

**EXTENSION PARADIGM SHIFT: A DRIVE
FOR AGRICULTURAL PRODUCTIVITY
AND VALUE ADDITION IN NIGERIA**

BY

SARAFAT AYANFUNKE TIJANI

**2020/2021
FACULTY LECTURE**

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delivered

on Wednesday, 24 February, 2021

by

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The Dean, Faculty of Agriculture, The Head, Department of Agricultural Extension and Rural Development, Heads of other Departments, The Faculty Officer, Distinguished Ladies and Gentlemen.

Preamble

First and foremost, I wish to express my gratitude to Almighty Allah for the gift of life, for His mercy and for making today a reality. I would also like to express my sincere appreciation to my immediate past HOD, his predecessor and the current HOD for their trust by nominating me to present this faculty lecture on behalf of the Department of Agricultural Extension and Rural Development of this great University.

It is worthy of note that, the journey for the presentation of this lecture first came up in June, 2018, when the issue of faculty lecture was rekindled and our Department made a request for representation due to the fact that it was over 20years that the Department had such opportunity. Though, I was unavoidably absent at the Faculty Board meeting where it was raised, my then HOD and his successor had deliberated and decided to nominate me for the task. So, on my arrival at the Department on the same day; they both briefed me on their decision to nominate me for the presentation of the lecture, on behalf of the Department. In my mind, the question then was, "Why me?" Unconsciously, I voiced it out and I was told: "You are the only Senior Lecturer". Reluctantly, I accepted, but it was still like an illusion, probably because of the preparation for my journey to Portugal and Germany that was already on top gear then. I therefore replied that I was travelling, but in no time, I got their response that the date for the lecture was yet to be fixed. Hence, my mind was at rest as I needed not think of any lecture while on the journey. Throughout the remaining part of year 2018 (i.e. from August to December), no reference was made to the lecture again probably due to the crowded

academic activities of year 2019, in which the lecture issue was not a priority. So, I was happy as no tangible preparation was made.

Meanwhile, year 2020 came with a fulfilment of aspiration when the current Dean emphasised at a meeting with HODs that the presentation of faculty lecture (as I was told) is a key component of his administration's agenda. In no time, the Dean's pressure led to fixing the date for April 29, 2020. However, ASUU strike and the COVID-19 Pandemic lockdown extended the date till today, February 24, 2021. Glory be to almighty God that we are all alive to witness this lecture and I pray that we would all witness many more years in good health.

By and large, it is worthy of note that this lecture is the first since the inception of the newly trimmed Faculty of Agriculture about three years ago and the first to be presented by a female in the new Faculty and Department of Agricultural Extension and Rural Development since its establishment. I sincerely thank the Dean for being gender sensitive.

Introduction

Agriculture (crop and animal production including hunting, forestry and fishery) contributes greatly to Nigeria's Gross Domestic Product and also contributes in no small means to improving food security in the country, as Nigeria's soil and climate are suitable for cultivating different kinds of crop (FMARD 2018). Nigeria, according to Oni (2008) has a land area of 98.3million hectares and 74million hectares out of this are good for a variety of agricultural activities. However, less than half of this land is being exploited due to the fact that 95% of agricultural production is by small-scale farmers with insufficient agricultural inputs, poor credit facilities and low access to technologies. Meanwhile, agricultural productivity and agricultural development that will reduce poverty and improve food security to a large extent is hinged on the effective access, management and utilization of resources.

Therefore, agricultural extension is expected to play significant roles, as an intermediary/link to access, an educator to manage, and a facilitator in the adoption and utilization of innovation.

Globally, the benefits of effective agricultural extension services have long been recognized. However, farmers in developing countries are not satisfied with the rate at which their problems are solved and at which agricultural development is taking place. Therefore, if scientific research is to have real impact on farm productivity and livelihood; new methodologies for dissemination of information have to be developed or adapted and the main direction of reform in agricultural extension must be towards learning, rather than teaching paradigm. The learning approach should incorporate new methodologies that are demand-driven and increase the real, interactive participation of local people at all levels of decision making in an extension delivery network. This approach requires that the roles and responsibilities of researchers, extensionists, and local people be re-defined and shared.

An Overview of Nigeria's Agricultural Sector

Agriculture is known as the engine and panacea for economic growth in most developing nations of the world. As once asserted by Nobel Laureate in Economics, Gunnar Myrdal: "The battle for long-run economic growth is either won or lost in the agricultural sector". Agriculture has been, and for many years to come, will remain the mainstay of the economy of many African countries, since it contributes substantially to the Gross Domestic Product (GDP) and export earnings of these countries (Msuya et al. 2017).

Agriculture is a major driver of the Nigerian economic growth and the main source of human livelihoods. Agriculture has been a stronghold of the economy for a long time; it was the main backbone of the economy before the advent/discovery of oil in the late 1950's and early 1960's (Salman 2017). The sector contributed 23.08% to nominal GDP in Q4 2018, which is higher than its contribution in Q4

2017 (21.93%) but lower than it was in Q3 2018 (25.52%). On an annual basis, NBS (2018) reported that the sector contributed 21.42% to nominal GDP. It accounts for employment of Nigerians (graduates and non-graduates), a source of foreign exchange and also provides raw materials for local industries (Iwena 2015). Food and Agriculture Organization (FAO) in 2009 noted that the agricultural sector contributes immensely towards a more sustainable societal development, because it ensures continuous production of food and raw materials required for meeting the needs of rapidly expanding industries.

On arable crop production, Nigerian has recorded remarkable strides in cassava and rice production as she is currently the largest rice producing nation in Africa. Statistics show that annual rice production in Nigeria has increased from 5.5 million tons in 2015 to 5.8 million tons in 2017. Also in 2015, Nigeria spent not less than ₦1bn on rice importation, but this spending has been drastically reduced. However, consumption has increased because of increased local production of the commodity (RIFAN 2017).

Despite its contribution, the state of agriculture in Nigeria remains poor and largely underdeveloped. The sector continues to rely on primitive methods to sustain a growing population without efforts to add value. This has reflected negatively on the productivity of the sector, its contributions to economic growth as well as its ability to perform its traditional role of food production, among others. Also, having more of poor people in any population is an indication that the role of agriculture to elevate many people above the poverty line has not been sufficiently fulfilled. This sorry state of the sector has been blamed on oil glut and its consequences on several occasions (Falola and Heaton 2008). Furthermore, in the livestock subsector, a major problem has been that of low technology input by the majority of animal producers apparently due to inadequate extension services and poor communication (and utilization) of livestock research findings. For instance, more than 80% of national production of cattle, sheep, and goat is contributed by

subsistence farmers who still rely on traditional production techniques (FMARD 2010). It is obvious that in order to meet the daunting challenge of supplying animal products in the right quantity and quality for an ever-increasing human population, the country's animal production sub-sector must witness adequate adoption of modern and efficient animal production techniques.

In addition, Nigeria's agricultural sector has continued to be plagued by a host of challenges ranging from low crop yield, policy inconsistencies, inefficient and out-modelled production techniques, low quality of produce, heavy post-harvest loss, limited access to mechanization and quality inputs, limited value addition and poor access to facilities such as; credit, irrigation, storage, processing and extension services.

Concept of Agricultural Extension

Agricultural Extension is defined by FAO (2010) as; "systems that should facilitate the access of farmers, their organizations and other market actors to knowledge, information and technologies; facilitate their interaction with partners in research, education, agribusiness, and other relevant institutions; and assist them to develop their own technical, organizational and management skills and practices".

Maunder (1973) viewed agricultural extension as a service or system which assists farm people through educational procedures to improve farm methods and techniques, increase production efficiency, income, quality of life and uplifting the social and economic standards of rural life. The author further conceptualized extension as a service or system which extends the educational advantages of an institution to individuals who hitherto were unable to avail themselves of opportunities of acquiring knowledge and skills in a normal classroom setting. Furthermore, the aim of all extension works is to teach people how to raise their living standard by their own efforts, using their own resources (human and material) with minimum assistance from government.

Various studies in the agricultural development process have proved that education is one of the crucial variables for achieving economic growth and human progress. Swanson and Claar (1984) saw extension as an on-going process of getting useful information to people and assisting them to acquire the necessary knowledge, skill, and attitude to utilize effectively the technology. This definition emphasizes change as the main outcome of extension education, hence agricultural extension has been seen as a voluntary, informal, out of school educational process which aims at facilitating the rural populace on how to improve their standard of living through their own efforts. This is done through making wise use of the resources at their disposal in improving the system of farming and home-making for the benefit of the individual, the family, community and the entire nation at large.

Quamar (2002) saw agricultural extension as a new formal programme designed to meet the information, inputs, services and skill requirements of farmers in a way to empowering them to be able to continuously provide food for the populace. However, the broader definition of extension indicates that it can be applied in several fields of study such as education, agriculture, health care and home economics, hence Michaels (2002) defined agricultural extension as a service that is committed to expanding human capacity by delivering education programmes and technical information that result in improved leadership skills in the areas of communication, group dynamics, conflict resolution, issue analysis and strategic planning that can enhance the economic viability and quality of life in communities. Furthermore, the essence of extension work as articulated by Oladoja (2008) includes:

- working with rural people along the lines of their immediate and felt needs and interests, which frequently involves making a living and enhancing their level of living and improving their physical surroundings,

- conducting worthwhile and acceptable activities in the spirit of cooperation and mutual respect between the extension worker and the rural people,
- utilising supporting activities to bring extension work and extension staff up to date through the use of subject matter specialists, resource persons, in-service training, conferences and the like,
- utilising certain teaching techniques in attaining the educational objectives of extension.

Therefore, agricultural extension has a role to play in agricultural development through supporting and facilitating people that engage in agricultural production to solve their problems and to obtain information, skills, and technologies to improve their livelihoods and well-being. Hence, agricultural extension facilitates the transfer of information on new technologies to farming communities, which are often used by the farmers to increase their farm productivity, turnover and standards of living. Agricultural extension service could be the government agency or ministry responsible for promoting the adoption and utilization of new scientific farming practices through educational procedures (Asiabaka et al. 2012; Christoplos 2010; Dragic et al. 2009 and Birner et al. 2006).

Extension as a Function

Extension, in general terms, is a function that can be applied to various sectors of the society. It operates in industrial, health, education, agricultural and rural development, as well as in cultural, financial, infrastructural deficit, among others. Thus, extension service does not only focus on agricultural development but it is a holistic development of farmers and their immediate environment (Mosher 1976). The term extension is therefore applicable to various areas of development (fig. 1). This suggests that extension staff can play key roles in various facets of the developmental process of any nation.

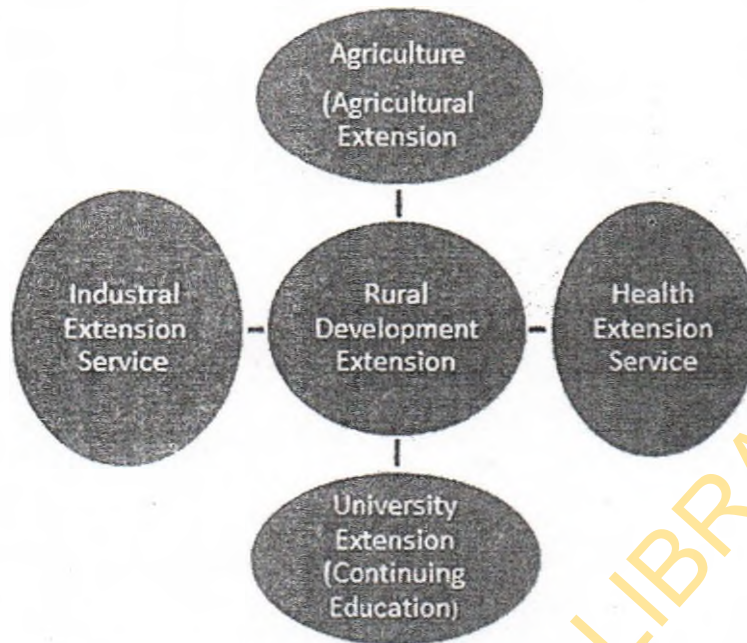


Fig. 1: Extension as a function in various sectors of society.

Agricultural Extension as a Knowledge System

Agricultural extension operates within a broader knowledge system that includes research and agricultural education. FAO(2005) and the World Bank refer to this larger system as Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD). The Organization for Economic Co-operation and Development (OECD) countries refers to it simply as the Agricultural Knowledge System (AKS). Others describe the three pillars of this system—research, extension and agricultural higher education—as the Agricultural Knowledge Triangle (fig. 2) and suggest that since the three pillars involve complementary investments, they should be planned and sequenced as a system rather than as separate entities (Eicher 2001). Linking the triangle's institutions with their common clientèle, namely the farmers, and with each other, also requires systematic planning.

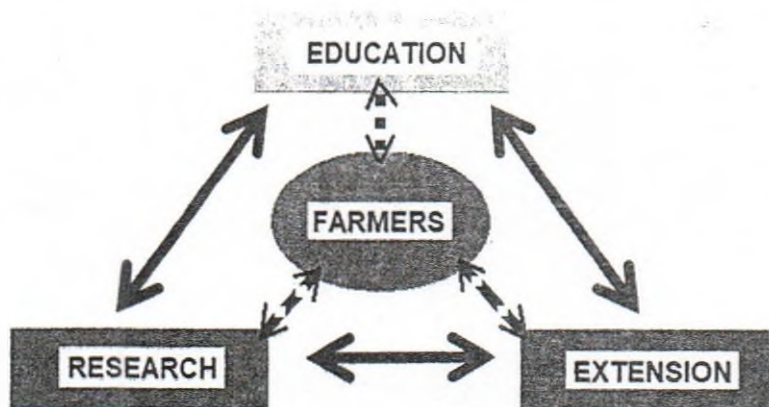


Fig. 2: Agricultural extension as part of AKS/AKIS.
(Modified after Eicher (2001))

Historical Background of Agricultural Extension from Global Perspective

The first modern extension service started in Ireland during the potato famine in 1845 (Swanson et al. 1997). However, the word extension derives from an educational development in England during the second half of the 19th century. Around 1850s, discussions began in the two ancient Universities of Oxford and Cambridge about how they could serve the educational needs of the rapidly growing populations in the industrial, urban area, near their homes. It was not until 1867 that a first practical attempt was made in what was designated as 'university extension' but the activity developed quickly to become a well-established movement before the end of the 19th century. The dissemination of relevant information and advice to farmers however has a long-cheered history prior to the emergence of modern forms of agricultural extension in the 19th century.

In the early years of the 19th century, extension services in their formative stage were relatively small in scale and limited in the scope of works and contact with farmers, and the organization was often somewhat haphazard even though based on legislation. They were organized predominantly

either by central or local governments, or by agricultural colleges, usually in close association with experiment stations, or by farmers' organizations, or combinations of these bodies. As the century progressed, the organizations matured in that changes often occurred to the affiliations, government funding became broader and extension workers became better trained and more professional.

The scope of extension programmes expanded in the 1950s as the newly independent states of Asia and Africa sought to increase food production and to spread the benefits of improved farming techniques more widely (Antholt 1994). Extension organizations therefore began to aim at broad national and farming system coverage. The economic strategies of these pioneering years relied on heavy state interventions, import substitution and rapid industrialization. Extension programmes often relied on the proposition that farming productivity was held back not so much by technological and economic constraints but by farmers' apathy, inadequate social arrangements and lack of local leadership. Often, extension agents came to be viewed as the foot soldiers of 'nation building' campaigns aiming at multiple economic and social objectives. Demonstrations were an important aspect of extension.

In the United States, extension was linked with the 'land-grant' universities, or schools mandated by Congress in 1862 to extend university knowledge to non-students. Extension clientele of the original services were mostly larger landholders, many of whom were growing commodities and export crops. This was especially true in colonial areas in the tropics. Initial extension structures were top-down, with information coming from the university or ministry of agriculture which in turn, filters to the farmers through extension agents. Farmers were involved only to receive information; no payment for services and not much input relevant to their needs. A good example of this was the early United States extension model. The US system is structured as a 'cooperative' system in terms of funding and control

between federal, state, and county (Seevers et al. 1997). The US system is one of the older models of extension that has proved very successful in certain areas. This model is also known as 'transfer of technology' because technology is developed in research stations and universities and then transferred through extension agents to farmers.

Another model, developed essentially by the British and other colonial powers to fully develop their cash crops is the commodity-based extension service. This tends to be quite top-down in terms of structure. The commodity group conducts research, which is shared with extension agents who pass the information on to farmers. The commodity group funds the extension service. Commodity extension uses vertical linkages, which allow for effective management of their activities/programmes.

Historical Background of Agricultural Extension in Nigeria

Agricultural extension in any country is a derivative of the main agricultural policy thrust of that country. Agricultural policy in Nigeria during the pre- and immediate post-independence period was more of an extractive approach. This approach viewed agriculture as a vehicle for extracting natural resources from the colonies for the exclusive use of the colonial homeland. This defines the relationship between the colonial homeland and the colonies. The resources in the colonies included valuable minerals like Gold, Diamond, Tin, and Columbite. It was usual for the equipment required for exploitation to be moved to site and deployed. Once the natural resources are obtained, most of the sites were abandoned in their ravaged states with open pits and gullies to tell the story. It was the same mind-set that underpinned colonial agricultural policy. Whatever investment made in agriculture was only such as was necessary to produce the required cash crops for the colonial homeland.

Agricultural extension activities, therefore, reflected the above mentioned policy of colonial government. This is

apparent in the choice of crops targeted for advisory services: Oil palm, Rubber, Cotton, Groundnut and Cocoa which were highly prized commodities in Britain. Seeds and seedlings were sometimes distributed free to encourage production and farmers were taught post-harvest handling to meet stipulated standards (Yudelman 1975). These efforts ensured that the agricultural sector was the backbone of the economy, accounting for much of the country's export. Therefore, the historical background of agricultural extension in Nigeria can be viewed from colonial and post-colonial period.

Colonial Period

The era was marked with trial and error, and effort was aimed at an extractive agenda to source raw materials for growing industries in the British economy. Several efforts employed failed while the outbreak of World War 1 interrupted further agricultural development programmes. After the war, efforts in agricultural development were directed at improving export crops and raw materials to feed the European markets.

Post-Colonial Period

The history of extension at this time followed the trend of political history in Nigeria. When the Western, Eastern and Northern Regions were created, each region had its corresponding ministry of agriculture in which the department of extension was domiciled. Same pattern ensued when an additional Midwestern Region was created and also with the creation of more states out of the regions. Various agricultural development programmes that were implemented at regional/state levels applied rudiments of extension, which by and large enabled the farmers to meet the needs of production of cash crops for export. Thus, Agricultural Extension became attached to the Ministry of Agriculture. Confidence in western technology led to the adoption of 'diffusion model' or 'Technology Transfer model' of extension delivery—a hierarchical process of technology transfer backed by advances in mass media. Focus was also

on interpersonal communication and community development. However, the agricultural extension service was multifunctional, with weak connections to agricultural research.

Furthermore, extension agents were entrusted with a variety of functions ranging from credit delivery, input distribution and sundry coordination duties such as: clerical, statistical, or even political chores. During the 1970s, the extension systems changed as there was a need to reach more farmers and to better train extension agents. The main developments in extension services included integrated rural development approaches, and the emergence of Training and Visit (T&V) extension system.

Roles of Agricultural Extension in Addressing Rural Poverty and Food Insecurity in Nigeria

In agricultural production, agricultural extension programmes have been the main conduit for disseminating information on farm technologies, supporting rural adult learning and assisting farmers in problem-solving and in developing their farm technical and managerial skills, thus agricultural extension brings about changes, through education and communication in farmers' attitude, knowledge and skills. A study conducted by Fawole and Tijani (2012) established favourable attitude towards Shell Petroleum Development Company (SPDC) agricultural extension programme among farmers that benefited from input services in Delta state.

This is because extension programmes are expected to help increase farm productivity, farm revenue (income), reduce poverty and minimize food insecurity, i.e. enhancing farm productivity and household income which is the critical role of extension programmes (Christoplos and Kidd 2000). To constantly perform these roles, agricultural extension service delivery should be boosted through timely recruitment, periodic training of agents and provision of adequate logistics.

Extension generally provides improvement of nutritional advice through home economics programme and enhances the quality of rural life by way of community development. Extension service providers make innovations known to farm households, act as catalysts to speed up adoption rate and also control change and attempt to prevent some individuals in the system from discontinuing the diffusion process (Alemu et al.2016). Extension now supports rural livelihood; improves farm and non-farm income; develops market instead of giving information only, uses diverse and involving approaches, facilitates evolution of learning by doing and experimentation, and encourages capacity to improve planning and managerial capability of rural farmers (Alex,Zijp and Byerlee 2001;Hall and Suleman 2004).

The crucial role of agricultural extension (i.e. farmers' education) in the social and economic development of the nation cannot be over-emphasized. Never before in Nigerian history has the necessity for educating and raising the productive capacity of our farmers been of such importance as it is today. Increased agricultural productivity depends primarily upon the acceptance of cultural and technological changes at the rural farm level. Thus, for Nigerian agriculture to improve, our farmers have no alternative, but to learn and adopt recommended scientific farming techniques in place of their traditional practices.

One way to transfer these scientific farming techniques is by person-to-person contact. This is done by bringing together the people who have the technology (researchers) with the people who wish to acquire it (farmers). The most effective means of building human resource capability is through formal and informal training of the farmers (managerial and technical skills, facilitation and coaching, among others) and the extension workers. In this age of information technology, not a day goes by without hearing of new information technologies that can make decision making issues or programming task easier and more efficient. Swanson (2008) argued that extension service goes beyond technology transfer to general community development

through human and social capital development, improving skills and knowledge for production and processing, facilitating access to markets and services which tend to provide solutions.

Thomas and David (2015) in a study of farmers in Wareng district, Kenya, revealed that despite the little extension information that they normally receive, it had boosted their production because they are educated on the variety of seeds, the methods of planting, weed control and the right chemicals used to combat pests and diseases. The study revealed that when the extension officers visited them frequently, their production shot up for that year. Similarly, Oluwasusi and Tijani (2012) conducted a study on effect of extension services on arable farmers' production in Ekiti West local government area of Ekiti state. It was discovered that 64.8% of arable crop farmers recorded high production after having contact with extension services which in turn may be an indication of increase in productivity. This shows that extension services impact agricultural production and thus have an impact on the food security of rural households.

*Food access is ensured when households and all individuals within the household have adequate resources to obtain appropriate food for a nutritional diet. Access depends upon income available to the household, on the distribution of income within the household and on the price of food. Food utilization is the proper biological use of food requiring a diet providing sufficient energy and essential nutrients, potable water and adequate sanitation. Therefore, effective food utilization depends on knowledge within the households of food storage and processing technique.

It is noteworthy that successful food security and poverty oriented programmes do not only assist poor rural populations to produce more and diversified products, but to produce a surplus that can be marketed, thereby generating income for the purpose of improving quality of life through improved diet and nutrition. Extension personnel have the requisite training with technical knowledge and skills which can help

in improving farming, farm yields and reducing poverty. Therefore, the Sustainable Development Goals (SDGs) of reducing hunger and promoting food security are rooted in increasing agricultural productivity. This is because agriculture is considered as the engine of growth in many developing economies, particularly in sub-Saharan Africa. Asfaw et al. (2012) opine that achieving productivity growth in the agricultural sector can only be successful through the development and dissemination of improved agricultural technologies to the smallholder farmers in the rural areas.

Paradigm as a Concept

According to the English WordNet mobile dictionary, paradigm is defined as the generally accepted perspective of a particular discipline at a given time. Guba and Lincoln (1998) view paradigm as sets of basic beliefs that deal with the first principles or representation of a worldview that defines for its holders the nature of the world, individual place in it and the range of possible relationships to that world and its parts. In scientific research, paradigm is simply a belief system that guides the way we do things, or more formally, establishes a set of practices. Paradigms are characterised by:

- (1) Ontology: What is the reality?
- (2) Epistemology: How is a phenomenon or an approach known?
- (3) Methodology: How do we go about an approach or phenomenon?

How is Paradigm Created?

A paradigm as shown in figure 3 begins with an inquiry involving a random collection of "mere facts" (although, often, a body of beliefs is already implicit in the collection). During these early stages of inquiry, different researchers confronting the same phenomena describe and interpret them in different ways. Subsequently, these descriptions and interpretations disappear entirely. A pre-paradigmatic school appears. Such a school often emphasises a special part of the

collection of facts and these schools vie for pre-eminence. From the competition of these pre-paradigmatic schools, one paradigm emerges. To be accepted as a paradigm, a theory must seem better than its competitors, but it needs not, and in fact never does, explain all the facts with which it can be confronted, thus making research possible. As a paradigm grows in strength and number of advocates, the other pre-paradigmatic schools or the previous paradigm fades.

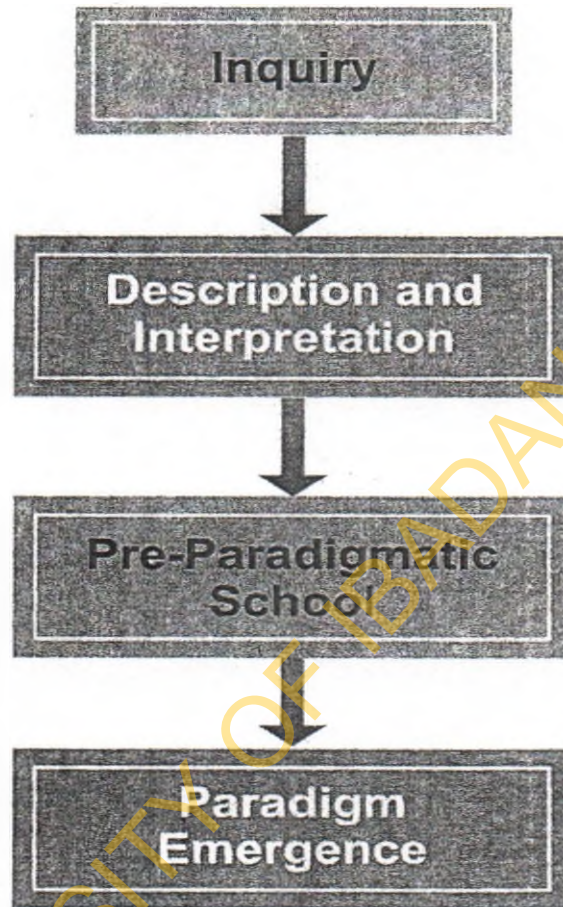


Fig. 3: Process in the emergence of Paradigm.

What is Paradigm Shift?

A shift in a field takes place when an anomaly undermines the basic tenets of the current scientific practice. That is, the tradition-shattering complements to the tradition-bound activity of normal science which gives rise to new assumptions. For a shift in paradigm to emerge, it requires a reconstruction of prior assumptions and the re-evaluation of prior facts as shown in figure 4. A paradigm shift therefore can be viewed as construction of field, phenomenon, or theory from new fundamentals. It can also be defined as the reconstruction changes of a given field, phenomenon, foundational theoretical generalizations, methods, applications and rules.

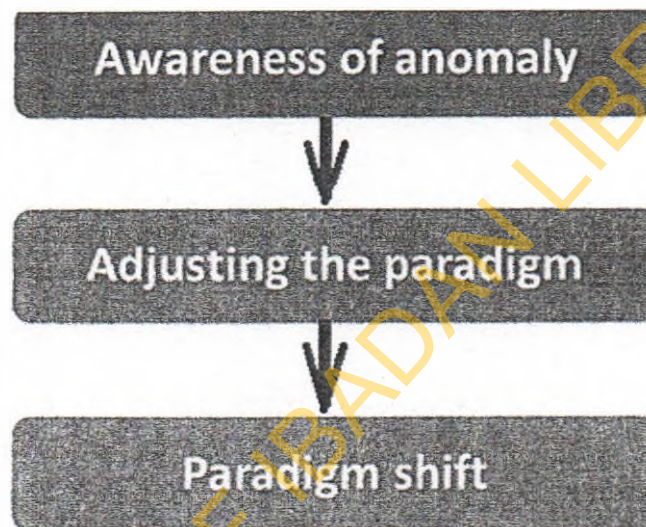


Fig. 4: Schematic representation of the emergence of a paradigm shift.

Paradigm Shift in Agricultural Extension

In a rapidly changing world, fighting poverty, ensuring food and nutrition security, while protecting the environment remains a major challenge facing global development practitioners today. In developing countries particularly Nigeria, food and agricultural innovation systems are facing

new and increasingly complex challenges. Thus, new mechanisms to foster development and diffusion of innovation are needed to strengthen the ways in which information, knowledge and technology are developed and disseminated to ensure that the global changes benefit smallholder farmers, food insecure households and other vulnerable groups. Paradigm shift in agricultural extension services can be pursued along four perspectives as depicted in figure 5:

- (1) Issue based
- (2) Technology based
- (3) Target based
- (4) Strategy based

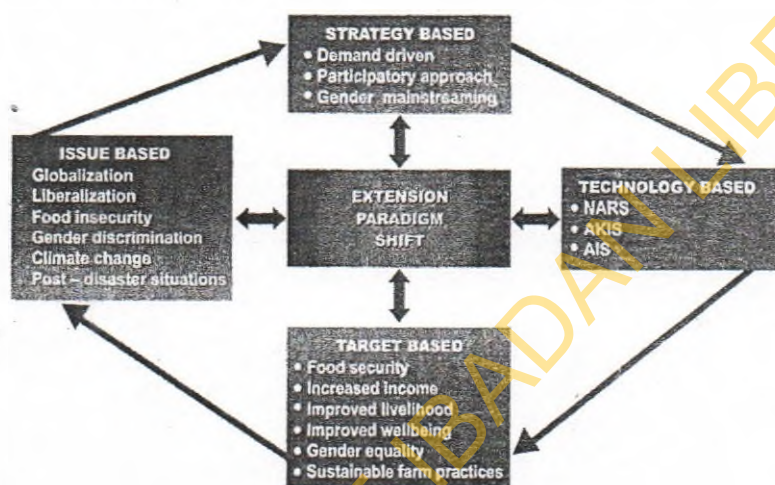


Fig. 5: Schematic presentation of paradigm shift in agricultural extension service.

(1) Issue based

Expectations from extension are rising as issues such as globalization, market liberalization, food insecurity, rural poverty, gender discrimination, climate change and post-disaster situations are on the rise. Globalization exposes the farming communities of less developed countries to both risk

and opportunities. In the light of this, the need for extension service to shift from farm to the farmer becomes necessary. Farmers need to be educated and prepared to adjust their agricultural operations within the context of globalization, a responsibility which, by and large, agricultural extension personnel will have to bear and thus must prepare in time to meet such imminent challenge.

Liberalization requires opening of markets, or deregulation, so that goods can move freely between countries. It also advocates removal of artificial price controls and public support (subsidies) to the farming sector so that the market can realistically determine the price of various commodities and products on the basis of demand, supply and quality, so that the consumers can freely choose what is best for them. Thus, commercial and subsistence farmers in developing countries are bound to be affected, directly or indirectly by market liberalization. In view of this, agricultural extension service providers will have to be knowledgeable enough to educate the farmers on how to properly enter the liberalized market. This realization particularly on Shea tree, which is the second most important oil crop in Africa after the Oil palm tree because of its nutritional and economic contribution (Onikoyi, Tijani and Oluwasusi 2014; Ahenkan and Boon 2010; Godfried et al.2015; Aboyella 2002) to the rural poor, coupled with less attention on its marketing for expansion as a sustainable rural industry, necessitated my research on determinants of market participation among small-scale Shea butter processors in Kwara State, Nigeria (Tijani 2018). The result as shown in Table 1 revealed that age, education, proximity to market, access to market information, production output, income and membership in Shea butter associations significantly contributed to respondents' decision to participate in Shea butter marketing in the study area. The identified factors imply low production, low sales and low income with consequent limited business expansion, thereby making it difficult for Shea butter entrepreneurs to grow, survive and

diversify as noted by Derbile et al. (2012) and Lovett (2004). The study therefore concluded that Shea butter processors have potentials to contribute to economic growth and development, but lack full participation in large-scale or international markets.

Table 1: Factors that Determine Market Participation by Small-scale Shea Butter Processors

Variable	Coefficient	Std. Err.	Z-value	P> z
Age	0.29	0.359	0.54	0.000
Marital status	0.16	0.47	0.69	0.492
Level of education	0.17	0.75	1.99	0.049
Household size	0.13	0.43	1.59	0.114
Production output	0.34	0.07	0.52	0.004
Income	0.007	0.04	3.31	0.026
Years of experience	0.11	0.01	1.29	0.199
Market information	0.30	0.97	2.03	0.003
Access to credit	0.55	0.93	2.80	0.000
Proximity to market	-0.22	0.03	-0.61	0.015
Membership in a group	0.88	1.39	0.63	0.000

Log likelihood = - 17.167565, LR
Chi² = 72.4; Prob> Chi² = 0.000;
Pseudo R² = 0.616

It is noteworthy that the drive for globalization and market liberalization requires a shift from subsistence farming to commercial agriculture. However, the rural population being the bulk of farmers in Nigeria rarely have a chance to participate in commercial agriculture owing to the fact that they produce barely enough for their own consumption, and in some very favourable cropping season, produce a bit of surplus for marketing. More so, the concept of food security has progressively evolved from one primarily concerned with achieving national food security to a new focus on the ability of individual households to have access to sufficient, safe and nutritious food to meet their dietary needs (and food preferences) for an active and healthy life.

This change has redirected attention to improving the livelihoods of the rural poor. At the same time, it is recognized that food insecurity may worsen due to increased use of staple food crops for biofuels and the potential impact of climate change. Achieving the goal of improving livelihoods requires that extension and advisory service be more carefully focused on the needs of different clientele (i.e. farm women; small-scale, medium-scale and commercial farmers; rural youth) within rural communities. Also, the demand for food products is changing as urban consumers purchase more fruit, vegetable, meat and fish products, opening up new market opportunities that can improve rural livelihoods. Hence, the practice of extension should not continue to be old fashioned. The transformation of extension therefore, demands political and fiscal commitment from politicians and policy-makers, so that this noble profession could serve the emerging educational needs of rural and farming populations a lot better than in the past. In addition, agricultural extension services will have to come up with strategies that could help subsistence farmers in organizing themselves for commercializing their operations profitably, without losing the pride of land ownership.

(2) Technology based

The traditional technology transfer model was the linear model characterised by innovations flow from international research centres to national research facilities, which in turn gets to the farmers via extension personnel. However, the linear model does not fit, any longer, into modern day agricultural information dissemination system as it fails to consider the plethora of other actors such as the private agricultural research institutions, commodity brokers/traders, input companies, processors who also dictate the flow of Agricultural Knowledge and Information System (AKIS) (UPOVWorldBank 2006). The direction of information flow is essentially determined by the demands of the stakeholders in the system (fig. 6).AISs focus on the generation, diffusion,

and application of knowledge (Roseboom 2004) and no longer a linear pathway as it was traditionally. The need to communicate Agricultural Knowledge and Information among the multi-stakeholders needs a robust communication system to fulfil the multi-pathway communication requirement. In the traditional system, which requires information communication task between the extension agents and the farmers, the system is seriously inadequate as the Extension Agent: Farmer ratio is between 1:5,000 and 1:10,000, whereas 1:1,000 is the recommended ratio. Nigeria has a population of over 200 million people, majority of whom are into farming. For Extension Agents to fulfil the roles; the traditional visitation method will definitely be inadequate.

As change in time modified the system, it has also come with enabling information dissemination technologies which can be used to fulfil the emerging service requirements. Adoption of Information Communication Technologies (ICTs) has been seen as a critical necessity for the contemporary stakeholders in the Agricultural Knowledge and Information System. The weakest end in the chain of stakeholders has been the farmers, who are mostly illiterate and poor. This (farmers) group has been the focus of efforts in the integration of ICTs into the AKIS in the developing countries, Nigeria inclusive. A classic example of the integration effort in the Nigerian agricultural system was the e-wallet component of the Growth Enhancement Scheme, which required that the farmers be equipped with enabling devices. The effort, which was seen in 2011 as ambitious and elitist, has proven that with appropriate enablement, farmers can effectively participate in the use of the new media. Implementation of the (e-wallet) effort has led to discovery of other issues that require attention in order to achieve better impact in the dissemination effort. One of such issues is literacy limitation, which is being addressed via audio-visual (video) content development using ICT media to reach the target audience, a project being piloted by Access Agriculture

in Kenya. Efforts like these are also being implemented by some organizations in Nigeria. This approach will make it possible for a few extension agents to reach out to several millions of farmers effectively. Information Technology shift is thus a major paradigm shift required for the contemporary agricultural extension service in order to be relevant.

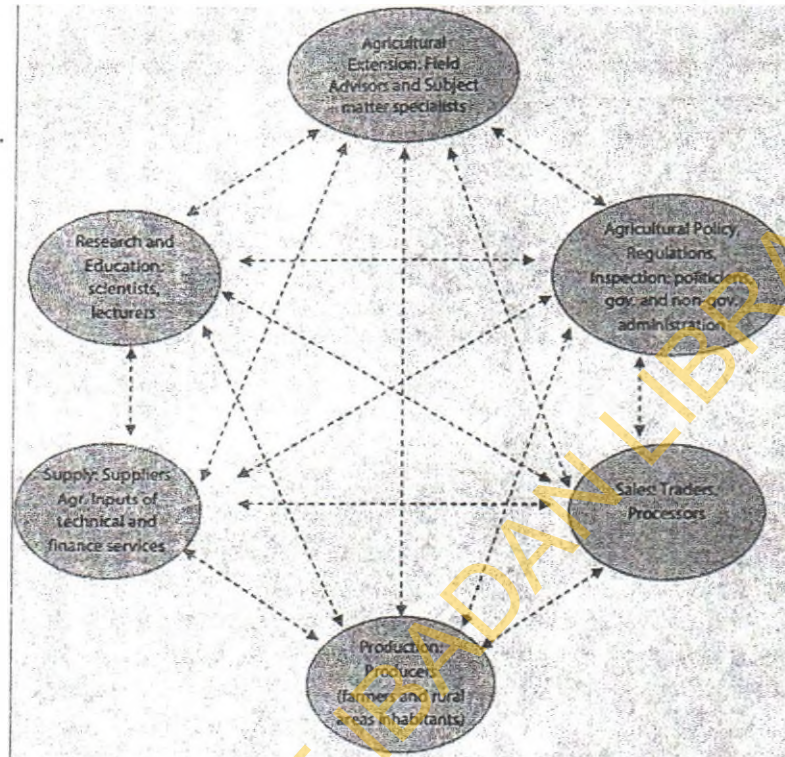


Fig. 6: AKIS pathway among the stakeholders in the system.

(3) Target based

The outcome of extension services requires a paradigm shift from solely increasing outputs to specific target oriented results such as improving rural livelihoods, well-being, etc., of farmers. In many cases, this change will involve the production, marketing and processing of higher-value crop,

livestock, aquaculture and other products, as well as other skills and knowledge, such as family nutrition, health and hygiene. In line with this, Tijani (2019) assessed farmers' knowledge of cultivation, economic and nutritional values of radish crop in Iseyin LGA of Oyo State. Radish is a root and leafy vegetable grown in the country and the world at large. It is a highly nutritive crop that is low in calories, high in Vitamin C, folate and potassium. It also contains sulphurous compounds like sulphuraphane, which has anti-cancerous properties and it is an expectorant. More-so, its roots, leaves, sprouts, seed pods and seeds are edible.

Medicinally, radish serves as a traditional medicine for treating coughs, cancer, whooping cough, gastric discomfort, liver disorders, constipation, dyspepsia, gallbladder disorders, arthritis, gallstones and kidney stones (Adams 2008). Despite all the benefits accrued from radish crop, its use in the daily life of the people is very low, probably due to limited information and research on the nutritional importance of the crop. Hence research was carried out in order to boost production and consumption of the vegetable among Nigerians for healthy living. On the overall, average knowledge of respondents on cultivation and economic value, but low knowledge on nutritional value of the crop was discovered. The favourable disposition towards radish crop among farmers further portends its prospect, if adequate measures are put in place. Hence, the study recommends the need for government, through her extension agency, to provide more awareness on the nutritional and economic value of the crop.

In addition, Adebisi, Tijani and Oduneye (2017) also examined the effect of nutritional intake on anthropometry status of rural pregnant women in Ifelodun LGA of Kwara State. The research stemmed from the fact that many rural women farmers have poor health status due to heavy farm work, childbearing and rearing, low income and poor nutrition. Adequate nutritional intake particularly for pregnant women in rural areas is rather difficult thus creating health risk for mothers and even leaving the children with

health risk such as low birth weight which can prevent them in their adulthood from engaging in agricultural activities (that requires energy) as an enterprise or business venture hence reducing food production, thus food insecurity. Respondents' anthropometry (weight and height) was obtained after presenting them with a list of food groups to select if consumed or not in 24 hours and their Body Mass Index (BMI) was calculated using formula in Wardlaw's perspective on nutrition. It was discovered that pregnant women had low intake of minerals and vitamins, thus deficiency in nutritional intake was predicted to have negative effect (lower immunity against diseases and birthing of deformed babies) on the development of the foetus. Hence, extension strategies and policies that will enhance their enlightenment and purchasing power need to be advocated.

Also, from increasing farm income, agricultural extension services are shifting their attention to the broader goal of improving rural livelihoods. To achieve this goal, extension personnel will need to enhance the technical, management, and marketing skills (i.e., human resource development) of all farmers, especially small-scale men and women farmers, as well as the landless, indigenous populations, young rural populace, and other vulnerable groups. In considering how best to implement the extension objective of improving rural livelihoods, it is necessary to differentiate among types of farm households (i.e., subsistence, commercially oriented, market oriented, and commercial farmers).

In addition, there is a need for a paradigm shift from primarily producing to value addition so that farmers can diversify from primarily producing food to adding value to produce high-value crop, livestock and fishery products. This requires:

- diversification into selected higher-value crop, livestock and fisheries production systems;
- post-harvest handling, including grading, packaging, value-added processing, storage and transportation systems for these higher-value products;

- meeting product quality and traceability standards for high-value food products, especially for export;
- agricultural mechanization, water management and protective cover systems;
- gaining access to and learning how to use market information;
- information technology skills and knowledge, such as precision farming and traceability;
- strengthening farmers' ability to adapt more rapidly to changes in market.

(4) Strategy based

The practice of extension was based on three major paradigms: (1) public led Technology Transfer with Training and Visit system (T&V system); (2) public and private Advisory Services and; (3) Non-Formal Education (NFE) involving Farmer Field Schools (FFS) and Facilitation Extension where front-line extension agents primarily work as knowledge brokers in *facilitating* the teaching-learning process among all types of farmers (including women) and rural young people. The Training and Visit system was able to increase agricultural productivity without significantly raising costs. However, it did not allow the intensification and diversification of farming systems. Therefore, to achieve both agricultural growth and to increase farm income, a broader extension focus becomes imperative, including farm management, marketing, and credit programs. In pursuing this farming systems approach, the extension service needs to switch from merely *delivering messages*, to *engaging farmers in the learning process*. The reason is simple: every farm is different and farmers know more about their respective farms than any extension field worker can ever know. This shift in focus towards a more balanced teaching-learning extension paradigm not only helps farmers learn but also helps the extension staff to learn from farmers, especially innovative farmers.

Under the *extension as teaching* paradigm, extension field workers relied on research stations and/or central administration to determine what lessons should be taught to farmers. However, under *extension as a learning* paradigm, extension workers must learn from the farmers being served, as well as listen and link to research and markets, in setting extension priorities. Therefore, under the extension as a learning paradigm, farmers and extension agents should work together in setting priorities so that their annual work programmes directly address farmers' needs.

Furthermore, extension has to shift from a *supply driven to demand driven one*. This is a bottom-up extension approach as farmers are able to organize into different producer groups and then diversify into a range of different high-value crop, livestock or other enterprises, based on the respective interests and resources of each group. Then, field extension staff can focus on specific technical and management skills that members in each farmer group or organization need to successfully produce and supply different product market such as needs assessment of snail farmers in Ogun State (Tijani and Thomas 2011) and training needs of mushroom farmers in Oyo State by Tijani (2019). The realization that snail constitutes an important component of the food of numerous rural dwellers, and wild collection of most of the available snails for consumption (Daniel 2008; Adekoya 2007), induced assessment of the needs of snail farmers for effective production performance. It was discovered that fast growing breeds, effective pest and disease control measures, essential training (knowledge and skill) on snail production and financial assistance (loan/subsidy) were the respondents' most important needs. The study generated useful data on snail rearing that guided the mode of extension services required in the study area.

In the same vein, Mushroom as a delicacy is highly rich in protein relative to other types of food and as such recommended by Food and Agricultural Organization as a healthy food for bridging the protein malnutrition gap (Mala 2018). Beside its nutritional value, mushrooms have potential

medicinal benefits and are also an ideal food for the diabetics as they are low-energy diet (Nagdeve 2019). Indirectly, mushroom cultivation also provides opportunities for improving the sustainability of small farming systems and can strengthen livelihood assets through the provision of income and improved nutrition (Shakilet al. 2014). These benefits notwithstanding, farmers' involvement in its production is low due to some factors, one of which is the inability to distinguish between edible and non-edible or poisonous mushrooms. This has affected efforts of commercial cultivation of mushrooms in Nigeria (ATPS 2013), thereby limiting its availability in local markets. Despite several trainings on mushroom production by research institutes (Forest Research Institute of Nigeria (FRIN), Institute of Agricultural Research and Training (IAR&T), Agricultural Development Programmes (ADP), as well as many non-governmental organizations (NGOs), there exists the need for further awareness on the benefits of mushrooms (IAR&T 2018) in order to encourage production, and boost supply. Hence the research on training needs of mushroom farmers in Oyo State was investigated. The study established that farmers have high training needs particularly in mixing/exposure period of substrate, ensure absolute infection free, preservation and quick freezing.

In addition, extension has to shift from *broadcasting to narrow casting*. Agricultural extension system in the country has been known for a long time to depend on the use of mass media and extension agents in information dissemination and getting of feedbacks. However, this system has been marred with a lot of challenges especially in the area of feedbacks as majority of farmers depend on radio stations as their source of information without necessarily been able to express their understanding, experience or opinion about an issue that concerns them. Coupled with this is the myriad of irregularities such as inadequate funds for extension services, inadequate extension-farmer ratio, monitoring authorities are

not able to get clear feedback on the quality of extension services being delivered in the villages serviced by extension agents in whom these farmers would have found solace, etc. The proliferation of social media in recent times has provided avenue to access agricultural information. Similarly, database is being created for almost every subject matter. For example, pesticide or chemical use, access to farm inputs, post-harvest techniques, among others. People want to choose where they get specific information and not lock themselves into choices made by one provider.

It is now widely demonstrated that rural women, as well as men, throughout the world are engaged in a range of productive activities essential to household welfare, agricultural productivity and economic growth. Hence, extension services have to shift from *viewing only men as farmer to viewing both male and female as farmers*. In the past, women's substantial contribution continued to be systematically marginalized and undervalued in conventional agricultural and economic analyses and policies, while men's contribution remained the central, often the sole focus of attention. The official definition of a farmer in Nigeria in 1965, for example, was given as "an adult male... who has the right to the produce of a farm" ... women are not classified as farmers". However, studies have shown that both men and women participate in agricultural activities (Oladeebo and Fajuyigbe 2007; Tijani and Babalola 2013). While the official definition of a farmer in Nigeria has been corrected to be gender neutral, as in most other countries, gender bias is prevalent in official agricultural circles and among field professionals. While contemplating gender issues, we must consider people as farmers (male and female) who work the land.

Globalization and market liberalization trends require that *public extension systems move toward a more facilitative role in working with small-scale men and women farmers*, and to work in closer partnerships with both private-sector

firms and civil society organizations. However, one of the major difficulties with any government agency, including agricultural research and extension, is how to bring about these institutional changes that will formally engage these primary stakeholders (i.e. small-scale men and women farmers), as well as with other key organizations in both setting priorities and collaborating on the delivery of needed services. For extension organizations to be effective in a dynamic market-driven economy, extension officials and their field staff must listen to the clientele served, as well as to private-sector firms, banks, NGOs, and other service providers. These changes will not happen unless there is formal agreement for a more decentralized decision-making structure, including formal mechanisms (e.g., farmer advisory committees, boards, etc.) at all system levels to get needed input from the clientele being served.

A shift from standard packages to tailored advice: Rapid and unpredictable changes in markets and in local climates demand a new paradigm that rejects blanket advice. This will have different implications for extension systems that provide detailed one-on-one advice to individual farmers and those where extension staff to farmer ratio makes such approaches unviable, but both require approaches that recognize that farmers will inevitably unpack and repack the packages they receive. Part of this is the challenge of synchronizing and making accessible the materials, credit, training and information (at the right place, time and format) needed to ensure that innovations are accessible and transaction costs minimized.

Other Paradigm Shifts

Non-Governmental Organizations (NGOs) and Project Based Extension Efforts

Extension services may be loosely defined as including all activities involved in the exchange of information relevant to agricultural and livestock production, processing and marketing. The word extension has been criticized as inherently emphasizing the top-down dissemination of

information while ignoring other types of information flow between farmers, extension and research—particularly activities that involve farmers as equal partners in the process. Agricultural extension in many countries has come to encompass a wide range of activities in both the public and private sectors, yet the exchange of information continues to be the primary focus of all extension activities. The traditional concept of public agricultural extension involves a professional body of agricultural experts (generally government employees) who teach improved methods of farming, demonstrate innovations, and organise farmers' meetings and field days on a wide range of topics. Public extension is sometimes used as a channel to introduce – and sometimes enforce – agricultural policies. Extension also functions informally as farmers transfer their best practices to each other.

The last two decades of the 20th century were decades that brought to the fore *a shift from government funded agriculture extension services and became ever increasingly allied on the side of privatization in changing demands of modern agriculture*. Privatization of extension services essentially means that farmers should pay for extension advice. Private companies, individual extension specialists, contracted agencies (through contracting-out and outsourcing modalities) and farmers' associations are main service providers. Total privatization of extension services has already occurred in England and Wales, New Zealand and Netherlands. Partial privatization has been done in Estonia, Chile, Hungary, Venezuela and Nicaragua (Bernard and Nantongo 2011).

Chile was the first country to adopt a privatized extension service. Extension programs across the globe are being challenged to consider their impact, relevance and effectiveness in a rapidly changing society (Ludwig 2001). Extension is a partnership between state, federal, and local governments to provide scientific knowledge and expertise to the public (Vergot et al. 2011). *This paradigm shift has led to resounding issues raised* concerning extension in many

facets. Intellectuals belonging to and who have championed this radical departure have seen public extension services as being outdated, inflexible, and being laden with the many inconsistencies of bureaucracy, and to this end, cannot cope with the realities of extension services which are public-funded; privatization here does not mean the sale of state properties to private bodies, rather it implies an over-representation and an increasing private participation in agricultural extension services which hitherto was a sole reserve of the public sector.

To these, agricultural extension in the 21st century has become more of a tool for technology transfer and for rural development in which evidently the public sector has not fared too well. More so, world over, there has been a decline in the place of agriculture to the economic growth and subsequent development of many hitherto agrarian economies. This has weakened the resolve, zeal, and zest of many governments to continue to fund public extension overtime.

The issue of privatization of agricultural extension in Nigeria as noted by Dimelu and Madukwe (2001) is not entirely a new phenomenon, though privatization of extension services in Nigeria is still in the form of increased private sector involvement in the provision of agricultural extension services and not an outright transfer of state assets to private hands. According to (Contado 2011) agricultural extension, to some extent, is decentralized in Nigeria but the Federal government acts in most cases as a coordinator for the activities of other organizations involved in extension programmes. These organizations amongst others provide quasi-private extension services in Nigeria: Nigerian Tobacco Company, Shell Petroleum Development Company, United African Company, Leventis Foundation, John Holt Nigeria Company, Agip Oil Company, and various Farmers Development Unions. Akele and Chukwu (2004) found that these private bodies brought positive changes and development to the areas where they are involved in providing agricultural extension services.

There is also the informal private sector. These are private organizations that provide extension services in areas of provision of agro-chemicals, micro-financing, farm tools, agroprocessing and general consultancy that are agricultural in nature. These informal private sectors according to Okoro et al. (2006) sell inputs along with provision of extension services which are not charged for. It is worthy to know, however, that privatized agricultural extension services are beleaguered with some inherent and concomitant challenges. According to Ajieh et al. (2008), the problems militating against privatization of agricultural services in Nigeria are; fear of job insecurity among extension staff, insufficiently trained extension personnel, high level of subsistence farming, and inadequate government legislation to back up the privatization process, amongst others. Oboh and Nnwa (2005) posited that privatized agricultural extension services though noble, may not be feasible in a country like Nigeria which has 65% of its farmers operating on subsistence level. These poor subsistence farmers would, all things been equal, not be able to pay for commercialized extension delivery and these would have adverse effect on food production and subsequent security of the nation.

Things are different, however, in the rich developed nations where you have less than 5% of the population into agriculture and majority of their farmers are educated and the population of their rural farmers are very low. In general, emphasis on commercialization of agricultural extension as it were, has serious implication for the organization and staffing of the agricultural services; the role of non-public extension services is more relevant for commercial oriented farmers and would be almost useless for farmers who are at subsistence level.

Also, public extension is expensive and sometimes wasteful and requires a huge investment especially in a poor agrarian country like Nigeria; a country with over 65% of its population in the agricultural sector and over 98% of these operating at subsistence level and in rural areas. Contado (2001) posited that instead of an outright public funding of

this sector a middle ground approach would be most desirable and should be pursued (a quasi-public quasi-private program). Modalities should be put in place to improve efficiency, reduce cost, become responsive to variations in farmer's needs, focus more on their core extension duties, decentralize management, motivate its staff to do more, check wastefulness, reduce its dependence on foreign donors, increase its private sector participation, and finally, cost sharing for public financed extension among other tiers of government should be aggressively pursued. However, Ajayi (2006) maintained that some farmers would be willing to pay for extension services, if it would profit them and if it would not be financially more than what they can bear (Tijani and Mudashir2013). Those who are proponents of privatized extension hold this as a reason to conclude that public funded extension is a thing that belongs to the past.

• ***A Paradigm Shift from Agriculture to Agribusiness: The Role of Extension***

A shift from agriculture to agribusiness is an essential pathway to revitalise small-scale agriculture and to make it a more attractive and profitable venture. The question is whether small-scale farmers can become entrepreneurs and how well extension is positioned to support farmers to foster entrepreneurship. There are two parts to entrepreneurship, the first is the managerial skills required to start and run a profitable farm business. Second is the "entrepreneurial spirit". It is important to realise that you cannot create an entrepreneur, but you can create the environment that will help them thrive. Governments and donors must invest in institutions and infrastructure that support them. Economic policies and financial incentives must be put in place to inspire a generation of agripreneurs. Extension has a critical role to play in supporting farmers to develop their entrepreneurial skills through training and by providing technical assistance.

Entrepreneurship depends on individuals understanding cost-benefit ratios, and being able to evaluate the market opportunities and associated risks. Facilitating agripreneurship will also require a bottom-up approach, and may also involve the establishment of supporting networks and brokering services. The development of a farm business occurs in five phases, namely establishment, survival, early growth, rapid growth, and maturity. Understanding these stages of farm enterprise development helps extension advisors to know when and how to intervene with appropriate support and create suitable opportunities to learn.

Farmers require support and advice from extension in identifying goals, as well as for preparing, designing and implementing efficient farm business plans. The advice and support must cover areas beyond production-led services; it must be as wide to include aspects of running a profitable, market-oriented farm business. Furthermore, farmers' managerial competencies must be developed and strengthened through training and development interventions as the business grows. Agripreneurs need to continue increasing their managerial ability to meet the demands of a complex and competitive environment of doing business. They require being well skilled in the following aspects:

- Cash flow management;
- Productivity and quality management - competition amongst farm businesses based on product quality and timely delivery performance;
- Networking for information - buyers, suppliers, friends and other farmers; and
- Competence in the use and application of computers and electronic equipment to access market and technical information.

Group or coherent entrepreneurship should be promoted where a producer group or like-minded farmers are willing to work together on a joint venture. These organizations or groups are expected to:

- (1) stimulate entrepreneurship through provision of information and other advisory and capacity building services;
- (2) strengthen market (bargaining) power through collective commercialization and by improving co-ordination between producers;
- (3) profit from economies of scale through collective storage and processing; and
- (4) represent farmers' interests in policy negotiations, and dialogue with other agribusiness stakeholders.

This often requires extension to support farmers with the mobilization of the group and facilitate linking farmers to people who can process, package, market and eventually buy the produce along the value chain. It is important to know when to downscale the support to handover the management and entrepreneurial functions to the group. A prerequisite for success is that ownership of the initiative should remain in the hands of the farmers.

Farmers can capture more value by producing differentiated commodities (like organic fruit or free-range chicken) for a limited or niche market, or adding value by entering into markets or producing contracts. Since value adding requires knowledge and understanding of the value chain and its bottlenecks; extension officers can support farmers with identifying, investigating and evaluating opportunities.

One way of growing is changing production systems to produce for specific market demands by developing or adapting new technologies and innovative practices. Extension officers should encourage farmers to innovate where required and share these experiences with other farmers. Information Communication Technology (ICT) like smartphones, tablets and other computer-based systems are powerful tools to educate and inform farmers about new ideas, technologies and practices (especially where budgets are limited, and transport availability is challenging). It can be harnessed for the benefit of both farmers and extension

without compromising the importance of human and unique local factors.

Successful farmer entrepreneurs are strategic in their planning and implementation of plans (big picture thinking). They look at their farm business from a holistic and long-term view, and make sure that major farm business activities and aspects complement the objectives and goals they have set for the business. They look at ways to strengthen the competitiveness of the farm business through satisfying potential buyers, achieving performance targets, and staying focused on the long-term goals of the business. Extension could support farmers in planning a long-term strategy for the farm business, help with implementing and monitoring the outcomes, and where required to adjust when conditions change, support the farmer with decision making.

Facilitating the learning process is an important role that extension advisors can play, as many of the farmers are not aware of the need to develop their entrepreneurial competencies and skills. However, extension advisors are trained in specific technical areas of agriculture, and therefore need specialized training themselves in order to become effective trainers and facilitators of entrepreneurship. Although extension advisors cannot do the actual training in entrepreneurship, they can still exchange experiences, share information, and participate in joint problem solving. They can assist farmers to link up with the right support institutions and individuals who have the necessary expertise to deal with the concerns.

As the farm business grows, effective communication becomes especially important to increase an understanding, cooperation and mutual trust. Some farmers find the transformation from a small informal business to a larger, more formal business structure daunting. Being used to hands-on management of day-to-day operations and making all decisions, the agripreneur may find delegating of decision making challenging. Extension should be geared to offer training programmes where farmers are helped to become more aware and understand the transformations required (personal and business transformation). This will help farmers

to prepare themselves emotionally, behaviourally and technically for the change process.

In conclusion, extension is absolutely important to support farmers after completing entrepreneurship training programmes. Entrepreneurship skills can be best learnt by doing. Learning happens through a process of discussion, acting (practise), and reflecting. This learning cycle equally applies to farmers when solving problems on the farm, and this process can sometimes be challenging which requires continuous support and guidance.

Agricultural Extension and Gender

In order to deliver on its mandates and contribute to positive change, extensionists need a well developed understanding of, and the skills necessary to address critical issues around gender in rural livelihoods. Men and women, young and old, all play vital roles in rural livelihoods, but assumptions are often made about who does what and who makes the decisions. These details of gender and decision making are critical to targeting efforts and helping everyone involved in rural livelihoods and agriculture to benefit from innovations and improved technologies.

Assumptions have long been made about the different roles of men and women, young and old, within rural livelihood systems and agriculture. The most common assumption has always been that the male head of the household is the farmer and everyone else either helps him or benefits equally from his labours. Little attention is given to the responsibilities, activities, assets and power of women within the household. As a result, new technologies are often not directed at the person who is actually going to use them or make decisions about them. Many times, therefore, the new technologies sit unused or are not used according to recommendations. This is especially the case when technologies target women. Because the men do not understand the importance or see the benefit of these technologies, they do not lend their support to the women in

their households when it comes to adopting these technologies. Hence, it is very important for an extensionist to make sure that he or she keeps up with the changing world.

One of the best ways to do this is to increase his or her understanding about gender and generational issues, as well as how addressing these issues will improve agriculture and rural livelihoods. In order to help achieve this goal, extension needs to move beyond old ideas and assumptions about who is considered a farmer and who is a helper. Extension personnel should focus on new ways to understand and address the challenges that they would face in engaging their clients in new and better ways to improve service delivery.

Understanding Gender Roles in Agriculture: Implication for Extension and Sustainable Rural Livelihood

Gender plays a very important role in agricultural systems. An example of this is that men are usually responsible for producing commercial crops, while women are responsible for producing subsistence crops. However, this does not mean that women do not work on commercial crops and men do not work on subsistence crops. In rural livelihoods, women and men do tasks that vary across space and time. Neighbours of the same sex and age may perform very different jobs on their farms, depending on what resources are available to them, their goals, who is making the decisions, and how those decisions are made.

Understanding the gendered nature of rural livelihoods gives extension personnel a much clearer picture of two aspects, the first being who does what and when. This aspect is determined by looking at the daily and seasonal activities of farmers using a gender lens. This is very important in making sure that the right information and technologies are given to those who will be able to use them at a time and place where they will do the most good. The second aspect is to understand the gendered nature of daily and seasonal workloads in rural livelihoods. The gendered division of labour in rural areas is a critical factor that will affect

decisions about how best to meet the needs of the people responsible for each step of the production, storage and marketing chains.

Men and women in rural communities mainly spend their time performing activities that can be placed in one of the following three categories:

- Production: those activities that focus on producing goods, often for sale or for wages. Odebode (2007) noted that both men and women participate in agricultural activities, however farm activities that require high energy are performed by men, while those that require details and affinity are carried out by women.
- Reproduction: those activities related to having children, as well as all the activities that contribute to the family's growth and survival, including building a house or a fence, feeding etc.

Inequities in access to and control of assets have severe consequences for women's ability to provide food, care, health, and sanitation services to themselves, their husbands, and their children, especially their female children. In the African context, female children have double tragedy of coincidence, first, they are least preferred in the household because of their gender in the provision of food, care, health, etc. and secondly, when they grow up to be adults they have to deny self in order to make these earlier mentioned provisions for their family members (Akinsanmi et al. 2005). Women with less influence or power within the household and community are unable to guarantee the fair distribution of food within the household. These women also have less ability to visit health clinics when their infants and children are sick.

Gender inequalities between men and women in accessing and controlling resources is not only unfair to women and their children, but also constitute bad economics, resulting in the misallocation of scarce resources, increased healthcare

costs, lowered productivity, and poor human development trends. Investment in the nutrition of women is an important short-term barometer in assessing expected returns to improving household nutrition and overall human development capacity for a country (Oniang'o and Mukudi 2002).

In addressing the problem of gender inequalities, it is very important for extension personnel to have a clear understanding of the "gendered access to, and control of resources". This will help in identifying who should be the target of new technologies and approaches. If extension personnel fails to clarify these aspects, he or she may unintentionally put information and technologies into the minds and hands of people who will never use them. This will limit the effectiveness of extension and deprive others of game changing opportunities.

Both men and women play very important roles in agriculture, but because there are variations in power regarding access to, and control of resources, there is a gender gap that negatively affects female farmers. This gender gap tends to cause female farmers to be less productive when compared to male farmers. The low level of productivity not only leads to smaller crop yields, but also to potential environmental problems such as over-cultivation, soil erosion and land degradation. In order to solve these problems, extension personnel needs to take an active role in using a gender lens to examine who should be included in extension activities. It is also extremely important to make sure the correct people are included in extension programmes and that the correct technologies are given to people that will use them.

Women and Access to Extension Services

Gender can be said to categorically affect women farmers' participation in agricultural extension services, even with improved extension services for various reasons. Female farmers are constrained by time due to their multiple roles as homemaker and income earners. They also are constrained by restricted mobility due to poor transportation systems in rural

areas. Adetoun (2003) in her study on the organization and management of extension services for female farmers in Southwestern Nigeria randomly sampled a total of 1,033 female farmers from four states—Oyo, Osun, Ogun and Ondo. Both the farmers and 262 male farmers in Osun State were interviewed to have a comparative analysis based on gender.

Extension agents were also interviewed. Data analysis revealed that only 55.8 percent of the female respondents were aware of the presence of village extension agents, while only about one-third (35.8 percent) of them actually had regular contacts with these agents. The early maturing cassava types and improved maize seeds were the most widely adopted innovations. Even though soya-bean planting and processing have been widely promoted (especially for female farmers), it has not been rapidly adopted due to several factors such as lack of additional labour for land clearing, unsuitable land, lack of marketing outlets, etc.

Paradigm Shifts in Roles of Extension: Implication for Sustainable Agriculture

Agricultural extension is the conscious provision of information and communication support to rural users of renewable natural resources. It involves offering advice, helping farmers analyse problems and identify opportunities, sharing information, supporting group formation and facilitating collective action. Extension is done not only by extension agencies but also by farmers, scientists, commercial companies and mass media organizations. Traditionally, extension has been linked with production objectives. More recently, food security, improved nutrition, equity and poverty alleviation have become part of the agenda of organizations providing extension services.

The demise of the Training and Visit system of agricultural extension in Asia has coincided with growing concern in the region over negative environmental effects of some elements of agricultural technology. High potential areas which have registered impressive productivity gains,

experience problems from excessive or poorly drained irrigation, leading to salination, waterlogging and depletion of groundwater reserves, with added concerns over the consequences of indiscriminate or inappropriate use of agrochemicals. In the drier, rain-fed areas, problems are related more to the effect of expanding populations farming at greater intensity or in inappropriate areas, and include deforestation, soil erosion and decline in soil fertility. The analysis below explains the shift in extension roles.

Environmental issues have a higher profile among extension workers and farmers, where land is scarce, farms are small and food security is a major concern. In recent times, the most pressing environmental problems are climate variability and change, decreasing water supplies, deforestation and land use conflicts. Farmers are also concerned about things which impinge on them more immediately, such as excessive weed growth (and the scarcity or high cost of labour to deal with it), encroachment of non-agricultural land uses and increasing levels of salinity in soils and water. Hence, with rising environmental stress, paradigm shifts in the roles of extension becomes imperative. Some of these shifts are listed below:

(1) From transfer of technology to building up of strong rural organizations

Sustainable farming and natural resource management is relatively knowledge intensive requiring the application of general ecological principles to a specific situation. Joint problem solving with clients, leading to an enhanced ability to identify and solve problems, will be an appropriate way of influencing their future behaviour. Extension objectives can range from the effective transfer of technology to the building up of strong rural organizations which can exert influence over future research and policy agendas, and also take and enforce collective decisions over natural resource management. A shift towards the latter will promote more sustainable agricultural development.

(2) From teaching to learning and a whole new professionalism

The central principle of sustainable agriculture is that it must enshrine new ways of learning about the world. But learning should not be confused with teaching. Teaching implies the transfer of knowledge from someone who knows to someone who does not know. Teaching is the normal mode of educational curricula and is also central to many organizational structures (Bawden 1992; Pretty and Chambers 1993). Universities and other professional institutions reinforce the teaching paradigm by giving the impression that they are custodians of knowledge which can be dispensed or given (usually by lecture) to a recipient (a student). Where these institutions do not include a focus on self-development and on enhancing the ability to learn, they do not allow students to grasp an essential skill in the sustainable management of a complex agroecosystem. In that case, "teaching threatens sustainable agriculture" (Ison 1990).

The problem for farmers is that they cannot rely on routine, calendar-based activities if they engage in sustainable farming. Their interventions must be based on observation and anticipation. They require instruments and indicators which make more visible the ecological relationships on and among farms. Technology for sustainable farming must emphasize measurement and observation equipment or services that help individual farmers assess their situations, such as soil analysis, manure analysis, and pest identification (Röling 1993). It also has to focus on higher system levels. Erosion control, water harvesting, biodiversity, access to biomass, recycling waste between town and countryside and between animal and crop production, all require local cooperation and coordination.

What becomes important is the social transition, or new learning path, that farmers and communities must take to support sustainable agriculture. This is much less obvious and often remains unrecognized by extensionists. Learning for sustainable agriculture involves a transformation in the fundamental objectives, strategies, theories, risk perceptions,

skills, labour organization, and professionalism of farming. This learning path has four key elements:

- (i) *The information system.* Sustainable agriculture must be responsive to changing circumstances, so farmers need to invest in observation, observation equipment, record keeping, and monitoring procedures.
- (ii) *Conceptual framework.* Sustainable agriculture is knowledge intensive, and so farmers must know about life cycles of pests and disease organisms and their recognition, biological controls, ecological principles, soil life processes, nutrient cycles.
- (iii) *Skills.* Sustainable farming requires a whole set of new skills, including observation and monitoring, compost making, mechanical weed control, spot application of pesticides, and risk assessment.
- (iv) *Higher system-level management.* Generally, sustainable management of the farm is not enough, and it is necessary to think at system levels higher than the farm and take part in the collective management of natural resources at those levels.

A move from a teaching to a learning style has profound implications for agricultural development institutions. The focus is less on *what* we learn, and more on *how* we learn and *with whom*. This implies new roles for development professionals, leading to a whole new professionalism with new concepts, values, methods, and behaviour. Typically, normal professionals are single-disciplinary, work largely or only in agencies remote from people, are insensitive to diversity of context, and are concerned with themselves generating and transferring technologies. Their beliefs about people's conditions and priorities often differ from people's own views. The new professionals, by contrast, are either multidisciplinary or work in close connection with other disciplines, are not intimidated by the complexities of close

dialogue with rural and urban people, and are continually aware of the context of interaction and development.

Extension personnel need to build up a broad understanding of ecological systems and processes relevant to the areas in which they work, and to develop skills in the assembly and interpretation of local information and in supporting local decision making by individual farmers and groups. Extension worker training curricula are increasingly being rewritten to give stronger emphasis to sustainability and environmental issues. There is some evidence of a move towards more learner-centred and participatory approaches to training, which are essential if extension workers are to develop the attitudes and skills necessary for client-centred, participatory extension practice.

(3) From directive to participatory extension

Extension has long been grounded in the diffusion model of agricultural development, in which technologies are passed from research scientists via extensionists to farmers (Rogers 1983). This approach is exemplified by the training and visit (T&V) system. It was first implemented in Turkey in 1967 and later widely adopted by governments (Roberts 1989). It was designed to be a management system for energizing extension staff, turning desk-bound, poorly motivated field staff into effective extension agents. Extension agents receive regular training to enhance their technical skills, which they then hope to pass to all farmers through regular communication with small numbers of selected contact farmers. The sustainability agenda calls for local participatory planning, and a willingness by extension agencies to learn from farmers' experiences, knowledge and technology.

Important lessons have been learned from the problems associated with T&V, and there is clearly a need to address the systemic issues facing extension (Zijp 1993; Antholt 1994). Extension will need to build on traditional communication systems and involve farmers themselves in the process of extension. Incentive systems will have to be

developed to reward staff for being in the field and working closely with farmers. There must be a “well-defined link between the well-being of field officers and the extension system, based on the clients’ view of the value of extension’s and field workers’ performance”. Participation, if it is to become part of extension, must clearly be interactive and empowering. Any pretense to participation will result in little change. Allowing farmers just to come to meetings or letting a few representatives sit on committees will be insufficient. With groups, better communication between farmers and extensionists leads to more adoption.

There are three major lessons for extension. First, it is important to make new things visible. An important role of extension is to make visible the state of the environment and the extent to which present farming practices are untenable. In addition, extension can demonstrate the feasibility of sustainable practices. Even more important is to give farmers the tools for observation and to train them to monitor the situation on their own farms.

The second lesson is the use of farmers’ knowledge. The location-specific nature of sustainable agriculture implies that extension must make use of farmers’ knowledge and work together with farmers. Often, indigenous practices which have been ignored under the impact of chemical farming can be fruitfully revived. Indigenous technology development practices and farmer experimentation can be an important “entry point” for introducing sustainable farming practices.

The third lesson is an emphasis on facilitating learning. Instead of “transferring” technology, extension workers must help farming “walk the learning path”. Extension workers should seek to understand the learning process, provide expert advice where required, convene and create learning groups, and help farmers overcome major hurdles in adapting their farms.

(4) Dominance of agricultural information systems by government and extension services compared to wider coverage media (Mass media)

Where agricultural information systems are dominated by government research and extension organizations, the resource poor who are often more in need than others of information on sustainable and low external input technologies are least likely to gain access to it. For example, Lawrence (1996) observed in a study that richer farmers with access to subscription journals and newspapers had better access to information on new varieties and fertiliser recommendations than the resource poor farmers. This skewed availability of information is reinforced by informal communication networks which do not generally cross socio-economic boundaries. The challenge for information providers external to the local social system is to enable key actors in all local networks to access information which may be relevant to network members.

There is relatively little information available through the mass media to help farmers decide how to improve the sustainability of their farming practice. Sponsorship of agricultural development programmes via the mass media can be a powerful tool for exchange of views and sharing of information within a rural population, but are seldom used in this way. Corroborating this, Badiru and Adekoya (2014) reported limited private sponsors engaged in rural development broadcast, while leaving the sponsorship in the hands of the government. Hence sustainable agricultural broadcasts may not actively seek out relevant technical information, or take account of farmers' views and their solutions to local problems and situations.

Paradigm Shift through Advancement of Science, Technology and Innovation (STI)

According to Yahaya (2017), the nation can only survive if it weans itself from the present mono-economy. The only way out is to diversify the economy by adopting positive approach to agricultural development. Level of advancement in STI especially for the agricultural sector is a crucial determinant

for satisfactory economic development in Nigeria. The nation will do very well once technology is used to galvanize its agro-based resources. The level of advancement in STI is contingent upon several factors. The factors include high level of human capital development, generation of sound, effective, efficient, cost effective, less complex, environmentally sustainable and relatively advantageous STI products; formulation and implementation of appropriate STI policies and more importantly; efficient and effective mechanism for diffusion of innovation and facilitation of the adoption of STI products.

Human capital development is recognized as a potent tool that is germane for generation and eventual utilization of STI products for improved agricultural production and productivity and transformation of the nation's agricultural sector and agro-allied industries. Human capital is the most vibrant asset any nation can possess as acknowledged by Musiyiwa. He concluded that the true wealth of Nigeria is its extraordinary human capital, and passion for education. Therefore, the generation and utilization of viable STI products by properly developed human capital will expectedly translate to tremendous transformation of agricultural production, enhanced productivity and a robust agro-allied industry such that there will be sufficient agricultural raw materials and products in Nigeria for both local demand and export that can surpass her counterparts in African and indeed the global agricultural market.

Paradigm Shift through Viable Agricultural Extension System (AES)

Leaving extension off the equation will always undermine a productive agricultural venture even when other agri-support services suffice. This implies that the progress made in the agricultural sector cannot be discussed without the mention of agricultural extension. This reveals the position and role of agricultural extension in the development of agriculture.

Agricultural extension service is the most veritable support system for farmers to increase the productivity of

their farms. This support is particularly needful now that the Nigerian government seeks to leverage on the available potentials in the sector through the Agricultural Promotion Policy (APP) as a growth pull for the national economy. However, the national agricultural extension and advisory system has left much to be desired in the provision of effective support to farmers due to several challenges. Some of these include; inadequate and untimely funding, poor coordination, low private sector participation, weak Research-Extension-Farmer-Inputs Linkages system and sometimes, inappropriate extension approaches for innovation delivery.

The critical success factor for innovation delivery as a platform for Nigerian agriculture is where the role of agricultural extension becomes imperative to take advantage of the cardinal role of extension in bridging the gap that may exist between various categories of stakeholders in the agricultural innovation system. Extension and advisory services have the traditional role to facilitate the innovation platform, and extension practitioners have the training in soft skills to foster partnerships and interaction among stakeholders. The country's hub for extension and advisory services need to be proactive in responding to needs of the different stakeholders where capacity development is well entrenched from extension training at the tertiary level. This is carried out under well-structured and packaged comprehensive modules and delivery on the agricultural innovation systems. Hence, there is strong justification for the up scaling of the agricultural innovation, which requires continuous capacity development of the National Agricultural Research System to work in the innovation systems mode.

Integration of E-extension Platforms into the National Agricultural Extension System

The basic concepts of E-extension as conceptualized and currently being promoted by the Federal Ministry of Agriculture and Rural Development and amplified by NAERLS involve the use of Information Communication Technology (ICT) as a platform for exchanging information

and providing services to actors in the agricultural value chains. It is an electronic means of extending information to farmers through mobile phones and similar devices as well as the use of ICT to enhance traditional method (face to face extension) of extension services delivery especially in the face of low manpower engagement in extension agents as well as the need for the extension service to leverage on emerging technologies to enhance its outreach to its service recipients and other beneficiaries/actors in the agricultural value chains. Electronic extension has the following advantages:

- Most of the farmers in Nigeria live in rural areas and are in most cases devoid of technology and vital agricultural support services needed to carry out farming activities;
- Reduced number of frontline extension agents;
- Wider penetration (more than the traditional face-to-face extension);
- Timeliness;
- Evidence that most farmers have access to mobile phones;
- Versatile application (weather, mapping, soils, etc.).

Key Opportunities of Electronic Extension

- (i) E-extension tools support delivery of information in diverse styles such as voice, image, motion, instants messages, and applications.
- (ii) Extension practitioners and farmers are among the owners and users of mobile phones.
- (iii) The National Agricultural Extension Service (NAES) system applies a diversity of methods, therefore E-extension presents a larger scope for the utilization of appropriate technologies for information sharing, capacity strengthening, programme and performance management, and other EAs activities.

- (iv) Private operators can come in and partner, even the telecom operators.
- (v) It is cheaper than traditional “face to face” approach.

Imparting Technical Know-how on Agricultural Production

Agricultural development under any educational system as stated by Nyako (2019) is studied under science and technology. He reiterated that it is not by self-incantation or any other person(s) but to give farmers and herdsmen, young and old, adequate knowledge on production of their agricultural units. Nyako (2019) maintained that as a fact, virtually all-agricultural units, be the livestock, plants, ponds of water etc. are today yielding less than 10% of what their counter-parts in other nations are producing. Some of the consequences of these low yields, as he noted are glaring. A teeming population of near 200 million people cannot be fed based on these primitive yields. It is further made clear that Nigeria would not be able to operate viable food industries with such insufficient raw materials locally produced, or imported because of insufficient funds to pay for them. A brace up is needed to substantially improve the yields of all agricultural units required for good health and productivity, earnings of foreign exchange from the sales of our agricultural produce, and a sizable reduction of unnecessary imports into the country. Agricultural businesses must be viable and paying as the human resource is adequate; eco-balance is right, and arable land is available to support extensive agricultural production.

Paradigm Shift in Agricultural Value Chain Finance (AVCF)

Value Chain (VC) involves the sequential linkages through which raw materials and resources are converted into products for the market. Agricultural Value Chain(AVC) as posited by Yahaya (2019) identifies the set of actors (private, public, including service providers) and a set of activities that bring a basic agricultural product from production in the field

to final consumption, where at each stage value is added to the product. It may include production, processing, packaging, storage, transport and distribution. Each segment of a chain has one or more backward and forward linkages. Thus, with AVCs, there is movement away from a commercial, segmented form of agriculture in which many separate links operate in isolation, out of sync with each other, in which farmers produce in bulk, are exposed to price risks and capital needs and produce independently. The AVC is based on integrated systems, differentiated production, risk management, information needs and interdependent farmers.

Agricultural Value Chain Finance (AVCF) according to Yahaya (2019) is the flow of funds to and among the various links within the AVC in terms of financial services and products and support services that flow to and/or through VC to address and alleviate constraints, and fulfil the needs of those involved in that chain, be it a need for finance, a need to secure sales, procure products, reduce risk and/or improve efficiency within the chain, and thereby enhance the growth of the chain. AVCF is a comprehensive approach.

Yahaya (2019) identified five main components to consider in VC analysis. These are the actors directly providing inputs, producing and distributing the product; the relationships and embedded services between these actors; the markets, the financial, general and specialized services coming from sources external to the production and distribution chain, and the enabling environment, including tax and trade policies and regulations. Apart from primary producers, several other players drive the AVCF and play important roles; these include dealers in agri-commodities and agri-inputs, producers, food processors, wholesalers, retailers, support service institutions, banks and financial institutions. Each of these players may be operating in the AVCF at varying scales with investments of only a thousand dollars or even less or outlays of more than several million dollars. They operate along the VC with linkages into one another, however, connecting to value chains is a first step towards economic/agricultural development.

Paradigm Shift for Water Conservation

The importance of water conservation for agriculture has been recognized for centuries (Unger, Kirkham and Nielsen 2010). Bennett (1939), in his book *Soil Conservation*, cited numerous examples from ancient times of countries where canals were developed to convey water to agricultural lands for improved crop production. In addition, reservoirs were constructed for retaining water for later use on agricultural land, terraces were constructed to reduce runoff, ploughed fallowing was promoted to conserve water, deep ploughing was used in some cases, and contouring was used to retain water on land. Water for agriculture is derived from precipitation or from a stream, reservoir, or aquifer where irrigation is practised.

Water Harvesting Techniques

Water harvesting, according to the Netherlands Water Partnership (NWP 2007), can best be described as all activities to collect available water resources, temporarily storing excess water for use when required, especially in periods of drought or when no perennial resources are available. The starting point is the collection of natural water resources from rainwater, fog, runoff water, groundwater or even wastewater, which otherwise would have escaped. World water resources are facing dramatic changes as a result of global climate change, high water demands, population growth, industrialization and urbanization. As climate change leads to more extreme variations, water-harvesting solutions must cope with both extreme rainfall and extreme droughts. Extreme rainfall requires good flood protection and diversion structures. Extreme drought requires large storage capacity and more emphasis on groundwater replenishment. In some cases, droughts last so long that alternative water sources are required, which means that water rationalization schemes must be developed in advance. By managing available water resources, livelihoods and human development can improve. *To respond to water scarcity and unequal distribution, new*

techniques need to be explored and old techniques revisited. Small-scale water harvesting techniques provide a direct solution, especially in rural and drought-prone areas.

Local storage of water is increasingly important for ensuring water availability and food security for rural and urban populations, especially in developing countries. This is particularly the case in areas with dry seasons where perennial rivers and fresh groundwater are not available or difficult to reach. In urban areas dam construction, long distance conveyance of water or desalinization may provide options for ensuring water availability. However, such solutions are generally too costly and complicated for rural water security. Rural populations require low-cost systems that can be constructed, operated and maintained with a high degree of community involvement and autonomy (NWP 2007). Water harvesting can have a positive impact on soil conservation, erosion prevention, groundwater replenishment and the restoration of ecosystems.

Despite its tremendous potential, water harvesting has not received adequate recognition from policy makers and engineers. Water harvesting techniques are often considered unsophisticated or 'traditional. Most good practices applied by small-scale farmers or development workers are developed by themselves through trial and error, by building on indigenous knowledge, or have resulted from the modified application of ideas introduced from outside. Often, these local innovations go unnoticed (NWP 2007).

Smart Water Harvesting Solutions

A water harvesting technology is 'smart' when adapted to local conditions and adaptable to a changing environment. Smart Solutions (SS) meet the needs of the user, are possible to replicate at a larger scale and are simple to implement, use, maintain and repair. Moreover, the techniques are affordable. Some success factors can be identified for water harvesting techniques. However, successful replication and

implementation depends on local conditions. Success factors according to NWP(2007) include:

- Start small, learn as you go and expand when needed;
- Build on existing practice, experience and infrastructure;
- Focus on local construction materials, local knowledge and techniques, local labour;
- Recognise local customs, social structures and habits;
- Consider existing institutional settings (develop institutional support);
- Ensure political commitment;
- Involve local stakeholders in design and planning (developing ownership and skills), including women;
- Organise operation and maintenance: simple, local, affordable, low frequency, accessible services, e.g. performed by water committees with balanced representation;
- Ensure proper local training, capacity building;
- Secure property laws/ownership; own benefits, motivation, financing mechanisms;
- Evaluate capital resources, loans, micro-credits;
- Recover costs; make choices based on affordability and willingness to pay;
- Respond to actual needs (demand responsive);
- Build on co-operation successes in communities;
- Inspire by showing results/successes of other projects.

Factors Shaping Extension Paradigms

The Extension paradigm for increased agricultural production, value addition and environmental sustainability is often shaped by factors some of which are highlighted below:

- (1) National goals in relation to extension functions (Swanson 2010)
 - Achieving national food security through technology transfer;

- Increasing farm income through a more market-driven extension strategy;
 - Empowering farmers by getting them organized into groups (social capital) based on common interest;
 - Promoting sustainable natural resource management practices.
- (2) Government's role in agricultural and rural extension reform (Rivera 2011). This stems from government concern for:
- Increased agricultural production;
 - Impact of agricultural practices on the environment;
 - Regulations governing quality standards;
 - Food safety;
 - Wellbeing of the people.
- (3) New extension challenges for government as a result of:
- Meeting the need to provide food for all;
 - Raising rural incomes and reducing poverty;
 - Sustainably managing natural resources.
- (4) Government's critical roles which stems from:
- Establishing market for commercial, farmer-farmer extension services;
 - Providing rural communication infrastructure
 - Developing human resources.
- (5) Emerging challenges in extension (Anandajayasekaram et al. 2008): these involve:
- Five complex transitions that will ultimately influence productivity and sustainability of the R and D system. These are: managerial, scientific, financial, political transitions and

new forms of public-private civil society research-extension partnerships.

- Recent developments that present challenges to agricultural research and innovations in developing countries through:

- (a) confronting new priorities in a rapidly changing world (e.g. stronger demand for competitive and quality conscious agriculture) and adapting to changes within a more complex innovation system framework where there are greater numbers of actors and linkages to consider;
- (b) Redefining the role of government in agricultural research and service provision and defining the roles of private sector, civil society and end users;
- (c) Strengthening the demand side of agricultural research and services to ensure that these programs are more responsive and accountable to end users;
- (d) Developing a clear understanding of the institutional structures needed at the national, regional and sub-regional levels for agricultural research and service provision and of whether, and how this understanding would imply changes in the current structures present at national, regional and global levels;
- (e) Facilitating development of innovative funding instrument that makes public institutions more sustainable, reduce donor dependence, and enhance co-financing by end users and others;

- (f) Developing a clear understanding of the institutional structures needed at every level for agricultural education within the emerging food and agricultural innovation systems;
- (g) Ensuring stakeholder participation and developing local, regional and global partnership alliances;
- (h) Assisting in developing mechanisms through which internal and external support for food and agricultural innovation systems are coordinated;
- (i) Strengthening system linkages and coordination, including linkages between agricultural research policy and wider policies for science and technology.

(6) Globalization

- Privatization has caused commodification of agricultural knowledge (Rivera 2011).
- Extension services are viewed as tools to generate income.

A major challenge faced by small-scale farmers is low prices for their produce because majority of agricultural outputs are marketed in their raw forms, thereby losing opportunities for higher earnings/income. A paradigm shift of agricultural extension from a production-oriented, technology transfer model to one with broader development objectives that emphasise production, value addition and marketing has emerged through provision of support in all value chain stages in order to reduce post-harvest losses and boost farmers' income (Agwu, Anyanwa and Kalu 2015; Kennedy 2015; Tobin, Glenna and Devaux 2016; Salvioni, Henke and Vanni 2020).

Agricultural Extension and Value Addition

In recent years, value creation or value addition in agriculture, and its management, has emerged as a business survival strategy (Kampen 2011). There is emphasis placed on value addition in contemporary times as both national and international intervention agencies seek better bargain for farmers. Farmers are encouraged these days to change the face of their farm outputs by adding value, thereby commanding better prices for their produce and escape from exploitation of middlemen. Agro processing has a tremendous potential for increasing income through value addition and increasing shelf life of agricultural products

Value addition is a change in the physical state or form of the product such as milling wheat into flour or making strawberries into jam that enhances its value, which should have unique attribution that goes beyond what is generally found in the conventional market (Francis 2006).

“Value” is usually created by focusing on the benefits associated with the agribusiness product or service that arises from it:

Quality — Does the product or service meet or exceed customer expectations?

Functionality — Does the product or service provide the function needed of it?

Form — Is the product in a useful form?

Place — Is the product in the right place?

Time — Is the product in the right place at the right time?

Ease of possession — Is the product easy for the customer to obtain?

Value addition in agriculture predominantly offers farmers the opportunity to receive a bigger share of the consumer's food money. Traditionally, value-added agriculture was associated with the processing of raw produce (Coltrain, Barton and Boland 2000; Amanor-Boadu 2003).

The value of farm products can be increased in endless ways: by cleaning and cooling, packaging, processing,

distributing, cooking, combining, churning, culturing, grinding, hulling, extracting, drying, smoking, handcrafting, spinning, weaving or labelling. However, over the years, value-added options for farmers have expanded to include enhancing value through the agricultural products' identity characteristics—traits that may not be physically seen, including local and organic designations (Womach 2005; Hueta. 2012). In fact, local foods are currently a popular component of value-added agriculture (Hardesty and Leff2010; Onken and Bernard 2010).

In Nigeria, value addition has come to the forefront of agricultural policy to strengthen small farms and farmers to survive in an era of agricultural liberalization, privatization and globalization. This can be attributed to the fact that agriculture in Nigeria is in the hands of rural poor farmers operating at subsistence level. As farmers struggle to find ways to increase farm income, the potentials in adding value to raw agricultural produce must be understudied as the value of farm products can be increased in endless ways.

Consequently, besides offering higher returns, value-added products can open new markets, create recognition for a farm, expand the market seasons, and make a positive contribution to the community and nation at large. Value addition also brings about increased bargaining power because it helps to increase the shelf life of the agricultural produce. The longer a product can stay without getting spoilt, the more guaranteed a farmer is in selling at due time and price. As the popular saying goes "*You cannot continue to do the same thing the same way and expect a different result*". Therefore, if agriculture is going to wear a good look in Nigeria, it must transcend the sale of raw produce to the development of new products and create remunerative markets for higher agricultural commodities. The Home-economics unit of Agricultural Extension Department has been vital and supportive in complementing the roles of agricultural extension from time immemorial. The unit is key to rural development as it has helped in providing the much-needed knowledge on value addition of agricultural produce through training on processing, good nutrition, preservation,

food safety measures, and means of canning surplus food which in turn has helped farm families in surviving economic depression and droughts.

It is noteworthy that value addition to agricultural produce will remain a mirage outside the shores of technology as the greatest asset to harness the untapped potentials embedded in the country's agricultural sector lies in the adoption of modern technology. In the light of the above, a proactive partnership among farmers, agric-food industry, researchers or subject matter specialists and extension personnel is sacrosanct to actualizing the benefits or gains of value-added agriculture.

Challenges to Paradigm Shift in Agricultural Extension

In the past, agricultural extension was initiated with the intent of passing information to farmers who were not literate or who did not have any access to formal education. Today however, it goes a great length to involve the transfer of scientific knowledge required by farmers in understanding the use of modern technology. It also integrates innovations with agriculture in a way intended to promote agriculture and make it a lasting solution to crises such as food shortage and low level of agricultural production. However, there are lots of challenges that need to be addressed for a smooth transition from the old method of extension delivery to new paradigm (paradigm shift) in Nigeria. Some of the challenges are highlighted below:

- **Inadequacy and Instability of Funding**

Agricultural Extension programmes require adequate funding to ensure successful extension service delivery. Due to inadequate funding, extension organizations are unable to adequately provide efficient agricultural extension service. Funds are needed to purchase audio-visual aids, office equipment and other communication related materials for training of farmers. In addition, recent threats of climate change and the rapid advancement in technology, imply that more farmers require capital investment in agriculture and human capacity development (from extension officer) to at

least continue to make their living out of farming. However, Nigeria, like other developing countries depends on financial supports from International Organizations to finance the agricultural extension system. When such assistance ceases, it becomes difficult to sustain the level of performance/achievements recorded by the agricultural extension organizations. For example, Agricultural Development Project (ADP) suffered a great set-back when World Bank funding assistance was withdrawn in Nigeria, and till date, the project is still struggling to survive in terms of funds to carry out their activities. Tijani, Fawole and Adekoya (2010) also documented the negative impact of World Bank funding withdrawal on activities of Women in Agriculture (WIA) Programme of Oyo State ADP. WIA activities over the period of 1989 – 2001 were examined using secondary data. The source confirmed significant drop in WIA activities after withdrawal of funding by World Bank. The t-test results on the overall activities show significant difference indicating that the state government may not be capable of sufficiently funding extension work especially when this affects women farmers.

- **Poor extension contact**

Studies have shown that male farmers are more likely than female farmers to have contact with agricultural extension agents because of the misconception that farmers are usually male. Despite this, the extension contacts to male farmers are still inadequate due to inadequate number of extension agents. In addition, women farmers' production problems were seldom passed on to the research sub-system and technologies appropriate for solving women's problems were also not available, coupled with few women extension workers. Thus, due to lack of appropriate contact with extension agents, farmers lacked knowledge of improved agricultural practices, as established by Oluwasusi and Tijani (2012) in an assessment of the effect of extension services on arable farmers' production in Ekiti West LGA of Ekiti State. The study reported low access to extension services with

consequent little effect on production, and traditional barriers that could prevent male extension workers from reaching and training women farmers.

- **Ineffective agricultural research-extension linkages**

Effective communication links between researchers and extensionists are vital in the identification and pooling of farmers' problems/research needs; modification of technologies through verification at the on-farm trials and in initiating further research. Weak research-extension linkages affect the quality of knowledge generation and knowledge management upon which the long-term success of an extension organization depends. There is currently a weak agricultural research-extension linkage in Nigeria because of the low involvement of village extension agents and block extension supervisors in collating farmers' needs for the formulation of research themes/plans and the irregular technology review meetings between the two stakeholders.

- **Use of poorly trained extension personnel at the local level**

As agriculture develops and intensifies, the agricultural extension workers must develop their skills and knowledge. The opportunities for the right type of staff training are low, while individuals without background in extension are being employed as extension personnel. Consequently, this insufficiently qualified, inexperienced and poorly trained personnel end up not doing much to improve the quality of extension service offered to farmers. Another major factor that has been responsible for poor quality of personnel and poor service delivery is the poor pre-service training that the staff had prior to joining the extension service.

- **Disproportionate ratio of extension agents to farm family**

A critical problem facing agricultural extension in Nigeria is the insufficient number of agricultural extension workers that

provide service to the huge population of farmers. The World Bank recommendation of extension workers is one extension agent to about 500 farmers (1:500) but in Nigeria, there is one extension agent to about 3,000 farmers (1:3,000) which makes it impossible for efficient service delivery. Therefore, the prevalent disproportionate ratio of extension agent to farm family has led to a situation where many farmers do not benefit from the services of agricultural extension agents.

In addition, Tologbonse et al. (2008) identified the following as challenges confronting agricultural extension in Nigeria:

- Total absence of a national extension policy which has culminated into rowdy nature of extension delivery services with no direction and focus;
- Uncoordinated intervention of projects by donor agencies with the attendant confusion in the ADP across the country;
- Over-emphasis on production at the expense of other parts of the value chains in agricultural development;
- Non-involvement of the third tier of government (LGA) in extension service despite the closeness to the people at the grassroots.

Case Studies of Paradigm Shift in Agricultural Extension Intervention Programmes Across the Globe

The examples below illustrate the importance of participatory processes and farmers' proactive participation in extension programmes. The case studies highlight the diversity of issues that can be tackled through extension and advisory services, and the positive impacts these can have on farmers' livelihoods. In many cases, extension services are an addition to existing structures, such as farmer co-operatives, and are offered as part of a package of services. This helps to ensure that the positive outcomes from extension, such as increased yields, can be translated into positive outcomes for farmers, for example by supporting the marketing of the improved crops.

MALI – The Cheetah Network

In Mali, farmers were able to sell their products and derive better prices from their production by developing and honing their business skills through extension services provided by the Cheetah Network. Specific programmes called 'business incubators' were established to assist the farmers in developing their entrepreneurial skills. In Mali, small-scale farmer organizations formed a partnership with the national agricultural research organization, the national agricultural university, and some American universities to develop the Mali Agribusiness Incubator Network – the 'Cheetah Network'. The Network facilitated university students and staff to train farmers in business skills, and encouraged university staff to revise the university curricula to include greater skills development in marketing agricultural products. Using women's co-operative, they focused on producing, processing, and storing shea butter for export and developing a high-quality market for its products in the United States and Canada.

MOZAMBIQUE – Nhambita Community Carbon Project

Extension services do not only focus on increasing yields or improving marketing skills. It also carries out innovative programmes that can help farmers protect and gain value from their environment. For example, in Mozambique, with the support of a specialized organization called Envirotrade, farmers set up a successful business model for the sale of carbon offsets to support the conservation of forests and the planting of new ones. The project focused on increasing local productivity, while protecting the forest in the buffer zone of the nearby *Gorongosa* National Park. Farmers' use of sustainable farming practices, introduced as part of the *Nhambita* Community Carbon Project, increased cashew and fruit yields and improved livelihoods for about 1,300 families. Since its launch, the initiative has traded more than 120,000 tons of CO₂, earning the community over US\$1 million. Similar activity tagged "Reducing Emissions from Deforestation and Forest Degradation (REDD+)" is on-going in Nigeria.

Participants are paid for carbon stored by the trees they plant, the forests that they manage, and the fires that they prevent.

MADAGASCAR – Best practices for improved soil

Communication is a key source of knowledge sharing and can play an important role in helping to disseminate and scale-up the use of best practices. In Madagascar, *la Coalition Paysanne de Madagascar* (also known as FTM/CPM) is one of many farmers' groups that encourage best practices such as crop rotation, by training their members. Crop rotation was used to improve soil nutrients, foster soil quality, minimise soil erosion, and increase water efficiency. Continuous replanting of one crop in a field depletes soil nutrients and the organic matter in the ground. National support programmes and international research and extension networks are critical to furthering these efforts. Co-operation with scientists and agricultural research centres, and conducting workshops with farmers to put practices into place locally, are both vital activities. In Madagascar, extension personnel carried out information dissemination on the radio and on key 'Action Days'. Forums were also held to encourage farmers to share their experiences.

KENYA – Mobile telephony for delivery of animal health services

FARM-Africa, an NGO working in Kenya in conjunction with an agricultural extension organization and other stakeholders developed a decentralized animal health care system as part of Kenya Dairy Goat and Capacity Building Project (KDGCBP). In order to link key participants in the system, the project approached the Safaricom Corporation, the corporate social responsibility arm of the mobile phone company Safaricom. The KDGCBP system works with extension personnel who purchase veterinary drug kits and mobile phones at subsidised prices. Extension personnel and vets working with the project also receive mobile phones,

while community phones are also installed at vet shops, with solar panels and batteries, where there is no electricity. The owner of the community phone is responsible for repairs and can make a profit by charging for its use; a way for private vets to diversify their income. The phone system allows the extension personnel to update one another, share information, and conduct referrals. This system has reduced transaction costs and increased the efficiency of animal health care in the area.

PERU – Café Peru

Agricultural extension service is often essential to enable farmers reach global markets and meet the product standards imposed by major buyers, or achieve valuable certifications which allow for the sales of the products at a premium.

Cacao production is a major source of income for farmers in Peru. Three cacao cooperatives in Huánuco Region partnered with Café Peru extension services to acquire technical assistance and training to increase the productivity of cacao, obtain certification for organic cacao production, and increase the marketing of their organic cacao. The co-operatives received market analysis and specific training in co-operative management and product promotion. Starting from zero in the project's first year, more than 1,200 producers had obtained organic certification by the end of year three. Over the same period, cacao productivity rose from 340 to 600 kg per ha, and the co-operative now markets some 1,500 tons of organic cacao.

NIGERIA FADAMA III project

The World Bank in partnership with Nigerian Government developed the programme to enhance productivity, reduce marketing and transportation cost, encourage farmers to take informed risks and participate in markets. The Fadama III project was implemented using the Community Driven Development (CDD) approach which strongly emphasizes stakeholders' participation at community level. This is to develop participatory and socially inclusive Local

Development Plans (LDPs) that provides the basis for support and funding under the projects (Adeolu and Taiwo 2004). The paradigm shifts from the traditional public sector dominated/ supply led development approaches of the past to a private sector led demand-driven strategy ensured full guidance of participating farmers through several institutional structures. This entailed the establishment of model extension programs customized for meeting the requirements of particular communities, based on contributory funds provided by the Federal, State and Local governments.

The project provided periodic trainings and workshop on formulation of demand for advisory services, participatory implementation and supervision of activities, as well as quality control functions to extension personnel and facilitators in order to ensure that the subprojects emanating from the Fadama Community Associations (FCAs) meet minimum technical standards. The extension personnel, in turn exposed farmers or beneficiaries to technologies, such as new varieties and cultivation methods, participatory methodologies and facilitation skills, marketing and enterprise management, improved cultural practices, soil fertility management, sound use of agro-chemicals, soil conservation practices, rational water management and sustainable pasture management as well as sustainable ecosystem management.

The various Fadama resource users including crop farmers, pastoralists, fishermen and women and on and off farm entrepreneurs, operating through their respective Fadama users' groups (FUGs) and their apex bodies, the FCAs agree on the consensus on how to use the common resources for the mutual advantage. Through the process, communities decide on the advisory services and infrastructures they need to enable them attain development goals they set for themselves based on their efforts; the consensus so reached are articulated in community development plans (CDPs) drawn at the level of the Fadama Community Associations (FCAs).

Positive strides emanating from the programme were reported by several authors. Adereti and Fadare (2017) reported that Fadama III project succeeded in improving the socio-economic status of its beneficiaries with significant increase in annual income, social status and access to health care services. Similarly, Umaru (2019) posited that the programme enhanced the capacity of its beneficiaries to realize significant increases in farm size, output and subsequently increase in income among women farmers in Shelleng LGA, Adamawa State, Nigeria. In addition, Iwala (2014) revealed that, both Fadama III participants and non-participants benefited from the positive spill over effects of the project in the areas of accessible rural roads, culminating in reduced waiting time for vehicles and motorcycles, reduced travel time and reduced cost of transportation. They have also enjoyed conducive marketing environment and potable water at affordable costs.

NIGERIA Agricultural Transformation Agenda (ATA)

The major aim of the ATA was to transform agriculture in Nigeria from a mere traditional practice to a business enterprise. The value-chain approach adopted promised to lift agricultural activities beyond primary production to embrace significant investment in storage, processing, services and marketing (Akinwumi 2012). Coming during a period of serious national economic stress, there was a need for a shift of emphasis from public services to favour public-private partnership, and free-market operations. The policy also aimed at being sensitive to the needs of the most vulnerable farmers, as structures were set in place so as to capture their peculiar needs. For instance, the Growth Enhancement Support Scheme (GESS) was designed to deliver subsidized farm inputs including fertilizers, seeds and other inputs to the resource poor farmers.

The strategy to achieve this was the e-wallet system. Under this system, the Federal Government in conjunction with the states engaged service providers who supply inputs

to farmers at the agreed subsidized rates. Electronic coupons are generated and sent to the mobile phones of farmers who must present same to the service provider before they can buy inputs at the subsidized rate. The input merchants then present records of sale of inputs to the governments to claim the balance that represents the subsidy. This scheme effectively cut off the intermediaries who used to hijack subsidized inputs in the past, and resolved a protracted nightmare, except that the two bags allocated to each farmer have been grossly inadequate for the needs of most farmers (FEPSAN 2012).

Another key component of ATA is the Nigeria Incentive-based Risk-sharing System for Agricultural Lending. This strategy is designed to make agricultural credit more accessible to all players in the agricultural value chain and attractive to the lenders by considerably reducing the risk associated with lending for agricultural production. The Staple Crops Processing Zone strategy is an additional component of ATA. It is focused on attracting private investors to locate processing plants in areas of concentrated food crop production. The aim is to process commodities into food products.

Marketing corporations, operated by private investors are yet another component of the ATA. These corporations are expected to provide markets for farmers and redress price volatilities promoted by intermediaries. These if implemented diligently should result in a robust agricultural sector that would drive the economy and guarantee better living standards of most Nigerians. Agricultural extension which is aimed at improving the knowledge of farmers for rural development becomes a critical component for actualizing the objectives of ATA.

Agricultural Promotion Policy (APP)/The Green Alternative
According to Federal Ministry of Agriculture and Rural development(2016), the Agricultural Promotion Policy (APP) is an attempt at strategically refreshing the agricultural

renaissance commenced through the initiation of the ATA. The policy document is the outcome of an intensive consultative process starting in November 2015 through April 2016, and involving multiple stakeholders. From farmer groups to investors to processors to lenders to civil servants, and to academics, many stakeholders provided detailed input, commentary, and support.

Building on the successes and lessons from the ATA, the vision of the Buhari Administration for agriculture is to work with key stakeholders to build an agribusiness economy capable of delivering **sustained prosperity** by meeting domestic food security goals, generating exports, and supporting sustainable income and job growth.

The specific objectives of the APP include:

- (1) Growing the integrated agriculture sector at twice the average Nigerian GDP for 2016 – 2020;
- (2) Integrating agricultural commodity value chains into the broader supply chain of Nigerian and global industry, driving job growth, increasing the contribution of agriculture to wealth creation, and enhancing the capacity of the country to earn foreign exchange from agricultural exports;
- (3) Promoting the responsible use of land, water and other natural resources to create a vibrant agricultural sector offering employment and livelihood for a growing population;
- (4) Facilitating government's capacity to meet its obligations to Nigerians on food security, food safety and quality nutrition; and
- (5) Creating a mechanism for improved governance of agriculture by the supervising institutions, and improving quality of engagement between the federal and state governments.

The new policy regime, is founded on the following guiding principles, a number of which are carryovers from the ATA reflecting the strong desire for policy stability. New elements

added reflect the lessons from the ATA, as well as priorities emerging from the aspirations of the Buhari Administration:

- (1) Agriculture as a business – focusing the policy instruments on a government-enabled, private sector-led engagement as the main growth driver of the sector. This essential principle was established in the ATA and will remain a cardinal design principle of Nigeria’s agriculture policies.
- (2) Agriculture as key to long-term economic growth and security– focusing policy instruments to ensure that the commercialization of agriculture includes technologies, financial services, inputs supply chains, and market linkages that directly engage rural poor farmers because rural economic growth will play a critical role in the country’s successful job creation, economic diversity, improved security and sustainable economic growth.
- (3) Food as a human right – focusing the policy instruments for agricultural development on the social responsibility of government with respect to food security, social security and equity in the Nigerian society; and compelling the government to recognize, protect and fulfil the irreducible minimum degree of freedom of the people from hunger and malnutrition.
- (4) Value chain approach – focusing the policy instruments for enterprise development across successive stages of the commodity value chains for the development of crop, livestock and fisheries sub-sectors, namely, input supply, production, storage, processing/utilization, marketing and consumption.
- (5) Prioritizing crops – focusing policy on achieving improved domestic food security and boosting export earnings requires a measure of prioritization.
- (6) Market orientation – focusing policy instruments on stimulating agricultural production on a

- sustainable basis, and stimulating supply and demand for agricultural produce by facilitating linkages between producers and off-takers, while stabilizing prices or reducing price volatility for agricultural produce through market-led price stabilization mechanisms.
- (7) Factoring Climate change and Environmental sustainability – focusing policy instruments on the sustainability of the use of natural resources (land and soil, water and ecosystems) with the future generation in mind.
 - (8) Participation and inclusiveness – focusing instruments on measures to maximize the full participation of stakeholders including farmer’s associations, cooperatives and other groups, as well as NGOs, CBOs, CSOs, development partners and the private sector.
 - (9) Policy integrity – focusing policy instruments on measures for sanitizing the business environment for agriculture, in terms of accountability, transparency and due process of law, ensuring efficient allocation and use of public funding and fighting corruption on all programmes involving public resources.
 - (10) Nutrition sensitive agriculture – focusing policy instruments on addressing the issues of stunting, wasting, underweight and other manifestations of hunger and malnutrition with particular reference to the vulnerable groups, which include children under-5, nursing mothers and persons with chronic illness and disabilities.
 - (11) Agriculture’s Linkages with Other Sectors – focusing policy instruments on the connected relationship between agriculture and other sectors at federal and state levels, particularly industry, environment, power, energy, works and water sectors.

Extension: A Leg in the Innovation System Tripod

Extension is one leg of the innovation system tripod while the other two are the technology generating system and the end-users (farmers). Extension is an activity that facilitates the transmission of useful innovation to the end users. These innovations flow from the technology generating system traditionally represented by research institutes, universities, and other formal institutions that engage in research, but also recently including NGOs and indigenous technical knowledge of farmers (Asiabaka 2007).

Research, extension and farmers are the three main pillars of the agricultural system and their effectiveness largely depends on strong linkage among each other. Research and agricultural extension are dependent on each other for their successful operation. Extension needs research findings as production recommendations to provide solutions to the technical problems of the farmers. Extension should serve as a main source of research to develop an orientation to maintain an awareness of actual farmers' problems. Research focuses on the technical aspects for generating useful technologies, while extension focuses on the acceptance and adoption of those technologies by users (Agbamu 2000; FAO 2005).

Flow of information from agricultural research to farming communities and vice versa requires that continuous contact be maintained for information to be useful to farmers. If the link is weak the agricultural productivity will not increase. The lack of strong linkage causes disruption in technology flow and low adoption rates, increased time lags between development and adoption of new technology, reduced efficiency in the use of resources, unnecessary competition and duplication of efforts, and increased cost of agricultural research and extension activities (Ashraf et al. 2007).

Several criticisms of public agricultural extension services that weaken the link between research and production involve supply-driven, technical weakness, patronizing only big farmers, insufficient coverage of farmers, practicing top-down administration and poor dissemination of improved

agricultural technologies (Belay and Abebaw 2004; Farooq et al. 2010; Qamar 2002).

In Nigeria, the public sector is the primary source of extension, education and research services (Adebayo 2004). Research and extension organizations generally compete over the same scarce government resources and, leaders of these institutions do not see themselves as part of a broader system. Instead, they try to increase the flow of resources coming to their respective institutions so as to solve their day-to-day management problems, rather than ensuring that their respective organizations contribute to the broader goal of getting improved agricultural technology to all major categories of farmers. The challenge for extension and research organizations therefore, is how to better empower smallholder farmers to exploit emerging opportunities and to deal with the challenges of food security. New learning needs of farming communities are emerging as the world enters into an era of globalization, privatization, decentralization and market-liberalization, while the traditional public extension services have not yet transformed in order to meet those needs satisfactorily (Van Crowder 1996).

Effective communication links between researchers and extensionists are vital in the modification of technological recommendations and in initiating further research. Such links will enable new technologies and management practices to be suited to local ecological conditions. The participation of extension workers in adaptive research trials would allow them to become familiar with the technologies they are expected to promote and help to ensure that the sociological dimensions of farming are not neglected.

The agricultural research findings are of little use if they are not adopted by farmers. Studies have shown that the achievement of a stable and more productive farming system in a nation like Nigeria results from building a strong link within and between research and technology transfer agencies and the farmers (Nnadozie et al. 2015; Okoedo-Okojie and Okon 2013; Oladele 2008). Research, extension and farmers belong

to the agricultural production sub-systems. The three sub-systems interlock and hence the interface between them should be managed in the linkage mechanism. The relationship is such that researchers release research results to extension agents who in turn apply the knowledge to assist farmers, and then farmers discuss their farm problems with the extension agents who in turn pass these to the researchers.

The Disconnect Between Extension and Other Related Fields in Agriculture

The research-extension-farmer relationship, although seems ideal in theory, has not been successful. In developed countries, there tends to be a greater commitment to acceptance of new knowledge and promoting new practices, thus, allowing for technology to be adopted more rapidly. However, in developing countries, information is often not freely shared and authority is not delegated.

The challenge for researchers today is to develop economically viable technology that is easily adaptable to the rural society. Most of the developed world has traditionally followed the paradigm where research is conducted at universities and the resultant technology is transferred through various extension mechanisms to the producer (Swanson and Davis 2014). However, in the developing world, the farmers are meant to be the passive recipients of research results based on perceived needs identified by extension personnel with little input from the end user. The researchers, being the source of creative thinking are to develop new technologies which are to be passed to the extension staff who in turn refines the technology and disseminates to the end users in an easily understandable manner. However, most of these research outputs end up on the shelves resulting in little or no impact of the “gown” in the “town”.

Also, we often see researchers in the ivory towers generating technologies without carrying the extension personnel along. In some cases, some of these researchers

often question the ability of extension personnel to perform their jobs effectively. This continues to limit the flow of information, knowledge, useful technologies and resources among actors in the technology-delivery utilization system.

It is therefore pertinent to note that agricultural extension has a role to play in agricultural development through supporting and facilitating farmers engaged in agricultural production to solve problems and obtain information, skills, and technologies to improve their livelihoods and well-being.

Extension and the New Normal

Agricultural extension is an essential service that cannot be put on hold despite the pandemic. Therefore, the need for the paradigm shift in strategy to reach farmers is inevitable. Apart from the normal agricultural related activities, the agricultural extension agent oftentimes is the only link between the rural farming community and the government, hence information about Covid-19 prevention protocols are expected to be passed along with basic agricultural information to the farmer. Therefore, there is need for training and retraining of extension officers towards performing this additional role.

Furthermore, the e-extension framework in the country has been underdeveloped for years and there is no better time to upgrade and deploy it other than now. Extension agents and agencies need to make use of information and communication technologies (ICTs) to reach the farmers now more than ever.

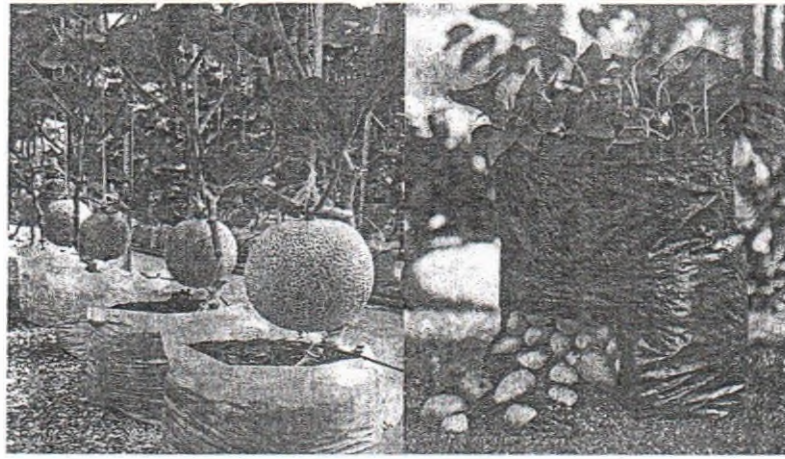


Fig. 7: Alternative planting in polythene bags.

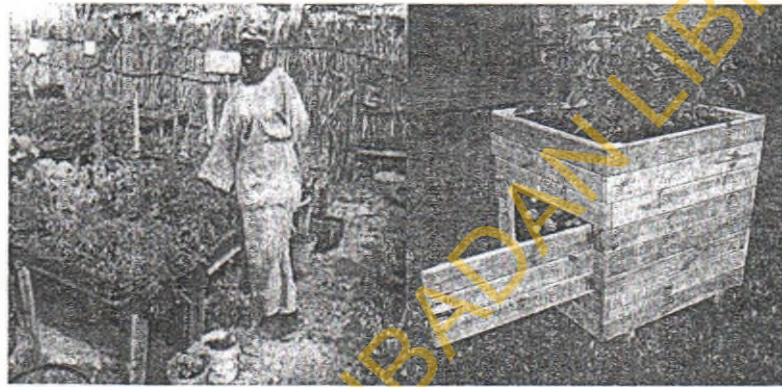


Fig. 8: Alternative planting using wooden materials.

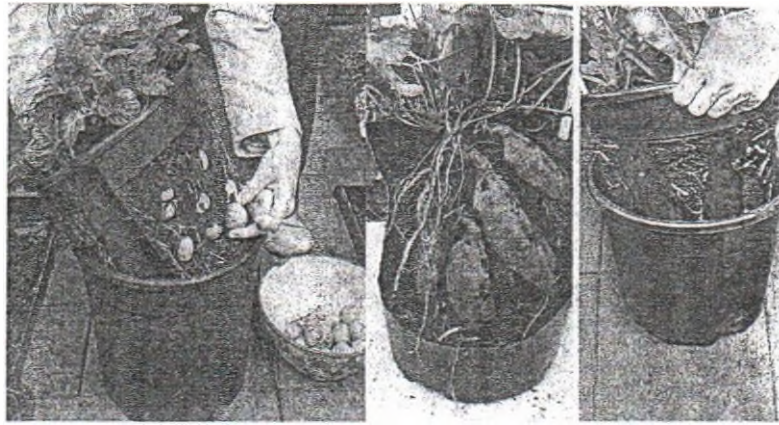


Fig. 9: Alternative planting in plastic buckets.



Fig. 10: Alternative planting using tyres.

Contributions of Department of Agricultural Extension and Rural Development to Knowledge in line with the Paradigm Shift in Agricultural Extension

The contributions of Department of Agricultural Extension and Rural Development, University of Ibadan to enhance agricultural production and productivity ranges from research

activities on agriculture, rural sociology, development communication and value addition. For instance, the establishment of Diamond 101.1 FM radio was initiated from the Department by the then HOD in person of Prof. A.A. Ladele to get across to farmers and the general public at large on current information on agriculture, in order to increase productivity and agricultural produce. Till date, the Department is still enlightening farmers through the popular agricultural programme tagged Farmers' Forum on the radio station.

Furthermore, through the Community Integrated Rural Development Project Fund by MacArthur Foundation under the leadership of Prof Janice Olawoye, the felt needs of palm oil processors in Ile-Ogbo were identified by the Department which led to the fabrication and donation of palm oil processing machine to the community which was demand driven i.e. a shift from supply driven. It helped to reduce the drudgery and expense in their livelihood activity

In addition, using TETFund grant, twenty-five women farmers from Ijaye-Orile community were trained on value addition led by Dr. Mojisola Oyewole using local (human and material) resources. The empowerment programme was on production of Lemor tea i.e combination of lemon grass and Moringa leaves. The women were taken through the cultivation, harvesting, post-harvest treatment of leaves, stripping and drying of stripped leaves, then ground into a coaxed form and further dried to reduce the moisture content. This was followed by dispensing into tea bags in the desired grams (2g), then sealed and packed in 25s into 7 X 3 Inch food grade nylon and sealed with sealing machine. It was then inserted into a designed Lemor Tea Pack and shrink wrapped. This research output and other value added products from the Department were displayed to represent the Faculty during the 2018 Research Fair organized by the University. My Dean Sir, It is worthy of note that this earned the faculty first position in the University-wide contest during the 70th Founder's Day Celebration.



Fig. 11: Training of Ijaye-Orile Women on LEMOR (Lemon grass and Moringa leaves) Tea production.

Furthermore, my department also collaborated with the Department of Wildlife and Ecotourism Management in 2012 for the training on snail and grass-cutter productions, as alternative income generating activities among rural dwellers in Ile-Ogbo Community. The objective of this training was to ensure the domestication and rearing of snails and grass-cutters in enclosures, so as to increase the production for consumption and ultimately increasing the income of rural dwellers. The Department has also collaborated with Center for Petroleum Energy and Law (CEPEEL) with one of the outcomes leading to the establishment of "Innovation Lab for Policy and Food Security (PiLAF) in the department. The core objective of PiLAF is to influence the agricultural policy process through research capacity development and effective collaboration among all stakeholders along the agri-food system. The Department also collaborated with College of Medicine, Departments of Geology and Geography on situation analysis, socio economic research and impact assessment. These are indications of the cross-cutting collaborative activities of the Department.

Conclusion

My Dean Sir, Ladies and Gentlemen, this presentation has brought to the fore the paradigm shift in agricultural extension. It has principally emphasised four categories of paradigm shift which are: Issue-, strategy-, technology- and target-based. The realities of globalization, liberalization and need for sustainability has necessitated a shift in extension paradigm from contact farmer approach to homogenous group approach; from persuasive role to a facilitating role of extension personnel; from emphasis on male farmers to a gender perspective approach; from top-down management approach to bottom-up approach; from no feedback to research system to farmers accountable feedback; from farmers ignorance as explanation for non-adoption of technologies to harnessing ingenuity of all for technology development; from centrally generated sources of information in extension to locally evolved innovation through farmers'

experimentation; from personnel and infrastructure development of extension system to development of linkages and networks; from prescriptive policy approach to facilitating evolution of locally relevant approach; from centralized administration to a decentralized administration; from emphasis on input and output targets in monitoring and evaluation to emphasis on learning through monitoring and evaluation; from fixed or uniform approach to evolving or diverse approach; and from emphasis on supply driven to demand driven. Equally, national goals in relation to extension functions, government's roles in agricultural and rural extension reforms, new challenges in extension, government's critical roles and globalization were major factors shaping new extension paradigms.

However certain challenges ranging from technological, linkage, discontent/disconnect between agricultural extension and other relevant fields in agriculture, technical, extension training and organizational problems have been militating against a complete metamorphosis of some of these shifts. Conclusively, for any nation to increase the level of agricultural productivity, the extension service must never be neglected because it is the live wire for farmers and an effective tool in attaining poverty reduction and food security.

The following recommendations are hereby put forward on the basis of the foregoing:

Recommendations

- An extension service delivery system comprising of competent and well-trained personnel, among other requisites, would go a long way in enhancing the development of the crop, animal and fisheries production sub-sectors.
- Extension should try to include hidden decision makers and strengthen their confidence to express themselves.
- Federal Ministry of Agriculture in collaboration with the telecom service providers should create an agriculture call center as established in Zaria, Kaduna

state in others states of the federation to improve extension services.

- In order to achieve a bumper harvest through the use of available resources, a demand driven extension approach should use well trained agricultural extension personnel that can supply necessary information which will consequently bring about increase in agricultural production.
- Emphasis should be placed on strengthening agricultural research and revitalization of the agricultural training and streamlining the extension delivery system including the involvement of non-governmental organizations (NGOs) and opinion leaders in extension delivery through capacity building and promotion of improved technologies that are appropriate to the needs of farmers.
- Extension support must be completely entrenched within the livelihood framework of their clientele. This would shift the underutilized energies and intellectual wealth of extension agents from focusing solely on primary production activities to a broader extension conversation. This would include exploration of the full spectrum of issues related to production (e.g. marketing, finance, input supply and organizational capacity) as well as identifying (jointly with their clientele) other livelihood opportunities which can further improve the household food security of clientele, including both agriculture and non-agriculture related livelihoods.
- While making the above-mentioned paradigm shift, agricultural extension needs to reform in ways that allow it to fulfil a diverse set of objectives. These range from better linking of farmers to input and output markets, to reducing the vulnerability and enhancing voice of the rural poor, development of micro-enterprises, poverty reduction and environ-

mental conservation as well as support of farmers' organizations.

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To my great audience, thank you for your attention.

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