

EDUCATION IN THE POLITICAL ECONOMY OF AFRICAN AGRICULTURAL KNOWLEDGE SYSTEMS: STAYING ABREAST OF THE CHANGING ENVIRONMENT*

By

George I. Abalu**

I. INTRODUCTION

Most African economies are dominated by agriculture and an overwhelming proportion of the economic activities therein take place in farm households located in rural communities. 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.¹ 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. It is, therefore, obvious that many things in African economies will go wrong unless things go right in African agriculture.

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** Professor Abalu is the Principal Adviser for Food Security and Sustainable Development at the United Nations Economic Commission for Africa, Addis Ababa, Ethiopia. The views expressed in this paper are those of the author and do not necessarily reflect those of the United Nations or the Commission.

The fact is that many things have not been going right in African agriculture since the early 1980s (Figure 1). A large part of the explanation for the deterioration of

Figure 1: Trends in per capita agricultural production (Index 1979-81=100)

African agriculture during the last two decades can be attributed to serious flaws in the “agricultural knowledge system” in many African countries (Eicher, 1999). This paper analyzes the place of agricultural education within the framework of “agricultural knowledge” systems of African countries and examines prospects for improving agricultural education in the context of the political economy of African agriculture.

II. THE PLACE OF EDUCATION IN THE NATIONAL AGRICULTURAL KNOWLEDGE SYSTEMS IN AFRICA

Agricultural knowledge systems in African countries are anchored on three legs: education, research, and extension. The term agricultural knowledge system is used here to refer to the network of institutions, agencies, and stakeholders

whose activities, relationships, and interactions generate and diffuse the knowledge and produce the research and extension personnel needed for evolving a dynamic agriculture. As used here, agriculture encompasses the production of agricultural commodities, including food, fiber, wood products, horticultural crops, and other plant and animal products. It also extends beyond production to include: the financing, processing, marketing, and distribution of agricultural products; farm production supply and service industries, health nutrition and food consumption; the application of science; the use and conservation of land and water resources; and related economic, sociological, political, environmental, and cultural characteristics of the food and agricultural systems. The concept of “agricultural knowledge systems” provides a useful basis for better understanding the linkages between and among the key actors in generating and disseminating agricultural knowledge for national agricultural development.

African economic development requires a dynamic agriculture. A dynamic agriculture results from a set of complex relationships involving several stakeholders who produce, distribute and use various kinds of agricultural knowledge. A well functioning agricultural knowledge system is indispensable for evolving a dynamic agriculture that ensures that substantial numbers of African households: have incomes exceeding the poverty level; operate farms efficiently and profitably and produce a surplus (i.e. selling a substantial portion of the value of their output); specialize in production at the farm level; invest significantly on the farm, including investments in conservation measures; purchase commercial inputs, including hired labour, in significant quantities; and, adopt new technologies on a regular basis.

One of the most essential tasks in evolving a dynamic agriculture is a well functioning agricultural knowledge system involving relationships between the agricultural and non-agricultural sub-sectors and interactions between all the stakeholders who constitute the network of institutions in the public and private sectors whose activities initiate, modify, and defuse the recommended agricultural innovations and technologies for improving farm technologies and incomes. Eicher (2001) reminds us that there is no free lunch. African scientists, teachers and farmers cannot count on borrowing agricultural technology from the industrial countries, cannot rely indefinitely on overseas universities to train its scientists, and cannot import education models and expect them to be effective

and financially stable. In the rest of this section we examine the performance of three sub-systems of the agricultural knowledge system.

Agricultural Education

Agricultural education is essential for providing the leadership, technical, and field personnel needed to evolve a dynamic agriculture. It involves a systematic programme of instruction for students who wish to learn about the science, business, and technology of agriculture in all its manifestations as defined above. The goal is to develop a cadre of people who value and understand the vital role that agriculture plays in overall national rural and economic development.

Following independence many African countries inherited education systems that were ill-designed for their economic and social needs as emerging independent States. In most cases, these systems were created to serve colonial and minority interests and, as a result, they were inadequate to meet the development requirements of the new independent African governments. As a result, agricultural education played very little or no role in the national agricultural knowledge systems that were inherited by many African countries. Instead, national education systems were characterized by racially segregated structures and educational opportunities that were dictated by colonial settlements; missionary presence and development opportunities resulting in major imbalances in curriculum content and educational spread within and across countries. However, today, agricultural education takes place at the primary, secondary, intermediate and higher levels in most African countries (Court and Kinyanjui, 1989).

Primary Level Agricultural Education

Because of the system of education inherited by many African countries, agricultural education still features very little at the primary level of many post independence African education systems. This is because many parents still erroneously believe that agriculture is not a scientific or technical subject (Hanson, 1986). Since agricultural work was seen as having a low status and many parents wanted their children to obtain an education that would turn them into white collar elites, just like the colonial administrators in the big towns, there was very little demand for the teaching of agriculture at the primary level. As a result, following independence there

was widespread belief that primary schooling turns children away from agriculture and drives them away from the land. It is, however, now being increasingly recognized that other factors may be more important in explaining primary school children's apparent negative attitude towards agricultural education, including the fact that in many African countries, rural life is characterized by poverty, scarcity and/or lack of access to good quality land and lack of adequate infrastructures, all of which are important prerequisites for transforming traditional agriculture into the "modern farming".

The teaching of agriculture at the primary level is now gaining increasing acceptance even though suitable syllabuses for primary agricultural education are still non-existent in many countries. Consequently, most of the agricultural education offered at the primary level often takes the form of school projects which introduce the pupils to the practice of agriculture through farm related activities under the supervision of ill-informed teachers (FAO, 1992). Furthermore, other agricultural education related activities such as the 4-B clubs in Botswana and Young Farmers' clubs in several other African countries are increasingly being organized for primary school age children, most of whom usually do not gain admission into secondary schools, but who, nonetheless have acquired an early grounding in agriculture.

The problem is that there is still a large influx of primary school leavers from the rural areas into the urban centres. Hanson (1986) suggests that the cause of this influx is misunderstood. His study shows that, despite the magnitude of this influx, many young primary school leavers would be happy to pursue a career as "modern" farmers. What this finding demonstrates is that the occupational choices of these young prospective farmers are significantly influenced not so much by an aversion to the land but by what they think their educational attainments and related opportunities make possible for them if they choose to take up farming.

Secondary Level Agricultural Education

Agricultural education at the secondary level is now generally accepted as part of the general secondary education process in many African countries. Two types of agricultural education takes place at this level. In some cases, agriculture is usually offered as one of the required secondary school subjects. The rationale for offering these agricultural subjects to the pupils is usually 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. In other cases, vocational education secondary schools dedicated to providing instruction on agricultural subjects admit pupils whose first choice was to gain admission into a regular secondary school but who were not successful and who often accept admission into the vocational agricultural secondary school with the expectation that they will later transfer to a regular secondary school once an opportunity presents itself.

Agricultural education at the secondary level is faced with many problems. First, the secondary schools offering agricultural subjects are usually ill equipped to run agricultural programmes. They often lack appropriately qualified teachers, equipment, teaching facilities including the right agricultural text books, reading materials in the libraries and a school farm for exposing the pupils to practical on-farm experience. Second, because many African countries do not have explicit policies on agricultural education, these programmes are usually the first to suffer in the face of budgetary cuts. Because of these constraints, the teaching of agriculture that is done at this level is usually largely theoretical. Furthermore, the pupils graduating from the secondary schools who are unable or unwilling to move on into the intermediate or higher level education are also unable to take up farming on their own not only because they are ill-equipped to do so but also because, to begin with, they did not see the type of traditional farming their parents are engaged in as an occupation to which they should devote their whole lives.

Intermediate Level Agricultural Education

Intermediate level agricultural education in Africa is hard to define, as there are many variants with different objectives. In general, however, we can say intermediate level agricultural education is typically available to students who have completed a formal secondary school education and usually involves two to three years professional training in agriculture after which the student is awarded a Certificate or a Diploma in Agriculture. The main aim of the agricultural education offered at this level is usually to provide the manpower that will serve as the link between the farmers on the one side and the decision-makers, agricultural administrators and agricultural researchers on the other. The training usually takes place in a college of agriculture or polytechnic and is usually in general agriculture although there are a few cases where specialized training

in fields such as animal science, irrigation technology, forestry, wildlife management, are offered etc.

As frontline workers in national efforts to achieve agricultural and rural development, the graduates from these colleges of education and polytechnics require skills that will not only enable them to understand and evaluate new technologies coming out of universities and agricultural research institutes but also those that will help them provide the support services and logistics that is needed by farmers for agricultural production. Little surprise, therefore, that graduates from these colleges and polytechnics are usually in short supply. Yet, the importance of the skills that is on offer to them at this level of education and the wide variety of activities that they are expected to perform in the agricultural development process, clearly shows that the graduates from this level of agricultural education should be trained in large numbers.

There are, however, several reasons why many African countries have not been able to produce the intermediate level agricultural graduates they need in sufficient numbers. First, many countries do not have manpower plans and so are unable to adjust the educational training programmes on offer at this level to bring them in line with their national manpower requirements. Second, because of budgetary constraints the intermediate level training programmes are often inadequately funded. Third, in many cases the agricultural teachers do not have adequate knowledge and practical experience in agriculture, particularly about the agriculture of their own country. Furthermore, many of them are science teachers who are unable to find employment in their area of training and have to make do with teaching agriculture as the next best occupation.

Higher Level Agricultural Education

Most of the higher level agricultural training in African countries takes place at the Faculties of Agriculture in national universities although there are a few countries which also run Indian-type agricultural universities that are supposed to be dedicated exclusively to the teaching of agricultural subjects. The agricultural education goal of these faculties of education is usually the award of first degrees in general agriculture. Some of these universities also run post-graduate degree programmes (M.Sc. and Ph.D.) but a significant number of them rely on post-graduate training in other universities, mostly overseas. The main aim of these postgraduate programmes is

usually to provide high level manpower to work as research scientists, university teachers, and managers of government and parastatal farms.

Students offering the first degree programmes usually spend three to five years in the university depending on the minimum entry requirements of the university. In countries whose educational system is based on the British system, "A" level passes in science subjects usually forms part of the entry requirements. In some other countries entry into the degree programme is through progressive movements from either a Diploma in Agriculture programme from the same university or from a remedial programme designed to bring lagging students up to the minimum requirements for entry.

There are subtle differences in the content and coverage of higher agricultural education training programmes between the so-called anglophone and francophone countries but there are broad similarities in the types of agricultural courses that they offer, i.e., crop and animal production, soil science, agricultural engineering and agricultural economics. In many of these universities, there has been an on-going debate as to whether or not the agricultural education offered to the first degree students should be a broad-based general training in agriculture or whether the students should be allowed to specialize in a particular area of agriculture after their first or second year in the university. The main argument in favour of a general agricultural training at the undergraduate level is that the student must be thoroughly grounded in all the basic agricultural science subjects since, in most cases, they do not usually know for certain what jobs they will undertake after graduation. Furthermore, it is argued that agricultural graduates are usually called upon to perform a wide range of agricultural functions. To prepare them to have expertise in only one area is, therefore, unrealistic. More recently, however, the general trend has been towards specialization in specific disciplines with new areas of specialization such as forestry, range management, and rural sociology, being increasingly offered to new students as possible options for specialization. It is interesting to note that many of these university programmes do not offer courses in agricultural education.

There are a number of problems and constraints that higher-level agricultural education face in Africa. These include:

- Unclear signals from government about the nature of the relationship between universities and other institutions dealing with agricultural research and extension;
- Debilitating budgetary constraints;
- Inadequate curricula; and
- Management and organizations problems.

Unclear Government Signals: Very few African countries have well throughout policies on higher level agricultural education even though the importance of education in a changing economic environment has been recognized by many African policy makers since the early 1960, as exemplified by the fact that total school enrolment has grown faster in Africa than in any other developing region of the world (ILO, 1996). Although agricultural education has not been left out of this rapid expansion of overall education in Africa, the lack of clear policy for all levels of agricultural education but, particularly, for the higher agricultural levels, has led to inadequate and unstable support by governments and their international development partners for this level of training.

Budgetary Constraints: The requirements of the structural reforms that many African countries embarked upon in the mid 1980s has resulted in sharp cuts in the real budgets for higher level agricultural education in many countries leading to sharp deterioration in teaching facilities, and equipment, and stagnant remuneration and fringe benefits for staff in the face of rising consumer price levels. The net result has been a general decline in the quality of higher agricultural education as well as an acceleration in the rate of brain drain from the continent (Eicher, 1999).

Deficient Curricula: One of the most frequently hard criticisms of higher agricultural education in Africa is that it is too academic and as such, it is not imparting adequate practical skills to the graduates. This situation is further aggravated by inadequate teaching facilities, outdated equipment, and the employment of teachers who are themselves products of the same practical-deficient educational systems which they are continuing to perpetuate. For these reasons, their prospective employers including governments, the private sector, and the farmers who are their ultimate clients, feel that

the subjects taught the students in the universities are not relevant to their needs. One area that is often singled out here is lack of training in managerial skills to prepare the students for entry into agri-business including farming as a business. Deficiencies in training in agricultural administration are also often cited as a major problem here. Quite often, agricultural graduates are called upon to fill posts that require considerable administrative skills, while the training they have received concentrated mainly on technical matters.

Lack of Adult Education: Another area of higher education that is often criticized relates to continuing higher agricultural education. Many universities do provide public lectures and extra-mural courses in addition to their regular courses. However, continuing adult agricultural education seldom exists in the faculties of agriculture of many African universities. When adult education is provided, it is usually located in the Faculty of Education and it hardly accommodates serious agricultural education training.

Management and Organizational Problems: A major structural problem often cited about higher agricultural education in Africa is the absence of strong vertical as well as horizontal linkages between institutions offering higher education and institutions at the lower levels (FAO, 1992). This often results in a situation where the reservoir of talents that are ideally suited for higher agricultural education and would benefit from and contribute most to its further development, cannot be guaranteed. It is, therefore, not uncommon to find most universities and colleges of education drawing their student intakes mostly from urban centers, and admitting students who will often possess lesser ability since the more able urban candidates would have already chosen the more prestigious types of higher education studies such as medicine, engineering, law, and even the social sciences.

Agricultural Research

Agricultural research is the other leg on which the agricultural knowledge system is anchored. This leg of the system is important because it provides the information needed for the generation of new technologies to be used by farmers and other agricultural entrepreneurs. However, this leg of the system is not a single monolithic entity, but a network of different organizations each either influencing or engaging in agricultural research and each taking initiatives from time to time on what type of research activities should be undertaken. The network of these organizations makes up the national agricultural research sub-System of the National Agricultural Knowledge

System (NAKS). The membership of national agricultural research sub-system is quite diverse and the different organizations and agencies involved include research institutes, universities, colleges of agriculture, government ministries, parastatals, agricultural development projects, and the private sector.

The national agricultural research sub-systems in many Africa countries presently suffer from a number of problems. First, many of the new technologies coming out of them are not being widely adopted by the farmers for whom they are intended for a variety of reasons. Second, the absence of adequate funds for agricultural research has resulted in sloppy research efforts, haphazard research activities, incomplete research projects and general uncertainty for research staff. Third, in many countries, agricultural research is faced with a shortage of qualified agricultural scientists and technicians. Fourth, much of the research carried out has tended to concentrate mainly on the physical and biological aspects of farm problems at the expense of other economic, social, cultural, and political aspects.

Agricultural Extension

The third leg on which the National Agricultural Knowledge System (NAKS) rests is the national extension sub-system, which is indispensable in transferring agricultural knowledge and information to farmers. African countries, this task is entrusted to Ministries of Agriculture or to parastatals supervised by the Ministry of Agriculture. The typical national extension service has an overall director at the national level supported by a layer of provincial and district directors, who, in turn, supervise a number of field level extension staff. Quite often extension services are financed by governments and their development partners as components of national rural development projects. These projects have had a high failure rate and their extension components are often poorly managed. A recent analysis by the World Bank reveals that the technical messages that they attempt to communicate to farmers are usually of an extremely general type applicable over diverse agro-ecological conditions. Cleaver (1993) summarizes the problems of Africa's extension systems as revealed by the World Bank study as follows:

- The extension staff are poorly trained, poorly paid, know little more than the farmers and have little motivation to share what ever knowledge they do have with farmers;

- Management systems are poor, and as a result, there is little pressure on staff their managers to seek new knowledge or to serve farmers;
- Farmers are treated as ignorant recipients of information, rather than knowledgeable partners in technology transfer;
- Extension agents are not accountable to farmers;
- Operating facilities, vehicles and bicycles are often so rare that even the few motivated and knowledgeable extension staff cannot systematically visit farmers even if they wanted to; and
- Competition often exists between various donor-inspired extensions systems with each usually providing contradictory messages.

The result has been largely bureaucratic agricultural extension institutions with little or no impact on agricultural productivity.

III. THE POLITICAL ECONOMY OF THE NAKS AND THE IMPLICATIONS FOR AGRICULTURAL EDUCATION

The political economy of the NAKS is still not well understood because many African countries do not have an “agricultural knowledge policy”. A dynamic agriculture requires a well functioning NAKS which, in turn, has profound implications for the relevance, responsiveness, and efficiency of the key sub-components of the system, i.e., agricultural education, agricultural research, and agricultural extension.

Rationale for Government Intervention in the NAKS

Governments everywhere are prompted to intervene in the NAKS for a number of reasons. First, if the acquisition of agricultural knowledge were left to private markets, these markets will fail to produce the optimal levels of agricultural knowledge requested for a dynamic agriculture because the private acquisition of agricultural knowledge is beyond the means of most individual Africans. Even though there is evidence of high returns to education, research and extension projects in Africa (Eicher, 1999), markets

in African countries do not provide an effective solution for purchasing agricultural knowledge because of strong imperfections that reduce participation particularly among the key poor. Second market failure also occurs in the provision of agricultural knowledge because of uncertainty and incomplete information. Rural households in African countries often do not know about the existence of services offering agricultural knowledge or, if they do, they are not usually aware of the private returns to the agricultural knowledge on offer. As a result, left to their own devices, they will tend to under-invest in agricultural knowledge. Thirdly, a significant proportion of the benefits from agricultural knowledge will accrue not only to the person paying for it, but also to the wider society at large. Private provision or full cost-recovery will, therefore, result in under-investment in the provision of agricultural knowledge because of the existence of this externality. Fourthly, agricultural knowledge is a “good” with special merits which cannot be quantified. Consequently, it is likely to be under-supplied if left solely to market forces. Fifthly, for agricultural education in particular, the principal decision-maker is the parent and not the child and the important issue is the perception of the parent of the balance between the costs and benefits of sending their children to school. Since only a fraction of the returns to agricultural schooling will accrue to parents, the parent will be economically rational to under-invest in agricultural schooling, notwithstanding its confirmed high economic returns.

Because of the existence of these types of possibilities for market failures, governments always feel obliged to intervene in the provision of agricultural knowledge. Furthermore, even if agricultural knowledge could be provided efficiently under market conditions, only those who could afford to pay would be able to benefit from it. Not only would there be under-investment from the social point of view, income inequalities would also be perpetuated and, in some cases, aggravated from one generation to another, since agricultural knowledge is itself a major determinant of how much of the benefits from a dynamic agriculture accrue to each individual member of the society.

Government intervention in the form of public expenditure on the provision of agricultural knowledge is, therefore, not only essential but also indispensable if Africa countries are to attain and be able to sustain a dynamic agriculture.

Financing Agricultural Education

Agricultural education is the weakest link in the NAKS in many African countries. The linkages between and among the three sub-systems of the NAKS and the major consumers of agricultural knowledge (the decision-makers, the farmers, the agriculture

students, the extension services, the agricultural administrators and planners, the donors, the private sector, etc.) have been very fragile in the past to say the least. One of the main reasons for this is because past government and donor efforts to improve national agricultural research in Africa have usually targeted the individual members of the NAKS separately rather than in a holistic and integrated manner. Eicher (1999) believes that another important reason for this low status of agricultural education in the NAKS is because colonial export crop research, the forerunner of present day national research institutes, were set up way back in the early 1900s, whereas the establishment of faculties of agriculture in African universities did not start until 50 to 70 years later, hence the present state of affairs where faculties of agriculture are usually under-funded vis-à-vis their important status in the NAKS.

Agricultural education at all levels requires many expensive things such as scientific and technical equipment, adequately equipped farms for practical training and agricultural research experiments, transportation and field materials, and teaching aids. In most African countries the main source for funding of agricultural education is government expenditures. This will continue to be the case for the foreseeable future because of the reasons cited earlier. The budgetary allocation to the educational institutions usually depend on the number of students they enroll, previous funding level, budgetary constraints facing the government, and its willingness to provide support to agricultural education. Other sources of revenues such as fees, donations, and internally generated revenues are usually insignificant. Agricultural education will therefore compete for Government budgetary allocations not only within the political economy of the NAKS but also within the political economy of the overall national education system, and within the political economy of the overall budgetary process. The performance of agricultural education in Africa can, therefore, be assessed not only by analyzing government expenditures on agricultural education as a share of total government expenditures on education but also by analyzing total government expenditures on education as a share of total government expenditures on all sectors of the economy and its share of Gross National Product. The problem is that very little data exists on the share of expenditures on agricultural education relative to overall government expenditures on the NAKS. However, there is evidence to suggest that, because most of the institutional capacity building that has taken place to date in African countries did not focus on the NAKS as a holistic and integrated entity, the result has been an under-investment in agricultural education vis-à-vis research and extension. For example, Eicher (1999) reports that a recent World Bank review found that agricultural higher education received only about two percent of the \$4.8 billion of the

global investments that the World Bank made from 1987-1997 while 98 percent went to research and extension.

Table 1 shows the average shares of government expenditure in the different sectors of the economy in the different development regions of the world while Table 2 shows education expenditures as a share of the economy in sub-Saharan Africa compared to other benchmarks. Table 3 shows average total educational expenditure as a percentage of GNP in all African countries for the period 1990 to 1992. It is not obvious from these tables how government expenditures may have affected the performance of agricultural education in African countries. What is clear is that great disparities exist on government expenditure on education across African countries. There is however evidence to suggest that during the last decade, countries in the developing world that increased their public spending as a share of GNP experienced

Table 1. Developing regions: Average Share of Sectoral Government Expenditures

Regions	Percentage of Total Expenditures				
	<i>East Asia</i>	<i>South Asia</i>	<i>S-S Africa</i>	LAC	MENA
General public services	33.02	30.86	33.88	38.81	38.84
Defense	12.98	14.85	9.71	12.03	21.25
Social Services	39.1	27.32	29.55	37.25	32.5
Education	23.98	7.48	15.89	17.31	12.42
Health	8.1	3.88	6.3	7.99	5.01
Social security and welfare	3.64	6.14	2.65	7.45	9.03
Economic services	30.01	31.37	25.29	23.08	21.7
Energy	1.65	1.65	1.63	2.01	2.81
Agriculture	9.52	10.1	8.59	5.26	4.8
Industry	2.11	3.06	2.53	1.41	4.6
Transportation and communication	11.18	10.6	17.12	8.91	4.7
Other function expenditure	22.58	29.23	26.13	38.4	20.04

Source: World Bank (2001); LAC = Latin America and the Caribbean; MENA= Middle East and North Africa

Table 2: Education Expenditures as a Percentage of GNP (1997)

China	2.3
India	3.2
Brazil	5.1
United States	5.4
Denmark	8.1
France	6.0
World	4.8
Sub-Saharan Africa	4.1

Source: UNESCO, 2000.

Table 3: Expenditure as percentage of GNP

Countries	Total Educational Expenditure as percentage of GNP (Average 1990-1997)
Algeria	5.1
Angola	4.9
Benin	3.2
Botswana	8.6
Burkina Faso	1.5
Burundi	4.0
Cameroon	2.9
Cape Verde	4.0
Central African Republic	1.6
Chad	1.7
Comoros	4.2
Congo	6.1
Congo Democratic Republic	-
Cote D'Ivoire	5.0
Djibouti	3.8
Egypt	4.8
Equatorial Guinea	1.7
Eritrea	1.8
Ethiopia	4.0
Gabon	2.9
Gambia	4.9
Ghana	4.2
Guinea	1.9
Guinea Bissau	-
Kenya	6.5
Lesotho	8.4
Liberia	-
Libya	-
Madagascar	1.9
Malawi	5.4
Mali	2.2.
Mauritania	5.1
Mauritius	4.6
Morocco	5.3
Mozambique	4.1
Niger	2.3
Nigeria	0.7

Countries	Total Educational Expenditure as percentage of GNP (Average 1990-1997)
Rwanda	3.8
Sao Tome and Principe	-
Senegal	3.7
Seychelles	7.9
Sierra Leone	0.9
Somalia	-
South Africa	8.0
Sudan	1.4
Swaziland	4.5
Tanzania	5.8
Togo	4.5
Tunisia	6.7
Uganda	2.6
Zambia	2.2
Zimbabwe	7.1
Africa	5.7

Source: African Development (2001).

Table 4: Average shares of Education by education level and region

Percentage Education budget that goes	East Asia	South Asia	Sub-Saharan Africa	LAC	MENA
Primary and Secondary	73	54	67	63	66
Tertiary	13	7	20	8	14
Other	12	42	10	22	14

Source: Pradhan (1996).

growth in primary enrollment, whereas those that did not do so, experienced a decline in enrolment (Figure 2). However, the actual composition of education expenditures are usually skewed toward basic education. Table 4 shows the allocation of the education budget by education levels in the different developing regions of the world. In the intermediate and higher-levels of education, the tendency in the past has been excessive “front loading” with new buildings, vehicles, teaching equipment, text books, agricultural machinery, overseas training, etc. aimed at achieving visible progress as quickly as possible. Because these items of expenditure are usually beyond the resource capacity of many of these institutions, the end result is usually rapidly deteriorating building and infrastructures, limited scientific capacity, and a bloated and fiscally unsustainable educational institutions (Eicher, 1999).

IV. THE CHANGING ENVIRONMENT OF AFRICAN AGRICULTURAL DEVELOPMENT AND THE IMPLICATIONS FOR AGRICULTURAL EDUCATION

The political economy of African agriculture has gone through considerable changes since colonial times and, as we speak, a number of changes are still unfolding. In this chapter we examine what changes have taken place so far in the world of African agriculture, analyze emerging trends that will affect African agriculture in the years to come, and review emerging and unfolding developments that have implications for African agriculture in the years to come. The aim is to gain a better understanding of these changes and determine how they will affect agricultural education as we enter this new millennium.

The Changing African Agriculture Development Strategies

Since the attainment of their independence, the development strategies that have guided African agriculture have changed rapidly. A number of distinct agricultural strategies that have shaped African agricultural development since the early 1960s can be identified (Delgado, 1995). They include the following:

- Commercialization through cash cropping;
- Community development;
- Basic human needs;
- Import substituting industrialization; and

- Structural adjustment.

The Commercialization through cash cropping agricultural development strategy was the main strategy during the colonial era and immediately after many African countries attained their independence. It was primarily a growth strategy, which was designed to open up foreign markets to African raw materials as a way of earning foreign exchange. The Community Development strategy was started in the late 1950s and early 1960s in an attempt to provide non-revolutionary sources of change in rural areas and keep rural people occupied in the country side until the non-agricultural sector could start growing fast enough to absorb the excess labour force from the rural areas. Delgado (1995) reports that the Community Development activities, which were largely patterned after similar programs developed in India in the 1950s, eventually evolved into integrated rural development schemes in the late 1960s and early 1970s. These integrated rural development projects, while emphasizing broad social development, continued to look to cash cropping as engines of growth.

The Basic Human Needs strategy which became popular in the early to mid-19970s argued for a direct approach to meeting the basic needs of the poor (nutrition, health, education, etc.). Concurrent with the Basic Human Needs strategy was a new paradigm shift that emphasized import substitution industrialization. Although this strategy was not an agricultural development strategy per se, it had two major effects on African agriculture. First, as this strategy was implemented, the real rate of exchange of the currencies of many African countries appreciated dramatically because of the policy measures they put in place to support the industrialization process. This had the effect of discouraging export crop production. Second, the ensuing over-valued exchange rates and increasing levels of urbanization encouraged rapid increases in food imports resulting in increased prices of non-tradable traditional foods such as roots and tubers, millet, sorghum, etc. relative to imported food items such as rice and wheat for bread.

By far the most dramatic and far reaching strategic paradigm change in African agricultural development thinking started taking shape in the later 1970s. World Bank and International Monetary Fund supported Structural Adjustment Programmes (SAPS) were introduced in many African countries as a reaction to the developments of the early 1970s which culminated in unsustainable budget deficits and foreign exchange shortages in most sub-Saharan African countries. The SAPS were operationalized through Structural Adjustment Lending (SAL) or Sector Adjustment Lending (SECAL). The distinction between the two types of lending is not always clear in Africa. Both seek major reform in policies and institutions and since agriculture dominates most African economies, the main distinction between them relates mostly to scope and complexity. In general, these lending programmes have four major parts as follows;

- A statement of structural objectives to be achieved in five to ten years (e.g. increasing non-traditional exports by a given percentage; reducing the rate of growth of total energy use and of imported energy by given amounts; increasing agricultural output by a given amount; reducing food imports by a given amount, etc.).
- A statement of the measures that will be taken over approximately five years to achieve these objective (e.g., reducing the level of trade protection and reforming its pattern on the basis of comparative advantage; increasing the real price of energy; altering the terms of trade between the agricultural and non-agricultural sectors, undertaking major changes in the organization of agricultural markets, including the roles of the public and private sectors etc.).
- A specific and monitorable set of actions to be taken by the government either before the SAL operation is approved or during the disbursement period (e.g. one or more cuts in tariffs on imports, introduction of specified export-promotion schemes, elimination of certain or all quantitative restrictions on trade; removal of all or part of price subsidies, specified increase in agricultural producer prices, etc.).
- An agreed-upon, quickly disburseable, amount of foreign exchange to finance imports not linked in advance to specific investment programmes with the purpose of providing balance of payments support to the borrower during programme implementation.

The disbursement of each operation under SAL is typically trenched in order to ensure both that the adjustment programme in general is on track and that specific measures included in the programme of action are actually carried out. However, The specific policy measures that drive these various components of the SAPs vary somewhat from country to country but they invariably include the following:

- Price policies;
- Trade policies;
- Public enterprise and institutional reforms; and
- Fiscal and monetary policies.

Of all these categories of policies it is the fiscal and monetary policy reforms that have had the greatest implications for agricultural education to the extent they call for the following policy instruments:

- Government revenue collection reforms;
 - Improve collection and compliance
 - Increase general tax and set revenue targets
 - Shift to ad-valorem from specific taxes
 - Index certain tax rates
 - Introduce tax reforms
 - Provide tax incentives to business

- Government expenditure reforms;
 - Set specific expenditure targets
 - Rationalize public investment
 - Cut current expenditure (reduction of subsidies, wage/hiring reduction)
 - Set limits on transfers to state enterprises
 - Improve monitoring and control of public expenditures

- Deficit reductions;
 - Set specific targets
 - Establish payback rule for project choice
 - Carry out thorough preparation of investment plants
 - Introduce/enhance privatization
 - Introduce major reforms to agricultural institutions, such as marketing boards and extension services

- Monetary and credit policy reforms;
 - Set limits to public sector credit
 - Decontrol or establish higher ceilings on interest rates

- External debt management reforms;
 - Set limits on new foreign borrowing
 - Improve monitoring and control
 - Carry out energy and other sector studies

Delgado (1995) reports that these changes in African agricultural development strategies were influenced by the following factors:

- Virtually all of the countries in the Sub-Saharan region were subjected for at least 80 years to one form or another of European colonial rule, a fact that still affects development patterns today.
- Many of the countries became independent at roughly the same time, during a short period at the start of the 1960s.
- All but five African countries were subjected to explicit or implicit military rule during most of the first two decades of independence.
- African nations emerged during a highly popularized phase of human history i.e., the Cold War.
- The common influence of major shifts in world economic events such as commodity booms, oil shocks, and foreign assistance on developing countries as a group was arguably greater in the historical period of Africa's emergence since the 1960s than was the case in earlier periods.
- The common influence of demographic factors such as high population growth rates that are prevalent in many African countries tends to distinguish the region from other areas of the world.
- African intellectuals have, until recently, been largely educated in a relatively small number of non-African countries.
- The same groups of expatriate thinkers have played a major role in the intellectual elaboration of development strategies of many countries in the continent.
- A relatively small group of donor agencies has had a huge influence over the allocation of public goods investment in African countries which, in turn, has influenced the evolution of agriculture in the continent.

Some Disturbing On-going Trends

There are a number of on-going trends which are having and will continue to have important implications for agricultural education in Africa. They include:

- Rapid population growth rates;
- Urbanization;
- HIV/AIDS;
- Environmental degradation;
- Wasteful water use;
- Unpredictable weather.

Rapid Population Growth Rates

The highest growth rate of population in the developing regions of the world during the next two decades will take place in Sub-Saharan Africa. Absolute increase in population between 2001 and 2025 in Sub-Saharan Africa will be about 700 million (IFPRI, 1994). The countries of Africa show considerable variation in the size and spatial distributions of their populations. The continent includes countries with small land areas and populations such as Swaziland as well as countries such as Nigeria, Tanzania, Ethiopia and South Africa with large areas and populations. Some of the countries such as Botswana and Namibia are large and sparsely populated while others such as Mauritius have relatively high population densities. The countries also vary in terms of their levels of resource endowments, colonial legacies, political and development experiences, levels of urbanization and the rates of growth of their total and urban populations. These diversities, in part, reflect variations in climate, soils, topography and ecology. The variations and diversity have combined to shape and influence the patterns of growth and spatial distribution of the populations in the continent, which in turn, has determined the existing cropping and livestock production systems. Despite these diversity and variations, one thing is clear: 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 the continent.

Urbanization

An inevitable fact that is not always recognized is that rapid rates of urbanization in Africa is bound to make urban food insecurity and poverty major problems in the near future (Pinstrup-Andersen, et. al., 1997). The rates of urban population growth in Sub-Saharan Africa are among the highest in the world. It has been estimated that by the end of this year, over 40 percent of the population of the countries of Sub-Saharan Africa will be living in urban areas. This figure is expected to rise to over 50 percent

during the first few years of this new millennium. 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 (GCA, 2000). 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 dwellers, to be much better. As a result, the pull of the cities becomes irresistible for many rural dwellers, particularly the youths. In some instances prolonged drought and incessant political conflicts in the countryside further aggravates the situation and forces more rural dwellers to migrate to the urban centers.

HIV/AIDS

At the rate at which the HIV/AIDS pandemic is spreading in Africa, there is a real risk that agricultural production will be drastically reduced. It is estimated that 70 percent of the world's AIDS burden is concentrated in Africa. The massive human capital degradation, family disruption and instability arising out of the HIV/AIDS will pose severe limitations to the continent's ability to feed itself. The impact of the massive loss of human capital is leading to lower rates of savings and economic growth. At the national/country level, the AIDS crisis is impacting severely on most rural households in terms of a reduction in the family labor force, farm output and increased expenditures on health care and funerals. All of these are bound to lead to a fall in agricultural production. For example, Wolgin (2001) reports that in Zimbabwe an AIDS death of a breadwinner reduces his farm-level agricultural output by 61 percent and in Tanzania households with AIDS patients could loose between 29 and 43 percent of labour during the year. What this means is that those who are not infected will have to increase their agricultural productivity dramatically in order to reduce poverty and hunger and still be able to achieve a dynamic agriculture?

Environmental Degradation

Available evidence suggest 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 must 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 (Thrupp, 1998). 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 (FAO, 1996).

Water Use

Water shortages poses serious problems in many African countries. Although the continent compares favorably to Europe and Asia, many countries face severe shortages in water availability. Annual fresh water resources per person per year dropped from more than 20,000m³ in 1950 to slightly above the basic need (danger point) level of 1000m³ in the late 1990s (Abernethy, 1997). The demand for water in the continent is expected to increase as economic development takes place in co-basin neighboring states, leading to stiffer competition and increased costs of supply augmentation (Hassan, et. al, 1996). 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 (Wold, 1997). 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 (Hassan, et. al. 1996). 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 (Abalu, 1997).

Climate Change

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 (Tolba, 1992). For example, it has been estimated that, of recent, overall rainfall in the semi arid areas of Africa has dropped by over 20 percent compared with the average before the last 50 years (FAO, 1994).

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 (FAO, 1994). 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 (Cleaver and Schreiber, 1994). 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.

Some Emerging Trends

A number of emerging trends will also have implications for agricultural education in Africa. These include:

- Increases in incomes and wealth;
- Globalization, trade liberalization, and economic deregulation;
- New developments in biotechnology;
- Information technology.

Increases in Incomes and Wealth

Ironically as the continent's agricultural resources are used to create national 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. This will have implications for the continent's forests, soils, wildlife habitat, and biodiversity.

Globalization, Trade Liberalization and Market Deregulation

Much of the reference to Africa in international forums of recent has focused on the benefits that the continent can reap from globalization, trade liberalization, and market deregulation. The expectation is that, these initiatives will offer limitless opportunities to working and poor people around the world, including Africa. However, so far there have only been big winners and big losers and we know very little about how globalization, trade liberalization and market deregulation might impact African agriculture and the environment in areas such as forest destruction, overfishing, rapid depletion of minerals, and excessive use of agro-chemicals.

New Developments in Bio-technologies

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 (Juma, 1999). Some analysts point out that farmers and consumers in the industrial world are already wealthy and well fed, so they can afford, if they wish, to take a highly skeptical,

precautionary view toward this new technology, but that Africa cannot afford this luxury (Paarlburg, 1999).

Revolutionary Developments in Information Technologies

Revolutionary developments in information and communication technologies have drastically reduced the cost of processing and transmitting information. These technologies will 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. Farmers and rural communities throughout Africa are having increased access not only to national radio but also to local and community-based radio stations. Access to telephones in many countries is also increasing at a fast rate thereby facilitating fast and cheap electronic communication by fax and through the Internet. This increased access to information technology will open up new opportunities for education, agricultural research and agricultural extension as well as opportunities for conveying information on markets, transport options, road conditions, and employment opportunities.

Responding to On-going and Emerging Changes

Some of the changes outlined above pose threats, others challenges, and others yet, 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). On the other hand policy-makers are often unable to make the painful changes required because of weak political structures. In such cases budgetary reforms alone will not be enough. They will have to be accompanied by political economy reforms that make it possible to formulate and implement the necessary reforms to adequately respond to the on-going and emerging changes outlined above (Gyimah-Brempong, 1998).

IV. AGRICULTURAL EDUCATION STRATEGIES TO MEET FUTURE NEEDS

The existing and emerging political, economic, technical and global changes outlined above have had and will continue to have major impact on African agriculture. The National Agricultural Knowledge Systems in African countries will have to adjust not only to position themselves to effectively respond to these changes as they unfold but also, and perhaps more importantly, to be a position to play a pro-active role in influencing the eventual outcomes of these changes on the overall national economy. The need for the NAKS to respond both actively and proactively to these changes is prompted by a number of reasons. First, we know that there presently exist basic structural weaknesses in the system which arise because of a fragmented approach to the agricultural knowledge system. Second, as the existing and emerging changes identified earlier in this paper unfold, the future of African agriculture is definitely going to be different and will require new approaches. If a system approach is followed in the pursuit of agricultural knowledge, the requisite atmosphere for change will have to be created within: the educational, research, and extension institutions; within the relevant decision-making bodies; and within the donor community. In the rest of this section we identify three key strategies to enable agricultural education in Africa to adequately meet future needs. These include:

- The need for African countries to evolve “national agricultural knowledge policies”.
- The need for structural transformation of the agricultural education sub-system.
- The need for organizational and management reforms.

National Agricultural Knowledge Policies.

Each African country should have a unique “agricultural knowledge policy” that operates for and within the NAKS. The national knowledge policy should have clear short-, medium-, and long-term objectives that cater for all sub-components of the NAKS in an integrated and holistic manner. With regards the agricultural education sub-system, the policy should address the issue of the human resources needed for attaining and sustaining a dynamic agriculture. The Dutch Government has demonstrated that as the role of government changes, public administration reforms take place, and agricultural policies change, the adoption of a single agricultural

knowledge policy holds considerable promise for ensuring that the national agricultural education system meets the agricultural challenges facing a country (Roseboom and Rutten 1998). In Africa, there is need for each country to start by undertaking a comprehensive inventory and evaluation of all the key institutions and stakeholders involved in agricultural education, research, and extension and carefully map out the role that each of these should play in meeting the challenges confronting the NAKS. These challenges will include but will not necessarily be limited to the imperative to move from (FAO, 1997):

- Production to increased productivity;
- Immediate needs to long-term sustainability;
- Reactive to pro-active organization and management;
- Hierarchical to participatory approaches; and
- Agricultural education institutions to institutions for rural development.

At present many African countries do not have explicit policies and institutional arrangements to address these challenges in a holistic way. Yet they are all interlinked and cry out for an integrated policy rather than focusing separately and independently on education, research and extension. Because present policies have failed to take account of the complementarities and synergies between and among education, research, and extension, the contribution of agricultural knowledge to overall rural and economic development is often compromised

It should be emphasized that the development of a national “agricultural knowledge policy” should be seen as a process and the evolution of a resilient national agricultural knowledge policy capable of adaptation becomes a major objective of the national agricultural knowledge policy itself. Consequently, throughout the evolution of a national agricultural knowledge policy, the right dose of testing, review, and reformulation will be essential. The policy process should proceed one step at a time, cannot be short-circuited or unnecessarily rushed and will require attention to be given to continued consensus building through dialogue and communication in order to obtain the commitment of the key stakeholders, who typically report to different ministries, at each stage of the process.

Structural Transformation of the Agricultural Education System

The role of agricultural education in the NAKS is to prepare a cadre of individuals for a lifetime of informed choices and relationships in an inter-linked environment involving science, business, and technology of plant and animal production, environment and natural resource systems. The aim is to create a cadre of people who value and understand the vital role of agriculture, rural communities, and natural resource systems in advancing agricultural, rural, and overall economic development of the country.

There are many problems and constraint working against the achievement of this vision of agricultural education but the main one is structural. The main structural problem is that of isolation (World Bank, 1999). First 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 affects those of the others. Second the activities of the educational institutions at all levels are often not linked to the agricultural needs of the country. Thirdly many of the education programmes are not mainstreamed and are not linked to the overall sectoral and macro-economic agenda of the country. There is, therefore need to structurally transform the agricultural education system at all levels so as to put in place the most cost effective and efficient structures for offering training at all levels in the face of the on-going austerity measures which most African countries are implementing. Structural transformation will be required to:

- Synchronize the training provided at the primary and secondary levels with those of the intermediate and high levels.
- Broaden the scope and content of the national agricultural education programme so that it is not seen by youths as a terminal stage leading to a condemnation to perpetual residence in the rural areas but as a programme that provides limitless opportunities for leadership development, personal growth and career success.
- Through research and experimentation, evolve a system which can generate training at all levels that can be delivered through an optimal combination of contextual learning (theory), work-based learning (supervised agricultural experience programmes) and agricultural student leadership activities (agricultural youth organizations and associations).

- Adjust training to the requirements of a dynamic agricultural and its linkages to the overall economy and adapt the content of educational programmes at all levels to the practical needs of the country. In this regard, the educational programmes at all levels should be geared not only to agricultural production but also to the wider national goals of rural development increased food security, the elimination of poverty, and the use of national socio-economic structures to address on-going and emerging changes affecting the agricultural sector.

Organizational and Management Transformation

The present organizational and management structure of national agricultural education sub-systems in many African countries suffer from shortcomings that prevent agricultural education from taking its rightful place as an equal partner to research and extension in the NAKS. Strategic changes will be required in the organization and management of agricultural education at all levels in order to:

- Ensure that there is improved planning analysis and management capacity to encourage quality improvement and cost-saving innovations in the provision of agricultural training.
- Encourage educational programmes at all levels to develop and use teaching methods and approaches, which are oriented towards local problems and the needs of local farmers. This will require new agricultural and management arrangements that:
 - Permit agricultural education curricula at all levels to be aligned to the employment needs of the public and private sectors;
 - Encourage close collaboration between agricultural education institutions and those of research and extension;
 - Train researchers, extensionists, and farmers to produce for a market economy targeting not only national markets but also regional and international markets as well.
- Ensure that once a unique agricultural knowledge policy has been agreed, the agricultural institutions at all levels are given enough autonomy in running their day to day activities so that they can fully participate in national and regional agricultural development initiatives.

- Encourage regional cooperation to help countries which, because of limitation in human and financial resources, will need to collaborate to be able to afford specialized agricultural training in specific areas. Donors and international organizations can play an important role here by coordinating their activities within and across countries to promote the creation and maintenance of regional centres of agricultural specialization to serve specialized needs of the less endowed countries in a region.
- Establish strong links between faculties of agriculture, colleges of agriculture and agricultural research institutes.
- Put in place a system approach to the teaching of agricultural subjects at all levels so that the graduating students can have a vision of agriculture as a system comprising technical, economic, social and political components which interact and are inter-linked in a recursive manner.

VI. CONCLUSION

This paper has attempted to highlight the important role that a dynamic agriculture can play in overall rural and economic development. Agriculture should be seen as encompassing much more than just the production of agricultural commodities, food, fiber, wood products, horticultural crops, and other plant and animal products and but also extending to include financing, processing, marketing, distribution of agricultural products, farm production input supply and service industries, health nutrition, and food consumption, the application of science, the use and conservation of land and water resources, and related technical economic, social, and political, characteristics of the entire food and fiber system of a country. The paper notes that as would be expected the political economy of African agriculture is changing rapidly and agricultural education in the continent must adjust to the realities of this change. The paper proposes an “agricultural knowledge systems” approach as a realistic perspective for preparing for this change. The need for national “agriculture knowledge” policies for each African country is advocated together with structural transformation of the agricultural education sub-system to bring its organization and management in line with this new approach.

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