community.

5.6 Action-research and more effective monitoring and evaluation will allow a better understanding of post-primary agricultural education and training in sub-Saharan Africa

There is a lack of comprehensive labour market and training needs assessment studies for the agricultural sector in most sub-Saharan African countries. More effective monitoring of post-primary agricultural education and training is urgently required. Too little is currently known about the content and modes of post-primary agricultural education and training needed, how knowledge and skills are being taught, what is actually being learned, and how formal post-primary agricultural education and training interrelates to non-formal and informal learning systems. .

The various types of expertise and technical skills needed to analyze the provision and quality of post-primary agricultural education and training may not be readily available in all countries. International partners can help by organizing in-country training workshops, study visits to countries with similar conditions and problems and other experience-sharing activities to enable national officials and specialists to acquire useful information and gain broader perspectives to deal with post-primary agricultural education and training. Further support can be provided through technical documents, publications and Internet websites. Lessons learned and experiences need to be shared with donors, educators, policy makers and the wider community.

There is not one best method for delivering post-primary agricultural education and training. Some models relate to the delivery of formal programmes which lead to a recognized qualification while other models reflect delivery of non-formal or informal programmes. Pilots of recent models and concepts that cut across formal, non-formal and informal modes of post-primary agricultural education and training need to be further evaluated.

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Annexes

Annex 1: Methodology of the study

The study methodology followed eight steps:

1. Review of relevant bibliography.
2. Construct selection criteria for case study countries and make the choices.
3. Identification and sub-contracting of case study researchers.
4. Quality support and peer review.
5. Design and delivery of a joint methodology training workshop for case study researchers.
6. Supervision and timely completion of the six country case studies.
7. Relevant data analysis.
8. Drafting and editing of final report

These eight steps of the study methodology are described in more detail below.

1. Review of relevant bibliography

The review of relevant bibliography was initiated at the beginning of the study and went on throughout the study. The literature review was not limited to the six case study countries and aimed to look at experiences and lessons learned from different parts of sub-Saharan Africa.

2. Construct selection criteria for case study countries and make the choices

First, we applied a combination of the following three sets of "minimum criteria" to the complete list of 46 countries in Sub-Saharan Africa:

1. The first set of criteria is related to the importance of agriculture in a particular country as expressed by criteria such as the percentage of rural population in the total population, the percentage agricultural labour force in the total labour force and the agricultural GDP as share of total GDP.
2. The second set of criteria is related to the commitment to Education for All and status and progress of post-primary education in general in a country as expressed by criteria such as the Education for All Development Index (EDI) and its variance over time and the survival rate to grade 5 and its variance over time.
3. The third set of criteria relate to the commitment of a country's government to poverty reduction as expressed in its Poverty Reduction Strategy Paper (PRSP).

Applying these 3 sets of minimum criteria to the list of 46 countries in Sub-Saharan Africa resulted in a shorter list of 19 countries.

We then did a quick scan of readily available literature and information on the status of agricultural education and training (AET) at post-primary level in these 19 countries. We took into account the following guidelines:

- The six case study countries should reflect some different approaches (like agriculture in formal and non-formal post primary education, agriculture as a separate subject or integrated into other subject areas, etc.)
- As specified in the Terms of Reference (ToR) of the study, three Francophone countries, two Anglophone countries and one Lusophone country should be included in the list of six case study countries.

Based on the above, the following six case study countries were selected (in alphabetical order):

- Benin
- Burkina Faso
- Ethiopia
- Kenya
- Mozambique
- Rwanda

3. Identification and sub-contracting of case study researchers

Case study researchers in each of the six case study countries with appropriate qualifications and experience were identified and sub-contracted.

4. Quality support and peer review

Quality control mechanisms were part of the programme of activities for this study and included management information, monitoring and evaluation and reporting. Activities have implemented following a clear protocol. Steps were taken to assure that data are not lost or misplaced. Copies of data and reports were made periodically and are stored. The quality of the research is also controlled by the fact that the research team is multi-disciplinary, with experts in educational science, agricultural development and rural economics. Findings were presented to and reviewed by peer researchers. We used DGroups as an online collaboration tool to facilitate quality support and peer review.

5. Design and delivery of a joint methodology training workshop for case study researchers

Two methodology training workshops for case study researchers were organized: one in Nairobi on April 3-4, 2006, for the case study researchers from Ethiopia, Kenya, Mozambique and Rwanda; and another one in Dakar on April 9-11, 2006, for the

case study researchers from Benin and Burkina Faso. The workshops included introductions of case study researchers, an introduction to the World Agroforestry Centre (ICRAF), an introduction to the Farmers of the Future (FoF) initiative, a presentation on the background to the research, a discussion on the Terms of Reference (ToR) of the consultancies, an agreement on a common format for the country case study reports (attached in annex to this progress report), a discussion on potential sources of information and methods of data collection and analysis and an agreement on the way forward and the timeline.

6. Supervision and timely completion of the six country case studies

Six country case studies were undertaken: Benin, Burkina Faso, Ethiopia, Kenya, Mozambique and Rwanda.

In line with the overall study, the country case studies sought to answer the following questions:

- What are the extent and characteristics of local demand for post-primary level educational content in agricultural and/or rural livelihoods development in a particular country?
- What are the extent and characteristics of the present supply of such education or training in the country, and how is their provision organized institutionally?
- To what degree are post-primary level agricultural education and training (AET) programs relevant to the main existing problems in the agricultural and rural sector of the country?
- How do students, parents, communities, teachers, agricultural extension workers, agricultural researchers, university instructors, and rural policymakers evaluate the relevance and effectiveness of post-primary level agricultural education and training (AET) as currently provided in the country?
- What noteworthy innovations have been introduced into the post-primary level curricula in the country with regard to student preparation for contribution to agricultural and rural development?
- What action seems indicated in the country by an analysis of the above responses?

Responsibilities of the country case study researchers therefore included:

- Review of historic and current, country-specific, relevant initiatives, policies, guidance materials and studies on post-primary level agricultural education and training (AET).
- Active participation in a joint methodology training workshop.
- Gather additional information on post-primary level agricultural education and training (AET) in a particular country through interviews with relevant stakeholders and key informants.

- Analyze and summarize the existing and gathered information
- Drafting and editing of draft and final report in English.

A common format for the country case study reports was developed jointly with the researchers from the different countries during the methodology training workshops. Draft and final country reports have been produced.

7. Relevant data analysis

The different country case studies employed data analysis methods as relevant to the respective countries. More details about this can be found in the respective country reports.

8. Drafting and editing of final report

A comprehensive analytical report with recommendations was drafted and reviewed by experts. Based on the draft report and comments received, the final report was written.