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Abang ISS
National Centre for
Technology Management, an
Agency of the Federal Ministry
of Science & Technology,
PRODA Training Institute,
Independence Layout, Enugu
State, Nigeria

Akhimie CO
National Centre for
Technology Management, an
Agency of the Federal Ministry
of Science & Technology,
PRODA Training Institute,
Independence Layout, Enugu
State, Nigeria

Nze ON
National Centre for
Technology Management, an
Agency of the Federal Ministry
of Science & Technology,
PRODA Training Institute,
Independence Layout, Enugu
State, Nigeria

Amasiatu IS
National Centre for
Technology Management, an
Agency of the Federal Ministry
of Science & Technology,
PRODA Training Institute,
Independence Layout, Enugu
State, Nigeria

Ukwueze RU
Institute of Management
Technology (IMT), Enugu
State, Nigeria

Agbatah OB
National Centre for
Technology Management, an
Agency of the Federal Ministry
of Science & Technology,
PRODA Training Institute,
Independence Layout, Enugu
State, Nigeria

Corresponding Author:
Abang ISS
National Centre for
Technology Management, an
Agency of the Federal Ministry
of Science & Technology,
PRODA Training Institute,
Independence Layout, Enugu
State, Nigeria

ICT for agricultural management: A tool for regional competitiveness in Nigeria

Abang ISS, Akhimie CO, Nze ON, Amasiatu IS, Ukwueze RU and Agbatah OB

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Abstract

This paper presents some solutions to how Nigerian agricultural sector can become great again, recalling the glory days, when the sector was the national economic backbone. The paper explained some of the challenges that agricultural farmers faces in Nigeria and how scientific application of ICT as a means of quick dissemination of farming skills, techniques and proper resource allocation, could aid the nations farming sector to achieve it aim. The objectives of this paper are to determine an alternative means of farming that would enhance the contribution of the agricultural produce in Nigeria and also to encourage the use of modern day technologies by farmers to improve their farming techniques and produce.

The concept of the growth pole technology was adopted as a means of enhancing the current farming situation and ICT is our focal tool in driving the growth pole strategy. The discussions in this study are premised on the concept of ICT, Growth Pole strategy, and the importance of agriculture as an alternative source of Income generation.

The methodology aimed at achieving some of the following in the discussion that ICT-enabled service, often use multiple technologies to provide information to rural farmers on forecasts so that they can prepare for weather-related events (Balaji and Craufurd, 2011; Gunda *et al*, 2017). The proliferation of mobile phones across the globe has not impinged agriculture in various ways. Mobiles are being used to help raise farmers' incomes, making agricultural marketing more efficient, lowering information costs, reducing transport costs, and providing a platform to deliver services and innovate (Honrao, 2012; Khapayi and Celliers, 2016).

Recommendation were made on Knowledge management application, where the study made suggestions to the federal ministry of information and communication technology that they should create a user friendly application that farmers could easily associate themselves with and share knowledge with each other, also the application should create room for researchers to post their own findings to aid farmers with modern ways of farming.

Keywords: growth pole strategy, ICT, development, agriculture and GDP, sector

1. Introduction

In recent times, farmers have experienced many challenges with respect to information dissemination and accessibility as a result of poor access to ICT tools. As at May 2009, most European nations embarked on a four-year expedition to bridge the gap between agriculture and information and communication technology (Weyenberg *et al*, 2010) ^[31]. The ICT AGRI Era-net is a project that is supposed to radically change the way farming is being done in Europe.

On a larger facet, poverty is eminent when a household or an individual is not capable of meeting what is considered as a minimum requirement to sustain livelihood in a given society. Most times, they lack sufficient food and shelter. Education and health deprivations also keep them from leaving the kind of life which every one values. They are also vulnerable to extreme ill health, economic dislocation, natural and environmental disasters. And they are often exposed to ill treatment by institutions of the state and society and are powerless to influence key decisions affecting their lives (Obayelu *et al*, 2006) ^[21]. These are all dimensions of poverty. A hungry man that is fed at a particular time has not been delivered out of poverty. A person that is alleviated from poverty must be empowered, helped to permanently overcome poverty rather than just for some time. This could be done by helping him or her to: secure a sustainable job, acquire skills cum technical knowledge that would be enough to provide regular source of earning and actively contribute towards the national productivity level.

This paper would consider a more radical way of agriculture which differs from the traditional method of being physically present to do most of the agro activities.

1.1 Research Questions

This study gave rise to the following research questions: (1) can ICT be applied for agricultural development? (2) Why is agriculture not able to compete with other non-agricultural sectors? However, very little have been done by the government to see that the agro sector returns to its glory days of being the national economic backbone.

1.2 Objectives of the Study

Thus the objectives of this study are: (1) to determine an alternative means of farming that would enhance the contribution of the agricultural produce in Nigeria. (2) To encourage the use of modern day technologies by farmers to improve their farming techniques and produce. This research hopes to turn Nigeria from a poor agrarian society to a modern industrial nation and create an all year-round farm production even in and out of seasons.

1.3 Statement of the Problem

In this era of climate change and insecurity, we cannot over emphasize the role ICT would play in making our environment safe again for us to carry out our daily activities regularly and more secure. This paper tries to show how ICT can help us as a nation becomes more competitive through the application of ICT in agricultural activities.

1.4 Purpose of the study

This aimed at investigating some of the challenges associated with old methods of farming, which is raised in the research questions and we suggested some possible solutions through our objectives, to see if these questions raised in the research questions could be addressed by the objectives and we also recommended some policies, which the study feels could assist in achieving our aim.

2. Literature Review

It is not an overstatement to assert that the growth and development of any nation depend to a large extent on the development of the primary industry, of which agriculture is a key player. Unlike traditional development economists such as Arthur Lewis who believed that agriculture plays a passive and supportive role, modern development economists have come to realize that the agricultural sector in particular and the rural economy in general must play an indispensable part in any overall strategy of economic progress, especially in developing countries. More importantly, majority of the world's poor live in the rural areas and depends upon agriculture for their livelihood. Agriculture is therefore critical both for poverty reduction and economic development. The agricultural sector continues to play a crucial role for development, especially in low-income countries where the sector is large both in terms of aggregate income and total labour force (Ehigiamusoe and Uyi, 2012; Agbugba and Binaebi, 2018)^[8, 3]. In most cases the growth in the economy of any nation is a clear indication of an improvement in the socio-economic well-being of its people.

Africa performance in the area of agriculture is extremely poor. One of the major reasons for the relatively poor

performance of agriculture in Africa has been the neglect of this sector in the development priorities of their governments. Some of the challenges facing agriculture in developing countries are to get the government to create right policies that will boost the attitude of farmers in adopting ICT technology. Although most urban communities in Nigeria have adopted ICTs, this is not the case with our rural communities (UNDP, 2002)^[30]. Rural farmers in Nigeria are highly limited to appreciating ICT technologies this is because of insignificant level of attention on the part of the government on one hand, as well as the huge capital required for setting up an ICT base centre on the other hand. For these reasons, it has affected the free flow of information on production capacity of farmers in terms of land cultivation, pest and disease control, marketing of farm's produce and farm activities in developing countries such as Nigeria (Sobalaje *et al*, 2013)^[27].

2.1 The concept of ICT

Information Communication Technologies (ICTs) are electronic/mechanical technologies for creating, acquiring, storing, processing, communicating, and using information (Tiamiyu, 2002)^[29]. In today's world ICT has a natural relationship either with man or his immediate environment. National development in its part is determined and influenced by the level of Information and Communication Technologies (ICTs) a nation controls (Wogu, 2006)^[33]. For the mere fact that the introduction of ICTs in most areas of human endeavours all over the world is usually followed with improved and increased success is a proof that ICTs are very significant and useful for sustainable development (Sobalaje *et al*, 2013)^[27].

2.2 Agricultural developments in Nigeria

Nigeria is one of the largest countries in Africa, with a total geographical area of 923 768 square kilometres and an estimated population of over 190 million. Nigeria has a highly diversified agro ecological condition, which makes possible the production of a wide range of agricultural products. Hence, agriculture constitutes one of the most important sectors of the economy. The sector is particularly important in terms of its employment generation and its contribution to gross domestic product (GDP) and export revenue earnings (Manyong *et al.*, 2005)^[15]. Agriculture, including farming and herding, accounts for 23 percent of Nigeria's GDP and engages 3 percent of the economically active population. Agriculture contributed more than 75 percent of export earnings before 1970. Since then, however, agriculture has stagnated, partly due to government neglect and poor investment, and partly due to ecological factors such as drought, disease, and reduction in soil fertility. By the mid-1990s, agriculture's share of exports had declined to less than 5 percent (Encarta, 2014). Manyong *et al.*, 2005^[15] opined that despite Nigeria's rich agricultural resource endowment, the agricultural sector has been growing at a very low rate. Less than 50% of the country's cultivable agricultural land is under cultivation. Even then, smallholder and traditional farmers who use rudimentary production techniques, with resultant low yields, cultivate most of this land. The smallholder farmers are constrained by many problems including those of poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and environmental

degradation, and inadequate research and extension services.

Agriculture contributes immensely to the Nigerian economy in various ways, namely, in the provision of food for the increasing population; supply of adequate raw materials (and labour input) to a growing industrial sector; a major source of employment; generation of foreign exchange earnings; and, provision of a market for the products of the industrial sector (Okumadewa, 1997; World Bank, 1998; Winters *et al.*, 1998; FAO, 2006) [27, 34, 32]. The agrarian sector has a strong rural base; hence, concern for agriculture and rural development become synonymous, with a common root (Nchuchuwa and Adejuwon, 2012; Adesina and Eforuoku, 2016) [18, 1].

In Nigeria, government is said to be committed to the agricultural sector as indicated in various Policy documents. The agricultural policy emphasizes the enhancement of growth and development of all aspects of agriculture in a sustainable manner (Nwaleji and Igbokwe, 2011) [20]. Some of the government policies include:

The 1962-1968 development plans was Nigeria's first national plan. Among several objectives, it emphasised the introduction of more modern agricultural methods through farm settlements, co-operative (nucleus) plantations, supply of improved farm implements (e.g. hydraulic hand presses for oil palm processing) and a greatly expanded agricultural extension service. Some of the specialised development schemes initiated or implemented during this period included: (i) Farm Settlement Schemes; and (ii) National Accelerated Food Production Programme (NAFPP), launched in 1972. There were also a number of agricultural development intervention experiments, notably (i) Operation Feed the Nation, launched in 1976; (ii) River Basin and Rural Development Authorities, established in 1976; (vii) Green Revolution Programme, inaugurated in 1980; and (viii) The World Bank-funded Agricultural Development Projects. While each of the above programmes sought to improve food production, the ADPs represented the first major practical demonstration of the integrated approach to agricultural development in Nigeria. The experiment which started with World Bank funding, with projects at Funtua, Gusau and Gombe in 1974, blossomed into Ayangba, Lafia, Bida in 1979 and Ilorin in 1980, Ekiti-Akoko in 1981 and Oyo-North in 1982 agricultural development projects. Following successful negotiations for multi-state agricultural development projects with the World Bank, each state of the country, and the federal capital, Abuja, now has one ADP. The years since the early 1960s have also witnessed the establishment of several agricultural research institutes and their extension research liaison services. Some of the major institutions are: (i) Agricultural Extension and Research stock production and fisheries production in Nigeria Liaison Service (AERLS) at the Ahmadu Bello University, Zaria, established in 1963; (ii) The International Institute of Tropical Agriculture (IITA), at Ibadan and; (iii) International Livestock Centre for Africa (ILCA) (Onlinenigeria, 2014) [24]

3. Methodology

The concept of the growth pole technology was adopted as a means of enhancing the farming situation and ICT is our focal tool in driving the growth pole strategy.

3.1 Discussion

Information and communication technology in the world today is designed to meet the needs of people globally. The digital divide phenomenon has caught up with the rest of the world especially the international organizations such as United Nations and donors agencies such as USAID, EU and NEPAD (Sobalaje *et al.*, 2013) [27].

3.2 Agricultural areas where ICT is applicable

ICT is a tool which any nation that is on a quest for modernization needs to exploit for its economy to have a significant effect. Improved agricultural, environmental, and food security could come from proper planning by federal government ministries and various stake holders in the agricultural sectors that are seeking the growth of the sector and how the country could be self-reliant in its agricultural unit to feed itself (Nnadi *et al.*, 2012) [19]. Planning tools and systems for the agriculture sector are obvious areas where ICTs can add significant value, the study proposes a knowledge based computer system where various stake holders could logon and share some of their findings with colleagues. There should be a large degree of human capacity training that would support and train the famers on the basic knowledge of computing. Geographic Information Systems (GIS) offer agriculture and natural resource management planners a more efficient way to plan for land use, track or estimate environmental impacts, visualize important social data, and compare different agricultural development scenarios. Agricultural and land use planners have used maps as a standard tool for years, but the ability of GIS to remake maps rapidly in response to new data or analysis allows planners new degrees of freedom in foreseeing and preventing disaster, or planning development scenarios. Accurate and timely information regarding areas of food surplus and shortages driven by the vagaries of climate can be facilitated through ICT. Such use can contribute to improved food management and food security. The Food Insecurity and Vulnerability Information and Mapping System (FIVIMS), is a national and global initiative that aims to raise awareness of food security issues, improve data quality, promote better use of the information to drive action.

3.3 Benefits of ICT in agriculture

Information and communication technology (ICT) have always mattered in agriculture. Ever since people have grown crops, raised livestock, and caught fish, they have sought information from one another on how to improve and increase their productivity (Murthy and Tara, 2013) [17].

ICT has recently unleashed incredible potential to improve agriculture in developing countries specifically. Technology has taken an enormous leap beyond the costly, bulky, energy-consuming equipment once available to the very few to store and analyze agricultural and scientific data. With the booming mobile, wireless, and Internet industries, ICT has found a foothold even in poor smallholder farms and in their activities (Sangbuapuan, 2012). The ability of ICTs to bring refreshed momentum to agriculture appears even more compelling in light of rising investments in agricultural research, the private sector's strong interest in the development and spread of ICTs, and the upsurge of organizations committed to the agricultural development agenda (Oyetoro *et al.*, 2013) [25].

An ICT is any device, tool, or application that permits the exchange or collection of data through interaction or transmission. Increase in the affordability, accessibility, and adaptability of ICT devices have resulted in their use even within rural homesteads relying on agriculture. New, small devices (such as multifunctional mobile phones and nanotechnology for food safety), infrastructure (such as mobile telecommunications networks and cloud computing facilities), and especially applications (for example, that transfer money or track an item moving through a global supply chain) have proliferated.

ICT-enabled service, often use multiple technologies to provide information to rural farmers on forecasts so that they can prepare for weather-related events (Balaji and Craufurd, 2011; Gunda *et al*, 2017) [4, 10]. The proliferation of mobile phones across the globe has not impinged agriculture in various ways. Mobiles are being used to help raise farmers' incomes, making agricultural marketing more efficient, lowering information costs, reducing transport costs, and providing a platform to deliver services and innovate (Honrao, 2012; Khapayi and Celliers, 2016) [11, 13]. Other, more-specialized applications, such as software used for supply chain or financial management are also becoming more relevant in smallholder farming. Simple accounting software has allowed cooperatives to manage production, aggregation, and sales with increased accuracy.

When farmers have access to biophysical and other yield enhancing technologies, frequently they do not know how to use them effectively to address their productivity challenges (for example, they may have fertilizer but not know the optimal amount to apply). ICT can fill this gap in knowledge. Global positioning systems (GPSs), radios, mobile phones, digital soil maps, and other ICTs give farmers information on how to use biophysical technologies appropriately (for example, nitrogen sensors can help to determine the correct fertilizer dose).

Similarly, governments or development partners may know that farmers are using new yield-enhancing technologies but may not have the capacity to understand their impacts. Data-mining technologies, decision-support systems, and modelling softwares that can clarify the impacts and outputs of yield-enhancing technologies are among the most promising means of linking productivity and ICTs (Basawaraj, 2013) [5].

With the advent of radio, ICTs opened new channels for learning that proliferated rapidly as the range of ICTs expanded to include computers, the Internet and their applications (CD-ROMs, e-mail, websites, multimedia, and so forth). Learning delivered through the newer ICTs was termed "e-learning," and its potential to facilitate "distance learning" and "distance education" (instruction and learning outside the traditional classroom setting) was recognized immediately (Pena-Bandalaria, 2007) [26]. E-learning can widen the inclusiveness of the agricultural innovation system by bringing elements of traditional learning and mentoring to a wider audience and further empowering people through learning communities.

3.4 When Oil is not sufficient

In Nigeria, the production of oil per day is almost as much as that of Kuwait and also United Arab Emirate (UAE). Kuwait has a population of about 2.9 million, where 1.2 million are non-national; UAE has a population of 8.2 million where about 26% of the population are Indian.

Considering the populations of these countries there is no way Nigeria could be as rich as them if she focus her economic growth only on oil production. This calls for an alternative source of revenue creation which would encourage competitiveness in the micro and macro level (CIA. World FACTBOOK, 2014).

3.4.1 Growth Pole Strategy: ICT as a tool

The growth pole approach to economic development looks at how an infrastructure that is developed for an existing investment in mining, agriculture, and so on can be used to encourage spill over into other sectors. Furthermore, growth pole, as economic initiative, is a spatially targeted investment instrument and set of policies for accelerating economic growth in developing countries. As a concept, growth poles are based on Perroux's assumption that, for an economy to attain higher income levels, that economy should first develop within itself one or several regional centres for economic strength. (Speakman *et al*, 2013; African economic outlook 2015) [28].

In recent years, there has been an attempt to stimulate the developmental process of agriculture using ICT. Before the era of oil boom, Nigeria had ground-nut pyramids in the North, cocoa in the West, and palm oil in the east. In essence with the recent on-going transformation agenda 20-20, the need to return to agriculture for sustainable development has been emphasized. The growth pole strategy which is ideal in disseminating current trends and best practices utilizing appropriate ICT tools is mandatory for resuscitating the agricultural sector for sustainable growth.

Traditionally, pen and paper have been used to collect data in the field and for monitoring and evaluation of projects in rural areas. However, this approach is time consuming and susceptible to human error that may affect productivity and accuracy. Information and communication technologies are now being used widely with remarkable positive results to perform these tasks in agricultural development projects.

Many of the questions asked by farmers (including questions on how to increase yields, access markets, and adapt to weather conditions) can now be answered faster, with greater ease, and increased accuracy. Many of the questions can also be answered with a dialogue—where farmers, experts, and government can select best solutions based on a diverse set of expertise and experience.

Digital opportunities have emerged as 'power tool' for fostering agricultural growth, poverty reduction and sustainable resources use in developing countries (Moni, 2012; Lohento K. and Oluwabanmi A. D., 2015) [16, 14]. Most rural farmers are not abreast with current farming trends and up-to-date information on best practices in farming techniques and as such cannot meet up with the demand of the growing populace.

The growth pole strategy is a concept of growths and channels through which growth is diffused from core growth poles to the peripheral areas. The focus here is on four major channels: technology; trade; capital flows; and migration.

Growth poles comprise of multiple simultaneous investments coordinated throughout many sectors with the purpose of supporting self-sustaining industrialization in a community. Growth pole projects are not oriented around addressing identified market failures, but around capitalizing on and augmenting opportunities that already

exist in an economy (Speakman *et al.*, 2013; African economic outlook 2015) ^[28, 2].

The core idea of the growth poles theory is that economic development, or growth, is not uniform across an entire region, but instead takes place around a specific pole. The pole is a concentration of productive activity and propagates growth by the diffusion of growth and spillover effects from the core centre into the surrounding peripheral regions (Ogunleye, 2012) ^[22]. Growth poles were a popular regional development strategy in the 1960s and early 1970s, with national governments investing in centres that were identified as growth poles or growth centers, with the belief that this would ultimately reduce regional disparities in employment and incomes, facilitate decentralization, and support rapid Industrialization. It is a community whose domestic growth diffuses and thus helps drive the growth process to other communities through spillover externalities, knowledge transfer, and gains from exchange and interfacing. The core issue here is that for a community to be a growth pole, growth in such communities must be capable of stimulating economic activity in the communities or peripheral areas with which it has strong links and interactions.

Growth pole strategies are defined as points of economic growth or centers of economic activity that benefit from multiple institutions, and through their interaction with surrounding areas spread prosperity from the core to the periphery. The primary goals of an integrated growth poles strategy are to promote private/public sector-led growth and employment while maximizing the development outcomes for sustainable and equitable growth, especially in the grass-root communities.

The growth pole concept presupposes a connection between several communities, whereby with acceleration in economic growth there will be diffusion of the benefits of economic growth over time within the nation. The diffusion of economic growth is due to the interactions between the growth poles and the peripheral areas (Moni, 2012; Lohento K. and Oluwabunmi A. D., 2015) ^[16, 14]. While the agricultural sector is traditionally not very popular among youth in Africa, notably because it lacks policy support, ICT innovations are contributing to improving its image (Lohento K. and Oluwabunmi A. D., 2015) ^[14].

The main message of the World Bank's World Development Report (2004) is that, as economies grow (from low growth to high growth countries), production becomes concentrated geographically within nations. As countries develop, the successful ones institute policies that make living standards uniform across board within nations. The way to get both the immediate benefits from the geographic concentrations of production, and the long-term benefits of convergence in living standards within nations is through greater integration within communities.

The growth poles concept could be used to emphasize an incorporated approach (integration across sectors, space and time) focused on the delivery of basic services in areas with actual or demonstrated growth potential.

Designing a growth pole strategy implies spatially targeted interventions and focused investment in strategic locations within nations. These communities stand to benefit from an integrated growth poles strategy to ensure equitable and sustainable growth in the various parts of the country, especially in the rural. The growth poles strategy can

address identified challenges through targeted public and private sector investments.

4. Policy Recommendation

Knowledge management application: the federal ministry of information and communication technology should create a user friendly application that farmers could easily associate themselves with and share knowledge with each other, also the application should create room for researchers to post their own findings to aid farmers with modern ways of farming.

5. Conclusion

In this paper we have tried to demonstrate the importance of ICT and agriculture for societal development and the possible success of implementing the growth pole strategy in both regional and national competitiveness.

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