

## Repositioning Tertiary Agriculture Education Curriculum for Sustainable Development in Nigeria: Challenges and Opportunities.

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**Abstract:** Nigeria's economic growth hinges on the development and promotion of a vibrant and sustainable agricultural production base. The prime movers of sustainable agricultural production include: availability of improved technologies, human capital, sustainable growth of biological and natural resource capital, improvement in performance of supporting institutions and favourable economic policy environment. Curricula and teaching methods and tools developed are not relevant to the development of the country and needs of the farmers and labour management, rather they are curricula adopted from countries that had colonies in Africa. The public sector used to absorb large majority of agricultural graduates, but this is no longer the case. Agriculture graduates are finding it increasingly difficult to become employed. Their education in agriculture has not been oriented to the needs of an increasingly sophisticated commercial sector. Central to solving the above problems is the production of suitable graduates, who are technically competent and relevant; equipped with the necessary skills and business skills; to work with local and especially rural communities. In this paper, we reviewed the challenges of effective teaching of agricultural education in tertiary institutions in Nigeria and also suggest that environmental degradation, rapid changes in scientific and technical knowledge, the changing role of women in society and the increasing marginalization of agriculture and rural life all call for changes in agricultural education, in addition to ICT introduction. Therefore, the tertiary agricultural education curricula must be transformed if agricultural education will be a ready tool for sustainable development.

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### 1. Introduction

The livelihood situation in Africa has been described as dire and deteriorating (Diao *et al.*, 2006). Africa is the only continent where hunger and poverty are projected to get worse. Statistics show that 80% of all Africans live on a daily income of less than two US dollars, while nearly half struggle to survive on one US dollar a day or less. More than 200 million Africans now suffer from malnutrition (Rosegrant *et al.*, 2005). Food security and its relationship to sustainable agricultural and rural development have increasingly become matters of concern for developing countries and for the international community. While there are many complex factors that influence sustainable development and food security, it is clear that education in agriculture plays an important role in preparing farmers, researchers, educators, extension staff, members of agri-business and others to make productive contributions. A critical issue in the 21st century will be the changes and adaptations required in agricultural education in order for it to move effectively (Crowder *et al.*, 1999), contribute to

improved food security, sustainable agricultural production, and rural development. If change is going to be achieved in sub-Saharan Africa in general and Nigeria in particular, then agriculture, particularly small holder agriculture has to be made to work.

Faculties of agriculture and agricultural colleges and universities were first formed in the belief that farm production could be increased as a result of the systematic application of current technology and agricultural research findings. The mission of these early educational institutions was to scientifically study agriculture with the participation of the farming community; to carry the results to a broad range of farmers who could use them; and to train farmers, extension workers, agricultural teachers and researchers so that agricultural production could continue to be increased on a sustained basis. But according to Rogers, (1996) "poor training of agricultural extension "staff has been identified as part of the problem of the relative ineffectiveness of much of extension in the field". "This applies not only to extension staff but to agricultural professionals in

general. Unfortunately, the training of human resources in agriculture is often not a high priority in the development plans of countries. As a result, curricula and teaching programme are not particularly relevant to the production needs and employment demands of the agricultural sector.

The situation has become more serious in recent years due to the economic crises in the public sector in many developing countries. In the past, the public sector absorbed nearly all agriculture graduates. This is no longer the case, and agriculture graduates are finding it increasingly difficult to find employment. Governments can no longer afford to hire every graduate, and education in agriculture has not kept up with the increasingly sophisticated labour demands of the private sector (Crowder *et al.*, 1999; FAO, 1997). These and other factors, such as environmental degradation, rapid changes in technical knowledge and the increasing marginalization of rural areas, all calls for changes in the current systems of education in agriculture in many developing countries.

## 2. Role of Agriculture in sub-Saharan African (SSA) Development

Agriculture remains the foundation of SSA's dominant economic activity accounting for 40% of GDP, 15% of exports and to 80% of employment (Diao *et al.*, 2006). Productivity of African agriculture over the last two decades has generally stalled. Per capital output of staple foods continues to fall and the continent is steadily losing its world market shares for major export crops like coffee, tea and cocoa. Improving performance of Africa's stagnating agricultural sector is a key to solving the problems of hunger and poverty. The only way of ensuring improved African agriculture is ensuring that the prime movers for its development are in place.

## 3. Prime Movers to Agricultural Development

Rukuni (2002) lists prime movers which should work in concerted manner to achieve sustainable agricultural development. These include:

- A) New technology produced by public and private investments in agricultural researchers or imported from the global research system and aspect of local conditions.
- B) Human capital in the form of professional, managerial and technical skills produced by investments in schools, agricultural colleges, faculties of agriculture and on the job training and experience;

- C) Sustained growth of biological capital (genetic and husbandry improvement of livestock herds, crops, forests, plantations and so on) and;
- D) Physical capital investments (large and small dams, irrigation, grain stores and roads), improvements in the performance of institutions such as marketing, credit, research, extension and land reform.
- E) Favourable economic policy environment. No single prime mover, such as new technology or higher prices can increase agricultural production and sustain it for any period of time.

However, central to making the prime movers operational is the production of necessary human resources to man the different institutions which will get agriculture moving".

## 4. Tertiary Agricultural Education

Higher education in agriculture and national resource management plays a particularly significant role in national development (Maguire, 2000). The major focus of tertiary agricultural education has been on the production of public sector employees (Muir- Leresche and Scull-Carvalho, 2006). Traditionally, graduates have largely found employment in ministries of agriculture, universities, state operated enterprises and other government functions. Agricultural graduates have worked as policy advisers, lecturers, researches, extension workers, business managers and financial experts.

## 5. Importance of Teaching Agriculture in Schools

Teaching agriculture to young, students opens them to understand how things grow, live and die. From flowers to potatoes, from cows and pigs to tractors and soil. Teaching students about farming and gardening introduces knowledge about how, for example, food gets onto their tables, clothes get onto store shelves, and seeds germinate. Starting agricultural education at a young age helps children get perspective on their lives and the world around them.

Teaching agriculture introduces young students to basic scientific procedures and shows them how to apply these lessons to daily life. For example, an agriculture instructor can teach students about how bees make honey, how trees grow and make fruit or nuts, and how corn can be made into oil, for example. Agriculture puts chemistry, biology and physics into everyday-life application.

School gardens planted by students serve as environmental and agricultural educational tools. Planting flowers, potatoes, tomatoes and trees teaches elementary school students about how things grow live and die. Gardens also can help young students develop personally and socially by adding a practical dimension to these agricultural subjects.

Agriculture-in-the-classroom initiatives educate students about nutrition, where foods come from, how to nourish themselves, and the importance of nutrition for the rest of the world. In 2004, the United Nations Food and Agriculture Organization of the United Nations and the UN's UNESCO Institute of Education Planning co-published a book on school gardening titled "Revisiting Garden-Based Learning in Basic Education." The book addresses the importance of school gardening and agriculture education to community life.

Students can develop skills in leadership, communication, team building and civic engagement through inter-curricular programs in agricultural education. They learn about the importance of farming to a community, and learn to work together in planting gardens and in discovering how their community provides food to the public (Iwu et al., 2011).

#### ▪ **Contextual Constraints to the Teaching of Agriculture**

Changing employment opportunities in agriculture reduced government spending as a result of structural adjustment has put pressure on agricultural education institutions to better relate curricula to employment opportunities. The dramatic reduction in employment by Ministries of Agriculture in recent years, in some cases over 50 percent staff reductions, means that students increasingly need to learn knowledge and skills for private-sector employment. It is also likely that employment opportunities outside the agricultural sector will grow at a faster rate than in agriculture. This requires a continuous analysis of job markets and employer's requirements in order to plan and develop appropriate curricula (FAO, 1997; Crowder *et al.*, 1999). Recent changes in employment opportunities mean that the curricula and training programmes in agriculture need to be reoriented to meet the learning requirements of diverse groups Unemployed and under-employed people, dismissed public-sector workers, agricultural professionals seeking career changes and advancement and young graduates seeking employment for the first time. Only by involving potential employers in the curriculum development

process will be possible to ensure that agricultural education will result in gainful employment for graduates. (FAO, 1993a).

Improving the employment opportunities for graduates requires that curricula focus less on specific technical knowledge that will quickly become obsolete and more on processes and abilities of students to think and solve problems that are relevant to societal needs. Students should learn skills and abilities that are transferable to a wide range of occupations. For example, excellent communication skills are as needed by agricultural graduates who plan to work in extension as business school graduates who hope for a career in the banking industry. Likewise, teaching methods should be changed to reflect the needs of society, and thus better respond to demands for trained human resources. Teaching with practical, reality-based cases is a good example of how teachers can change methods to meet student needs and those of the larger society (Boeher and Linsky, 1990).

#### ▪ **Budgeting and Financial Crisis**

In most developing countries, the major source of funding and financial support for agricultural education is the national government, or the provincial/municipal government level where decentralization has been implemented. Generally, agricultural education institutions operate on the basis of an annual budget which depends on the number of students enrolled, previous funding levels and government capacity to support the institutions. Tuition, fees and other possible sources of income, such as donations and institutional revenue from farms or the provision of various kinds of services (e.g., veterinary services) are often of limited significance.

Agricultural education is expensive. It requires teaching aids and materials, scientific and technical experiment as well as adequately equipped training and experimental farm. The initial funds for buildings, teaching equipment, text books, and agricultural machinery have usually been provided in the past by governments and donor assistance. The maintenance and replacement of these facilities is generally beyond the existing financial resources of many institutions.

The result is that agricultural education institutions face great difficulties in ensuring properly equipped, maintained and functioning laboratories and practice farms. Not surprisingly, the objectives of experimentation, teaching, outreach or agricultural production are inadequately achieved.

Budgeting cutbacks have also made it difficult to maintain teaching standards due to reductions in recruitment and in staff development programmes, especially those involving training abroad. Limited budgetary resources often do not allow teachers to obtain the scientific and technical publications necessary to keep their knowledge current, or to conduct up-to-date research. This has resulted in a decline in the standards of teaching, research and extension in many countries.

#### ▪ **Marginalization of the Agricultural and Rural Sector**

Due to increasing urbanization, fed by out-migration from rural areas, governments often give priority to urban needs for health, education and social services at the expense of rural areas and the agricultural sector. Such action leads to even greater impoverishment in rural areas and leads to higher levels of migration. It was felt that agricultural institutions are becoming increasingly isolated from the mainstream of national development and need to play a more dynamic role in rural development issues through better links with government and with other institutions. Admission is based solely on academic qualifications which place rural young people in direct competition with better schooled urban youth. The result is a significant waste of human resources, since rural youth possess unique aptitudes and qualities for understanding and working in the rural sector and are well suited for technical work in agriculture (FAO, 1997).

In some cases, the urban origin of agricultural students is now so dominant that it is becoming difficult to teach them about agriculture without special, often expensive, educational efforts. The result is that urban-based graduates, with little practical knowledge of rural development and agricultural production are working as extension agents and agricultural advisers.

The increasing number of students with urban backgrounds has led some institutions to look for ways to ensure that these students gain a practical understanding of the realities of rural and farm life. One way is early integration of students in rural life through practical training before final admission and a series of practical training periods throughout the programme of study. Agricultural universities and colleges need to take into consideration during admission the willingness of student to follow an agricultural career and their ability to adapt to work in rural areas (Crowder *et al.*, 1999).

Students of agricultural faculties are all-two - often not there by choice. Frequently they are there by default after failing to enroll for medicine, veterinary science, business studies, and engineering among other popular programmes (Muir - Leresche and Scull — Carvalho, 2006). This has a bearing on the graduate being produced.

#### ▪ **Relationship between Agricultural Education and Research and Extension**

With few exceptions, the institutional relationship between agricultural teaching and research and extension services are inadequate. In many countries, this is the result of the deliberate separation of education, research and extension into different ministries and agencies and a lack of functional mechanisms to link them together to solve common problems. (Crowder *et al.*, 1999).

Agricultural research is usually conducted at government research stations and laboratories, the majority of which are not linked with universities. Research activities are often carried out as part of postgraduate programmes of higher agricultural education, but they are seldom directly related to national research priorities and programmes (FAO, 1997).

As with research, close working relationships between agricultural education institutions and extension systems are indispensable in order to ensure the relevant and contributions in extension and community outreach is often limited. Even in those countries where extension and agricultural education are not separated into different ministries, the lack of resources and linking mechanisms greatly limits joint activities.

#### **6. Introducing New Topics Into The Agricultural Education Curriculum For Sustainable Development**

Although agriculture education has generally kept pace with scientific progress in the past, the pace of change is much faster today. The extent of scientific advances in the field of biotechnology, computers and communications 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 procedures, and thus to agricultural education. Agricultural education and training needs to take into account new subject areas and their socio-economic consequences.

The increasing concern with environmental protection and the preservation of natural resources makes research and teaching on

subjects such as crop protection and integrated pest management, rational use of fertilizers and soil and water conservation more pressing. Programmes of study have been concerned largely with intensive, high - input production techniques. Students need to have knowledge, skills and attitudes required for sustainable agricultural and rural development.

#### ▪ **Rapid Scientific Progress and Technical Change**

Although agriculture generally kept up 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 global sharing of information among scientists and educators. Since “new” knowledge becomes “old” knowledge so quickly, it is essential that students develop the skills and attitudes that will allow them to continue to learn and develop their competencies throughout their professional lives. New global developments in science and technology have profound implications for agricultural education institutions. New advances in science and technology influence the subject matter and types of courses students need to understand today’s agriculture. Food processing and post-harvest technologies, biotechnology, agri-business management and farming systems development are some of the subject areas which need, to be incorporated into curricula. These subjects will attract increasing numbers of students as new employment opportunities are created which demand expertise in these fields. Advances in biological sciences, increase the complexity of agriculture and compliment access to technology by poor nations. Regional cooperation centers and possible solution partnerships with private companies should also be explored means to improve access to new technologies (FAO, 1997).

In addition to new scientific knowledge, the most important source of knowledge for agricultural development is rural people themselves and the time-tested systems of production that embody their knowledge. An understanding of rural people and their production systems should be integral part of agricultural education.

This requires that agricultural education institutions play not only an academic role, but also a community development or outreach role that allows them to understand local knowledge and combine it with modern agricultural science. Understanding the contributions that local people can make to solving their own problems is the key

to sustainable rural development (Crowder *et al.*, 1999).

#### ▪ **Environmental Issues in Agricultural Education**

In many parts of the world, the increasing needs of growing populations for food, fuel and fibre have led to deforestation, severe soil erosion, loss of water resources, eventually declining crop production. It is clear that the loss of natural resources and environmental degradation affects food security. It is also clear that institutions of education in agriculture need to incorporate environmental and sustainable agricultural development issues into their curricula (FAO, 1997; Crowder *et al.*, 1999).

Environmental and sustainable agricultural development problems require an interdisciplinary approach to curricula since sustainable development relates only to technological concern, but also to economic, social, cultural, ecological and public policy matters. Furthermore, curricula need to provide students with opportunities to observe first - hand the physical, technological and social aspects of natural resources uses for agriculture through learning activities that are experiential and problem focused.

Experience shows that institution of agricultural education can play a vital role in bringing about changes in peoples attitudes and practices so that they are more environmentally responsible. Developed countries have for some time included environmental concerns in their teaching curricula, research activities and outreach programmes. Current practice in agricultural education in many developing countries, however, does not demonstrate widespread integration of environmental and sustainable agriculture topic into academic programmes (FAO, 1997).

Environmental issues are related to inappropriate production techniques and farming system. The least developed farming systems often cause deforestation and soil degradation while more advanced systems, which seek productivity at all costs, often result in soil and water pollution through excessive use of fertilizers, pesticides and herbicides. Furthermore, despite the numerous interactions with agriculture, problems of urban and /or industrial pollution often are not included in agricultural education in industrialized countries and are rarely mentioned in developing countries.

#### ▪ **Integrating population issues into agricultural education**

Population projections suggests that the world population will continue to increase from the

present figure of nearly six billion people to between 11 and 14 billion people by the end of the 21st century. There is a great need in the developing countries to teach agricultural students population issues in relation to development problems. Institutions of agricultural education need to incorporate population education concepts and principles into curricula since many agricultural graduates will become managers, planners, and policy - makers who need to understand the dynamic interrelationship between food, population, the environment and socioeconomic development (FAO, 1996; FAO, 1997; Crowder *et al.*, 1999).

Furthermore, students trained to work as extension agents need to be able to engage farm families in dialogue about sensitive population issues and to effectively communicate population messages to rural people. Population education should develop awareness and understanding of the nature, causes and implications of population growth and distribution as they relate to agricultural productivity and rural development, and how these issues affects, and are affected by farmer, their families and society as a whole. Population education can be integrated into training institutes by creating a separate population education courses; and by integrating population education issues and content into relevant topics in courses of study within existing curricula.

Population issues are good example of how to integrate the teaching of values and attitudes into an agricultural subject area. Educators need to develop teaching strategies that emphasize and help students develop their effective reasoning skills. Since the attitudes and values that people possess are difficult to change, educators need to place greater emphasis on the psychology of the change process, thus improving the likelihood that changes in practice will come as a result of educational efforts (FAO, 1997).

#### ▪ Gender Issues in Agricultural Education

Women play a major role in the world's agricultural production system. In the less developed countries, an estimated one-third of all rural households are managed by women. In sub - Saharan Africa and Caribbean, women produce 60 - 80 percent of basic foodstuffs, while in Asia they perform over 50 percent of the labor involved in intensive rice cultivation (FAO, 1996).

In recent years, there has been widespread recognition of the vital roles played by women in all areas of agriculture and need for women to have access, through formal and non-formal training, to the knowledge and skills needed for

improved agricultural production, processing and marketing. Extension agents, researchers, teachers and students all need to be education and informed about rural women's problems, potentials and aspirations.

The 1991 FAO expert consultation urged that special efforts be made to recruit and support female students from rural areas who could become extension agents, agricultural researcher, teachers and policy-workers. One of the reasons why there are few women extension workers, researcher and other agricultural professionals is the small number of female graduates from intermediate and higher-level agricultural education institutions. Yet, there are various countries where the enrollments of women are proportionately high. On average in Africa, FAO data show that there has been 10 percent increase from 1983 to 1993 from about 15 to 25 percent female enrollment in agricultural education institutions (FAO, 1993)

The question of how to attract more female students to agricultural disciplines is linked to the issue of encouraging students from rural areas to enter higher education. As noted above, the number of female students has increased over the past ten years and this trend should be supported and encouraged. Also, more role models from young women to emulate are needed, including teachers in agricultural education institutions. Raising the number of women in agricultural education, both as educators, administrators and students is important as a means of reinforcing a commitment to understanding and changing the status of women in agriculture (Karl, 1997).

Educators need to become more responsive to gender related issues by taking into account women's roles contributions in the total agricultural industry. While there is a trend for increased enrollment of women students in agricultural sciences at the technical or high levels, this has not resulted in the dissemination of improved technology to women farmers because few female graduates are employed in extension work. Agricultural education institution may increasingly have gender -sensitive admittance policies, but due to traditional barriers female graduates continue to have problems finding employment in agriculture (Crowder, 1998). Strategies, curricula, and policy shifts need to emphasize and include women as a role models and leaders in agriculture.

Gender sensitive policies have, at best, resulted in training programmes in which women are treated equally men. However, it is not only the equal treatment of women that is important, it is

equal employment benefits that is important. Equal treatment does not necessarily lead to equal benefits for women; indeed, the treatment may have to be different in order to take into consideration the different need, time constraints and productive activities of women.

Gender sensitive educational policies should be developed with a wide-range of stake holders, including community leaders, politicians, potential employers and especially women themselves. Measures should be put in place to encourage young women and better prepare them to take up agricultural studies. For example, special attention should be paid to revising admission policies that discriminate against women and to the creation of special scholarship for women to study agriculture. There is also a need to provide gender sensitization courses for teaching staff and to eliminate stereotyping of females in agricultural studies. In some cases, professional organizations of women agriculturalists can act as pressure groups for these changes (Crowder *et al.*, 1998).

#### ▪ Introduction of ICT

Today a new paradigm of agricultural development is fast emerging: in both developing and developed countries the overall development of rural areas is expanding in new directions; old ways of delivering important services to citizens are being challenged; and traditional societies are being transformed into knowledge societies all over the world. ICTs play a key role in improving the availability of agricultural production and market information in developing countries. ICT-based market information systems have a proven track record for improving rural livelihoods in middle income developing countries where they have been introduced. However, these systems are generally limited in scale and have not been effectively replicated beyond the local level.

#### ▪ An inter-disciplinary systems approach to agricultural education

At a relatively early stage of their education, students need an overview of the agricultural and rural systems of their countries. Throughout their training, they need not only specialized courses which deal in-depth with specific technical subject-matter, but courses that help them think holistically, or in terms of integrated agricultural systems, so that they can understand the multi-dimension nature of sustainable agricultural production. This requires an inter-disciplinary systems approach to agricultural education.

Training in the systems approach is essential for agricultural education because of the increasing complexity of agriculture, food and rural systems, the problems of environmental protection and management, women farmer and household issues had the needs of small-scale farmer. Even conventional subject-matter teaching should take place with in an inter-disciplinary framework of agricultural systems rather than as isolated subjects.

#### 6. Conclusion

Agriculture will continue to be the driver for economic growth in sub-Saharan Africa and Nigeria in particular. In order to get agriculture moving, a well trained cadre who is technologically competent and relevant equipped with the necessary skills and business skills to generate employment and wealth and able to work particularly with rural communities produced. The curricular should be directed to address the labour demands of the private sector, social and environmental issues for sustainable agricultural development.

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