PRACTICE WITHOUT POLICY: THE NIGERIAN AGRICULTURAL EXTENSION SERVICE

BY PROF. MICHAEL C. MADUKWE

1.0 Introduction

The records of the beginning of creation in the holy books were presented in farming community following some rules. Knowledge of farming in that beginning was not only a way of life; it was also a major determinant of success and failure of individuals, groups and communities. Then, the bulk of farm knowledge generation and utilization resided in individuals and transfer depended on interpersonal interaction that ran along family lines and groups. The importance of knowledge to farming was so critical that societies devoted a lot of intellectual skill and care designing agricultural knowledge system. Rules and regulations were made on how farming knowledge were to be validated, transferred and used. The capabilities acquired in the process were later applied to other secondary economic activities. The result was that all economically successful societies then were successful farming communities. Over time farm knowledge generation, transfer and utilization expanded beyond what an individual farmer could conveniently handle; consequently specialization had to be introduced. The expansion of farm knowledge called for existing regulations to be expanded and upgraded.

Synchronising rules for farm knowledge generation, transfer and utilization with farming practice on ground has been the major point of departure for developed and developing countries. Farming has become so knowledge dependent with globalization. The major drivers of agricultural and economic development are the effectiveness and efficiency in transferring knowledge to those who need and will use it. The degree of care and attention given to farm knowledge transfer and use is now a measure of the degree to which countries are developing or not. Countries that see the need for rules and regulations to improve their existing farming practices which ought to be part of their culture and way of life develop such rules and regulations. In addition they develop rules and regulations for other social, economic and political aspects of their lives. The reverse holds true for countries that do not see the need for rules and regulations.

The capability to make rules and regulations is learned from farming as a cultural trait. External interventions mostly stalled this learning and evolutionary trend of farming knowledge rules and regulation in agricultural systems of unsuccessful or developing countries. Some of these external interventions were like external pollen grains in a pollination process that fails to produce a viable mature fruit for continued propagation. The external interventions came in different pull and push factors. They included food aids, funds (grants and loan) and knowledge generation and transfer. Most developing

countries under the grip of external interventions found it difficult to make progress because they failed to find a pathway by not recognizing and analysing the role of other actors in farm knowledge transfer.

Success or failure in economic development can be measured by or seen from a nation's success or failures in making rules and regulations for agricultural knowledge generation and transfer. Consequently we see practice, or better, lack of practice without policy in most spheres of our national life. Recently, I asked a friend of mine who bought a used car why she puts the head lamps on in the afternoon. The answer "it is an American spec, and that is their policy"

Mr. Chairman, this lecture is divided into three main sections:

1. The first section reviews briefly agricultural extension practice in Nigeria pointing out emerging issues;

2. The second section employs the concept of innovation system to analyse the Nigerian agricultural extension system. The essence is to show how identifying and examining actors in agricultural extension system can provide the basis for an appropriate policy for practice; and

3. The third section discusses the relevance of a sound legal structure for agricultural extension policy and practice in Nigeria. This section deals

too with recommendations for developing an agricultural extension policy in the country.

The word practice means the actions carried out in implementing extension activities in Nigeria. Policy is any planned decision, initiative or acts designed to guide the activities of agricultural extension in Nigeria.

2.0 Section One

2.1. A Review of the Existing Agricultural Extension Practice in Nigeria

The existing agricultural extension practice in Nigeria is characterized with many short falls. I will attempt in this lecture to draw attention to some of them.

a. Establishment of regional ministries of agriculture

The beginning of recognizable agricultural extension practice in Nigeria started in 1954 with the establishment of three regional ministries of agriculture: one in the east, north and west. This was sixty years after the establishment of a botanical research station in Lagos in 1893. Following this development the posts of Director and Inspector-General of Agriculture in each region created in 1951 were abolished. Each regional ministry of agriculture had a research station, a school of agriculture, and a field service division. The extension personnel trained by the school working under the field service division were deployed to teach farmers innovative farming techniques.

The Federal Department of Agricultural Research was retained, (since constitutional provisions placed agricultural research on the concurrent legislative list) while extension work remained a regional responsibility. The research findings of the federal research stations under this arrangement were to be transmitted through regional ministries responsible for agriculture and natural resources. The regionalization of agriculture and the consequent separation of research and extension reduced the focus on extension and laid the basis for the enduring weak linkages between research and extension.

The official farm policy, even after independence concentrated attention on export commodities, in the belief that food production activities (which bordered on the indigenous knowledge and welfare of the farmers) could take care of themselves without any governmental intervention. The agricultural practices of the regional governments aimed at the modification of traditional farming methods. This was due to the weak capacity inherent in traditional practices to produce food to meet the needs of the rising population and urbanization.

The Federal Ministry of Agriculture and Natural Resources set up in the mid 60's had it's structure reflected in the state ministries that came on board with the creation of states in the late 60's. Agricultural extension under the ministry was a relatively small unit compared to other sections in the ministry. The roles of transferring and disseminating agricultural technologies

in the ministry were therefore bugged with so many problems. The problems were lack of staff, weak linkages with agricultural research, poor staff mobility, inadequate qualified staff, and weak financial support, (Madukwe and Ozor, 2004). The very poor performance of extension under the ministry of agriculture over time has been adequately reported (Madukwe, 1990; 1994; and 1995).

b. **Location of extension in the administrative machinery of the ministry.**

The second factor is the place of extension in the administrative machinery of the ministry. Extension was a very small unit in the administrative machinery of the ministry until the establishment of the Agricultural Development Programme (ADP). The location was low in the hierarchy of the ministry, the budget was relatively small and staff of the unit had little or no training in extension. There have been calls to restructure the ministry of agriculture and give more autonomy to the extension service (Madukwe and Obibuaku, 1991a; Madukwe and Anyanwu, 2000). Such calls have been resisted for fear of loss of budget, power and influence particularly as the total expenditure for extension over time has continued to be on the increase due to funds from external agencies.

Most of the additional agencies and programmes in extension namely; the then Project Coordinating Unit

(PCU), the Agricultural Development Programme, (ADP), the Root and Tuber Expansion Programme, the Special Programme on Food Security, (SPFS), the Fadama Project, and the National Food Reserve Agency (NFRA) are tied to the administrative machinery of the Ministry of Agriculture. This has not encouraged the fostering of strong linkages between extension and the two other pillars of agricultural development, namely, research and education. The major actors in the extension system were handled under the ministry as if they had no relationship. This atomistic approach has been the prevailing practice in research and extension within Nigerian agriculture.

c. **Agricultural extension research efforts**

We need to note the research interest in agricultural extension as a major driver of agricultural extension practice and policy. There were very few capable hands within and outside the ministry to carry out research in agricultural extension. Most research in extension focused on issues such as adoption of crops or livestock, emphasizing farmer acceptance of a small aspect of what constitutes the complete technology needed to make progress. The findings of these studies blamed the farmer for failure to adopt, referring to the farmers with such terms as “illiterate”, “conservative” and “peasant”. The broader and indeed more relevant issues such as institutions, policy, markets and consumer food preferences were rarely addressed. An earlier work on

the institutional framework for transfer of agricultural technology to resource poor farmers in Nigeria reported that agricultural extension institutions are uncoordinated and improperly aligned with the tenets of agricultural development (Obibuaku & Madukwe, 1992).

My study of the Agricultural knowledge System (AKS) for transfer of science and technology to farmers in Nigeria, using features which make other AKS effective found the necessary elements completely absent. The analysis showed that the operators of the different sub-systems were ignorant and indeed acted as if they had no relationship with one another. The situation also created misunderstanding between different levels of government over extension programmes, staff and location. The duplication of agricultural extension agencies and functions became the result, (Madukwe, 1995).

d. Dependence on external funding

Dependence on external funding is another factor seen in agricultural extension practice in Nigeria. The poor performance of extension under the ministry attracted the intervention of external agencies. The Food and Agricultural Organization (FAO), the United States Agency for International Development (USAID) and the World Bank are few examples USAID in the 70's embarked on training Nigerians abroad in agricultural extension. This was aimed at providing the capability to

meet the extension manpower needs of the country. Additionally, the World Bank in the late 70's and early 80's provided loans to reform the ministry's extension system. This led to the establishment of Agricultural Development Programmes (ADP) in every state of the country. It is today the most enduring system of agricultural extension in the country.

Part of my research work so far examined the different administrative aspects of the ADP. In doing that, I identified criteria for selecting effective contact farmers (Madukwe, 1995) effective agricultural extension agents, (Uguru & Madukwe 1997) and effective extension supervisors, (Orogbe & Madukwe 1996) in the ADP system. I found in my evaluation of the Fortnightly Training Programme that relevant subject areas which complement extension work were inadequately covered during training. Training methods were inappropriately combined, (Isife and Madukwe, 1995). A study of role perception of supervisors in functional model agricultural extension recommended training of supervisors in the areas of guiding agents, programme planning, coordination and evaluation (Madukwe,1993a) (For additional studies on the administrative aspects of the ADP see Madukwe, 1990; 1992; 1993 b & c; 1994a; 1997 a & b; 1999 a & b; Madukwe & Ayichi, 1997; Madukwe & Obibuaku, 1991a & b; Ayichi &Madukwe, 1996.)

However, report of good performance lasted as long as the World Bank loan facility lasted. The federal, state and local governments have proved incapable of financing the ADP extension system and indeed any extension system in Nigeria. The ADP has managed to sustain a semblance of its old self because some more recent externally funded projects have found the structure or a modified version of it suitable in implementing extension programmes.

Some of the relatively new projects include the Sasakawa Global 2000, the Special Programme on Food Security (SPFS) and the National Fadama Project. Some questions are pertinent here. Why do external funding sources get interested in supporting agricultural extension service in Nigeria? How long shall we depend on external support to run our extension service?

e. Dependence on external knowledge

Apart from dependence on external funding there was also dependence on external knowledge for agricultural extension practice in Nigeria. Conception and practice of agricultural extension have largely been influenced by ideas from abroad within the last five decades. The reason is that most of the ideas and concepts solicited and unsolicited from within were improperly defined, poorly understood and at times contradicting. A few attempts at developing and implementing home grown extension programmes show evidence of the poor

understanding of the role of extension in agricultural development. The result has been that most of the activities that define agricultural extension practice in Nigeria are not properly aligned to the tenets of the principles of agricultural extension.

For example the Fadama II Project funded by the World Bank and the African Development Bank (ADB) has quietly introduced the following:

- A new agency at the national and state level to implement the project
- Practice of benefiting farmers contributing part of the cost of extension service in their farming activities.
- Replacing the extension agent in the traditional public extension system with a private extension agent termed “facilitator”
- Providing extension support through farmer groups formed along economic interest
- Adopting the Community-Driven-Development (CDD) approach in extension practice.

These are actions that are appropriate in the current extension discourse. However they raise some questions when put in the national context. For instance:

- Do we need to set up another agency or administrative machinery outside the ADP to implement these interventions?
- Who are these facilitators in terms of agricultural training and farm background? How were they selected?
- What aspect of these practices would need legislation or an Act of the national assembly to implement in a normal democracy?
- How is privatization of extension services viewed in Nigeria?

A second example is the introduction of the Training and Visit (T&V) in Nigeria as an extension system, instead of a strategy by the World Bank. This resulted in the inefficient use of available resources, thus exposing the country to the dangers of giving priority to extension structures over functions and of neglecting to identify how extension interacts with other services within a particular social context. Knowledge is, thus as defined by the fund provider.

On the contrary an agricultural extension system is a service with the following characteristics:

- A legal or legislated framework for operation
- continuous direct link to a source of critical mass of new agricultural technology
- continuous direct link with training institution
- a dedicated source of critical funding

- capacity for procuring, processing and adapting agricultural technology
- capability for disseminating agricultural technology directly to farmers
- Identifiable organizational structure
- Separate field extension staff

An agricultural extension strategy usually will fall short of one or more of the above characteristics and is designed to serve as an interim measure to correct specific deficiencies in an existing extension system. Examples of extension strategies in Nigeria include the T&V, SPFS, Fadama II, and Sasakawa Global 2000.

Nigeria, based on the above, has no true agricultural extension system. What may approximate to an extension system as currently practiced in Nigeria are:

- the university agricultural extension outfit that lacks a dedicated source of funding;
- the ADP, that has no legal framework for operating, has no direct link to training institutions and lacks a dedicated source of funding; and
- few specialized extension systems in research institutes and non-governmental organizations such as oil companies that develop their technology through research, have their own field

staff, and have capability for training in the specialized area.

These ideas from outside tend to stall the evolving capability of indigenous knowledge and through that process make the country more dependent on “manna” from abroad.

2.2. Findings from the Review of Extension Practice in Nigeria

a. Lack of data about the farmer and the farm

The first step in establishing an agricultural extension service is to gather information on the existing situation. Such information include:

- the demography of the farming population and the changes over time;
- the importance of different information sources to different categories of farmers;
- the purposes for which they are used and types of information that are failing to reach farmers.

An example of lack of data about the farmer and the farm may be appreciated in the discussion I had recently with a commissioner for agriculture in one of the states in Nigeria. The State Commissioner for Agriculture in reaction to my question on the state agricultural programmes, gladly informed me that the government is

massively importing tractors to boost food production. I asked how the tractors will be put to use. He replied "they will be distributed four per local government area." I enquired further on why four tractors per local government area? He gave me a hard look and replied "they had none before." Furthermore I asked him if he knew the number of farmers or tractorable lands per town or community or per local government area in the state that needed these tractors. The Commissioner replied "the Federal government is also importing tractors to boost food production". With that last defence, I ended the topic sorrowfully. Do not ask about the farming experience or academic qualification of the Honourable Commissioner. I am not aware that there is a plan or policy that specifies the farming background or academic qualification of a commissioner for a very technical area like agriculture in Nigeria.

b. Existence of poor coordination and linkage mechanisms

Another emerging issue from the review is the existence of poor coordination and linkage mechanisms. The links between the key players in extension are weak and uncoordinated. Such links include those between extension, research and education and between various extension suppliers. Some pertinent questions are:

- why is there a weak link between the ministry of agriculture and her extension outfit with educational institutions in the country?

- how has this weak linkage affected the development of agricultural extension and indeed agricultural development in Nigeria?;
- how can the public and private (commercial and non-profit) sectors work together in the provision of extension services?; and
- can client-orientation be improved through improving users' access to extension decision-making or supporting user-controlled funds?

c. Poor financial base and donor dependence

The review reveals the existence of poor financial base for agricultural extension work in Nigeria. Little effort has been made in putting extension on a more sustainable financial footing. Under the ministry of agriculture, extension which is expected to be the main function of the ministry has little or no budgetary provisions. Reliance on international agencies has proven to be unsustainable any-time funding is withdrawn.

Donors rarely support the recurrent costs of large public extension systems. They therefore adopt extension strategies and seek to target particular sections of the population (for example by supporting NGO efforts in neglected regions) and/or financing innovative delivery systems (with a view of replication in other areas) such as wide use of information technology to facilitate wide, cost-effective coverage thus reducing the costs of face-

to-face extension, working with existing groups, utilising existing gathering places, training farmers as extension paraprofessionals, tying extension message to input sales, and building capacity of organisation members to increase their involvement in extension.

d. Weak policy-making capacity within government

The ministry of agriculture it appears is not interested in developing a strong policy on extension. The existing national policy on agriculture mentions the role of extension in each aspect of agriculture, but fails to state how extension will be organised to perform such roles. There exists a weak extension policy making capacity within the ministry. This weak capacity has failed to provide support for restructuring the public extension systems. There is need for governments to develop strategies for the evolution of extension systems based on synergy among sectors, and concentrate more on policy formulation and analysis.

e. Client participation in groups

The review showed that the need to develop farmers' groups and farmers' organizations to complement individual extension is not appreciated and pursued. Group extension is becoming more popular. Extension has become more needs-driven and the range of mechanisms for extension provision has widened in the

face of divergent interests. The basic idea is that farmers should have a voice. This is more readily achieved when farmers are well-educated, organised and politically astute.

Through external interventions, farmers are increasingly gaining responsibility for organising, financing and controlling extension in Nigeria. The growth of farmer-controlled group extension is an example of this trend. This has led to increased efficiency, quality and client orientation. This trend should be continued and from my field experience, it is a long term process that requires strong political will on the part of government and farmers.

f. Fear of loss of autonomy and insecurity

What further emerged from the review was that the ministry had fear of losing its autonomy and insecurity if changes were introduced. The ministry of agriculture is structured along technical subject matter lines, and coupled with entrenched interests. These make change contentious and difficult to broker. The fear is that public sector reform can mean loss of state authority and control, and public sector norms exhibit significant inertia in the reform process. Focusing more attention on farmer's problems and shifting more responsibility for extension to them will help break the technical barriers and interest. However, shifting more responsibility to farmers for obtaining advisory services will be easier in those situations where farmers already have existing

organisations or the potential for readily attaining a certain level of organisational competence. Unfortunately, this is not always the case in Nigeria. Similarly, public sector agricultural extension organisations resist change.

g. Privatization and payment of beneficiary contribution

Finally, the review showed that farmers are paying a small percentage as contribution to extension service they use under what seems a privatized extension service. Efforts at privatisation or commercialisation need to take account of both the private and the public good, (Madukwe and Erie, 1999). Private interests should be paid for by the individual who benefits,(Ozor and Madukwe, 2001; 2005). The basic idea is that farmers should at least make a token payment and that this will vary according to whether a service is a public or private good. Fees need to take account of a farmer's willingness to pay (Ozor, Agwu, Chukwuone, Madukwe and Garforth ,2007*).* The administration of beneficiary contribution in Nigeria has been targeted at farmers who are members of formally and legally registered groups.

Mr. Chairman, the summary of the observations is that the parts of a system have been treated as a whole and the parts that make up the whole are poorly understood and appreciated. Public sector extension services which are criticised for being inefficient and out of touch with the needs of their clients and wider society are major

reform agenda in many countries (Rivera and Gustafson, 1991; Rivera, 1996; Carney, 1998, Madukwe and Ozor, 2004). Over the past 10 years, debates in agricultural extension have focused on:

i. the relevance, impact, coverage and financial sustainability of large, state extension systems;

ii. finding ways to improve the linkages between extension and research;

iii. the relative roles of extension professionals, paraprofessionals and farmers as providers of agricultural information;

iv. rethinking on the underlying objectives of external intervention in rural areas in terms of increased production, empowerment, environmental protection, poverty alleviation; and

v. the scope for cost recovery and fully private extension provision.

These criticism and debates arose because extension abandoned the very essence for which it came into existence, which is to transfer innovation in agriculture and related areas to farmers without any form of discrimination (e.g. race and creed).

The concept of extension as a system designed to introduce innovation, and as an innovation system is examined in the next section using the systems of

innovation approach. The characteristics and capabilities of the parts or the stakeholders, how the parts acquire and use knowledge and interact provide a basis for understanding an extension system and the policy issues that should drive the system.

The concept of innovation and dissemination of innovation originated from the practice of agricultural extension. The success of extension and the emerging theories of diffusion of innovation attracted the attention of those in commerce and industry who have helped to expand the concept and application for wider use.

3.0 Section Two

3.1 Application of Innovation System to Analyzing the Nigerian Agricultural Extension Service

Mr. Chairman, in this section I will employ the concept of innovation system as a paradigm to analyse the agricultural extension environment in Nigeria. The paradigm assumes that there are key actors central in agricultural extension practice. The paradigm assumes also that identifying and examining the actors in agricultural extension will provide the needed data for an appropriate policy and practice.

a. **Definition of concepts**

I. Innovation

The concept of innovation is the search for development, adaptation, imitation and adoption of technologies that are new to a specific context, (Hall and Dijkman 2006). It is a process that involves continuous interaction amoug suppliers, clients, universities, productivity centres, standard selling bodies, banks and other critical system and economic actors. There must be continuous learning for innovation to take place and the opportunities to learn depend on the degree and type of interactions among the different enterprises, organizations and related sectors, as well as institutional behaviours, which determine the extent and rate at which information and knowledge, are produced, transferred and utilized, (CTA, 2005). Innovation therefore is not solely the product of organised research and development activities undertaken within universities and agricultural research and development institutes (World Bank, 2004). It is the enabling environment that encourages continuous learning, creativity and knowledge flow which facilitate innovation for socio-economic development. Innovation is not an individual act of learning. It is situated within a larger system that enables, and draws on the innovation process. Innovation in agriculture is therefore defined as the process by which farmers and farms accept and use agricultural technologies and services that are new to them, irrespective of whether they are new to their competitors.

II. **Innovation system**

The innovation system concept on the other hand embraces the totality and interaction of actors involved in innovation. It goes beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in useful ways. An innovation system is therefore a network of organizations within an economic system that are directly involved in the creation, diffusion and use of scientific and technological knowledge, as well as the organizations responsible for the coordination and support of these processes.

An innovation system refers to both the nature of the institutions that make up the system as well as to the linkages and flows that connect them to one another. The incentives to innovate vary on the basis of individual endowments of wealth, income, or capacity and collective endowments of a similar nature. The concept recognizes that innovations emerge from systems of actors (Hall, Sulaiman, Clark, Sivamohan and Yoganand, 2002; Clark, Hall, Sulaiman, and Naik, 2003). In our specific context these actors include farmers, agro-processors, marketers, researchers, universities, the ministries of agriculture, science and technology, environment and education, the PCU, ADP, state and local governments and others. These systems are embedded in an institutional context that determines how individual actors behave, and interact with other

elements in the system. Processes and systems invariably evolve and change because the actors involved in innovation learn along the way and modify their behaviour accordingly.

III. Agricultural extension innovation system

Innovation system's concept though relatively new to agricultural policy makers and agricultural research managers in developing countries is increasingly suggested as a way to strengthen agricultural innovation capacity (Hall, Sivamohan, Clarks, Taylor, and Bockel, 2001; Hall, Mytelka, and Oyeyinka, 2004). While innovation is a multi-stakeholder process that cannot be achieved by one group of stakeholders, the reconfiguration of agricultural research and extension in African countries means that positive outcomes are now particularly dependent in the role that farmers play in innovation system, (Wennick and Heemskert, 2006). At the farmers level, social networks and the changes that occur within them, have emerged as a crucial element in defining the nature of that role and delineate the context for success or failure of innovation. As the innovation processes unfold, the type of information shared changes. This type of information includes the constraints likely to be faced before and after adopting innovations and the types of benefits that farmers would expect to get after adoption.

There are changes in agricultural development which call for innovation in the agricultural sector (Barghouti,

Kane, Sorby and Ali, 2004). There is a shift to strategies that enhance agricultural production; secondly, the production, trade and consumption environment for agriculture and agricultural products are increasingly dynamic and evolving in unpredictable ways. If stakeholders (farmers and companies) are to cope, compete and survive in contemporary agriculture, they need to innovate continuously.

Knowledge information and technology are increasingly generated, diffused and applied through the private sector. Innovative businesses develop and supply a substantial number of the technologies that farmers use (examples include seed, fertilizer, pesticides and machinery). Exponential growth in information and communication technology (ICT), especially the internet, has transformed the ability to take advantage of knowledge developed in other places for other purposes. The knowledge structure of the agricultural sector in many countries is changing markedly. Greater numbers of experienced and educated people in the farm community, the private sector and in non governmental organizations (NGOs) now interact to generate new ideas or develop responses to changing conditions.

Agricultural research projects are experiencing a shift away from centralized biophysical technology led top down approaches towards more decentralized participatory approaches, which are flexible and interactive. Agricultural research is becoming more

concerned with reaching resource poor farmers and other stakeholders, and building their capacity to adopt to changing conditions. An important component of any innovation process is therefore to demonstrate the extent to which it creates positive impacts to the livelihood of poor people or result in improving the performance and effectiveness of agricultural research and development organizations.

The innovation system approach is a useful tool in studying agricultural extension innovations. The reality of agricultural extension innovation is that it involves a diverse set of actors with different sets of functions. Every function is important, and actors or stakeholders need to collaborate in order to achieve innovation. A major change in the way agricultural technology is generated viewed and supported by different actors is to put the concept of innovation system central in the administration of agricultural extension. It shifts attention away from agricultural technology, to the whole process of extension system in which research is only one element. The innovation system is applicable to all areas of human endeavour where knowledge is generated and used for the welfare of humanity, (e.g health, education, engineering, e.t.c). The system is also applicable to different agencies operating within each of the human endeavours, different geo-political areas, (local, state, and federal government), and to specific crop , livestock or product.

b. Factors for analysing the extension innovation system

Three issues are presented briefly to highlight some of the key actors in the agricultural extension innovation system in Nigeria. A few of our studies of some of the issues are mentioned.

I. Identify the key actors in the agricultural extension innovation system

One of the relevant factors in using the innovation system is to identify and analyse the key actors or stakeholders. Any of the following may be key actors in the extension system:

- farms – small, medium and large;
- input providers and services (such as seed or feed, agro-chemicals, machinery/ equipment, transport, credit, insurance);
- agro-processing enterprises (small, medium or large);
- marketers, markets and consumers; wholesalers, retailers, super-markets, commodity boards;
- policy makers and legislators; organizations that influence policy and provide resources.
- agencies- ministries of agriculture, science & technology, education, industry and trade, finance and regulatory agencies(IP, ISO);
- research organizations (national, regional, international whether public, quasi governmental, private);

- training institutions- universities and other institutions of higher learning;
- extension service- organizations that provide information and agro-technology transfer services;
- farmers- farmers' associations, cooperatives or other non-governmental organizations (public, private, quasi-governmental) that facilitate networking;
- financial providers and business institutions- outfits that provide business services such as feasibility studies and business plans and help in the development of marketing strategy; and

II. Identify and map the linkages that exist between the actors in the extension system

Linkages that exist or should exist among actors in extension must be identified and analysed. Linking technology users to technology developers, and agro-production to consumption is the key to enhancement of innovation process and partnership. Partnerships are characterized by sharing of roles, resulting in increased synergy in technology development and dissemination. Identifying all the relevant actors who make up the innovation system and mapping their relationships in specific sub-sectors is an important step in the diagnostic process since it helps to identify the actors who are involved in continuous innovation, (CTA, 2005). In agricultural extension, some of the major actors and the expected linkages are presented in Figure 1

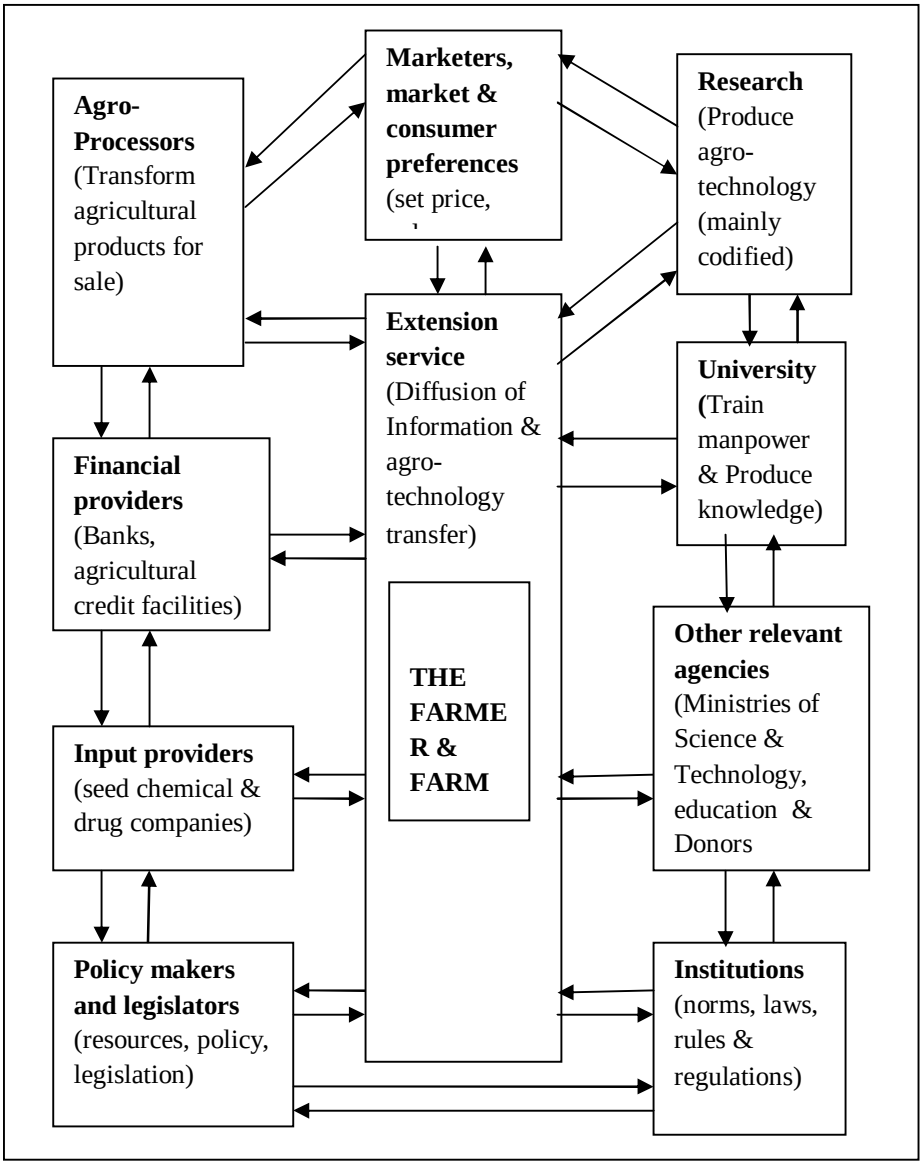

Fig. 1: A framework for analyzing the agriculture extension innovation system

Figure 1 positions the farmer and the farm as the nucleus and the main focus of an agricultural extension innovation and by implication the agricultural extension policy. The farmer and the farm are embedded, shielded and surrounded by the national extension service. The two actors in an innovation system are directly linked and interact with other actors as well as all the actors having direct interaction with each other. The implication is that each actor is not restricted to activities within its primary domain. Each actor depending on available capability can perform some functions in another actor's primary domain. For example, farmers can and usually generate agricultural technology. Researchers and universities transferring agricultural technology to farmers can also generate agricultural technology.

Beyond this, the agricultural extension innovation system demands that for a researcher to develop a particular agricultural technology, a good understanding and linkage with all the actors with responsibility or interest (expressed or not) in the technology should be secured.

III. Identify and analyze the technological capability of actors in the agricultural extension innovation system

Technological capability is the knowledge required to master new technologies, adapt, adopt, improve, and

diffuse them. They are important in creating, and sustaining competitiveness in actors within the extension innovation system. Technological capability is acquired through learning. The individuals within the actors or agency as well as the agency learn. Generally, technological capability has seven components. These include: **i**nvestment; production; minor and major change; linkage; marketing; and learning capabilities. The learning capability spans through the other six technological capabilities. When the actors in an innovation system learn over time they accumulate technological knowledge and progressively undertake new activities and acquire capabilities. (Oyeyinka, 2003) Technological capabilities of clients or end users are the final impact of the agricultural extension innovation system. They are measures of the degree to which the extension innovation system is successful and provide useful information for policy making and policy revision.

c. Analysis of selected actors

An examination of the activities of three key actors, namely universities, agro-technology transfer agencies, and agro-processors in the Nigerian extension innovation system is necessary to understand why we are implementing an unplanned extension service or implementing an extension service that is designed to fail.

i. Universities in extension innovation system

There is no formal linkage existing between universities and agricultural research institutes and extension agencies. There are three primary roles of the university in the agricultural extension innovation system. They are:

1. To train manpower (agricultural researchers, extension personnel, policy makers, farmer, and other actors in the extension innovation system);
2. Research to generate agricultural technology; and
3. Transfer technology directly to farmers.

To train a researcher, an extension staff, and a farmer demands that universities must understand the activities of these groups of actors and have strong linkage with them. Public universities in Nigeria are under the Ministry of Education, while the agricultural research institutes are under a different ministry. In practice there is no formal linkage existing between the universities and agricultural research institutes. What exists is antagonism. Similarly, there are no provisions for any linkages between the Ministry of Agriculture (federal and state) with universities. The study of the linkages between the ADP, an arm of the Ministry of Agriculture and the universities in Nigeria reported limited linkage and interactions (Madukwe and Eze, 1999; Uzoegbunam and Madukwe, 2005) The ministry of agriculture that is the main recipient of the agricultural graduates of

universities makes no input and has no commitment towards the production of these products.

Elsewhere, all successful agricultural extension systems are very strongly linked to the university system by law. I am not aware of any policy that provides for a formal linkage between universities and farmers. Consequently, formal training of agro-technology generators and extensionist largely adopts the top-down, ivory tower approach.

The research practice in generating "agro-technology" followed the ivory tower classical linear model and has helped to sustain the atomistic and narrow approach in meeting the needs of the farmer. Following this model, persons and institutions generating agro-technology do not base their inspiration for research at solving the real practical problems faced by the farm and farmers. Agricultural researchers in Nigerian universities spend available time and money generating agro-technologies that do not address the problems of farmers. Nigerian universities develop new breed of livestock or new method of feeding livestock or new variety of crop or new husbandry practice without reference to the capability of the farmer who will use the "new technology" or the farm condition under which the agro-technology will be applied or the market for the product. The practice exists partly due to the weak or absence of an agricultural extension policy necessary to highlight the areas of research focus in agro-technology

generation. In practice what we have is a situation where those who could be termed professors following the ivory tower perspective are ignorant of those who will use the technology they are labouring to develop. The result is that most of the emerging agro-technologies fail to be accepted, and those who produced them (researchers) could at best be described as "dumb professors", professing ignorance and poverty. These dumb professors not only confuse and frustrate the farmer and the extension system but pose the biggest threat to agricultural development in Nigeria.
I will not spend time analyzing the capability and incentives that exist within the universities to enable them perform her primary function within the system, because the poor capability and incentives are well known.

Another function of the university which is a primary function in successful extension systems but which for now appears at best secondary in Nigeria, is the direct involvement of universities in technology transfer to farmers. A few first generation universities (Ahmadu Bello university, University of Ibadan, University of Nigeria, and Obafemi Awolowo University) that ventured into this function did not make much progress as there was no policy to sustain their initiative.

No country in the world has achieved economic growth without developing science and technology capacity in agricultural research and training. This requires vibrant,

dynamic agricultural higher education system that is linked to the private sector, the national agricultural research institutions, the international agricultural research centres, and to higher educational institutions in other countries. Faculty and staff are better able to identify science and technology needs that are relevant to their own country's context by improving linkages. Linkages will have to be developed broadly, including linking ministries of education (educational policies) to ministries of agriculture, finance, health and international agencies. (Madukwe, 2008) To achieve this, students and professors would actually have to work with real farmers on real problems of the rural landscape, and disseminate their results back to farmers. Faculty will have to be re-tooled and re-trained and administrators will have to recognize the need to expand their mandates and curricula. Further studies are needed to understand why and how Nigerian universities innovate in agriculture and agricultural extension, existing technological capabilities, and those capabilities that need to be developed.

ii. Technology transfer agencies in extension innovation system

Our analysis reveals that the roles of agricultural transfer agencies are not properly defined. As a result the country is witnessing the involvement of increasing number of public and private agencies in extension work in Nigeria, in the effort to fill existing gaps, (Ozor and Madukwe,

2001). In the public domain the ADP stands out as the largest extension outfit, covering the whole geographical areas of the country. There are more linkage mechanisms between the ADP and research institutions. They include monthly technology review meeting, joint field visit of subject matter specialist team to farmers, forthnightly training meetings and demonstration plots. There are limited ADP linkages with universities and the local government councils (Madukwe, 1994; Madukwe and Eze,1999).

In terms of capabilities, the majority of field extension staff has general training in agriculture with sub-degree qualification such as the Ordinary National Diploma (OND) and Higher National Diploma (HND) as their highest academic qualification. More recently, holders of the bachelors degree have been recruited as extension agents. However, most of the degree holders have no training even in agriculture. Their appointments were not based on appropriate qualification but on political consideration. Apart from the extension agents, most of the personnel occupying top administrative positions in public extension outfits have little or no training in agricultural extension principles and policies. In some cases they have no training in agricultural fields whatsoever. A good university degree in agricultural extension with a strong technological and farming background should be the only acceptable qualification for doing extension work in Nigeria. There should not be

a substitute for a qualification in agricultural extension, no matter how the candidate is technologically qualified.

A critical issue that has afflicted agricultural extension practice since independence is the poor conditions of service of extension workers. Staff turnover has remained high in some states and those staying behind have tried to survive economically by doing anything except agricultural extension. Table 1 presents the number of extension agents on ground as against the expected number based on ADP demarcations.

Table 1: Number of extension agents in selected states in Nigeria as at Febuary 2008

State ADP	Capacity	Number on ground	% on ground
Bauchi	350	225	64
Jigawa	376	360	96
Kaduna	530	269	51
Kwara	170	89	52
Lagos	128	66	52
Niger	297	285	96
Ogun	158	135	85
Oyo	172	60	35
Plateau	63	57	90
Taraba	260	164	63
Yobe	453	323	71
Ebonyi	109	45	41
Enugu	190	40	21
Bornu	500	383	76
Edo	144	48	33

In Enugu state for example, with a capacity for 192 extension agents only 40 representing 21% are with the agency. In Edo state, out of a capacity of 144 only 48 are on ground. Salaries and allowances are low compared to the job input and jobs elsewhere. Transport allowances are perpetually in arrears and the system has no career structure for staff who are mainly unscheduled. Though, through our studies we have little understanding of some of the habits and preferences of the lower category of extension staff, a lot more needs to be done for us to have a clearer picture of the technological capabilities of the administrators of the extension service.

iii. **Agro-Processors**

Our recent studies reveal that most of the agro-processors are not aware of the importance of some relevant linkages. Processors are key players in the agricultural extension innovation system.

A study of the learning and linkage capabilities in the baking industry in south-eastern Nigeria examined bakeries in Onitsha, Owerri, Aba and Nsukka. The study revealed that learning and training in the bakeries were generally non-formal. Linkages existed between the bakeries and raw material suppliers, local equipment fabricators, National Agency for Food and Drug Administration (NAFDAC) through which they received some assistance. Assistance from equipment suppliers in training workers and repairing equipment was more strategic. The bakeries were not aware of any technology

transfer agency that could be of help to them. Emerging from this is the weak linkage between the bakeries and technology transfer agencies (public or private). This has implication for the operational structure of the bakeries in terms of the attitude towards learning which is necessary for the bakeries to remain competitive. The finding also points to the need to put in place a planned system of transferring relevant technology to the bakeries either through improving on existing practice or making a policy to introduce a new system, (Enwere and Madukwe, 2001).

A similar study on the investment capabilities in the baking industries in South-east Nigeria found that investment capabilities existed in equipment procurement and packaging with very little on training (Enwere and Madukwe, 2004). Studies on different components of technological capabilities of agro-processors have been reported.(see, Enwere and Madukwe, 2000 a & b; 2001; 2002 a,& b; 2003; and 2004).

4.0 Section Three

Mr. Chairman, this third and last section will briefly deal on the relevance of a legal base for agricultural extension policy and practice in Nigeria.

4.1 Legal Base for Agricultural Extension Policy and Practice in Nigeria

Emerging from the analysis above is a list of all the actors relevant for agricultural extension to function effectively. These actors left alone pursue the primary mandate of the acts or initiative that established them. The analysis also provides information on the existing or non-existing linkages among the actors and the capabilities and internal functioning of each actor. Armed with these information rules are made regarding the functions of each actor in the system, the expected level and type of linkages. The rules take into consideration the acts, initiatives and intensions establishing or propelling the different actors.

There are many agencies involved in agricultural extension service in Nigeria each with its own objectives and approach. Some of the approaches fall short of the basic principles and philosophy of extension and may have negative effect on the long run. The need for an agricultural extension policy is predicated on the fact that such uncoordinated efforts cannot lead to sustainable agricultural extension practice. Considering the role of agriculture as the engine of economic development and the sensitive nature of agricultural extension, such rules are enacted as an act of legislation. This is necessary to shield extension from the vagaries of political and national development. Nigeria after many decades of agricultural extension practice has no legal framework

for her extension activities (Madukwe & Anyanwu, 2000). The lack of a legal base has resulted in the Nigerian extension service taking all kinds of pills mostly from abroad in the hope that they will bring relief. The legal framework will specify the minimum condition for agricultural extension practice in the country. The condition will define:

- how and why actors will participate in the extension system, and the method of entry and withdrawal of actors;
- primary function of each actor;
- who should be the clients;
- the administrative location of national and state extension services;
- funding arrangement;
- extension content and methods;
- linkage patterns; and
- staff capability, qualification, training, discipline and welfare

The United States of America for instance, has enabling legislations that strengthen her extension practice and policies. The following is the key pieces of enabling legislation at the federal level that shaped the United States of Americas' extension service (one of the world's

oldest extension services and represents the pattern of most of the other countries that followed later):

- The Morrill Act of 1862 made provision for the establishment of at least one college in each state to teach such branches related to agriculture and the mechanic arts without excluding other scientific or classical studies. The Land Grant University system is the largest educational delivery system in the world. The Cooperative Extension is a key component of the Land Grant. This act provided a strong linkage between universities and agricultural extension
- The Hatch Act of 1887 made provision for the establishment of an Agricultural Experiment Stations in one Land Grant College in each state. This act established agricultural research as a recognized function of the Land Grant Universities. This act provided a strong linkage between universities, agricultural extension, and agricultural research.
- Farmers' Institutes became one of the primary means of disseminating research findings of the experiment stations to the general audiences. Agriculture and home economics teaching staff served as institute resource persons.
- The 4H club (1911) emphasized youth training in agricultural occupations such as gardening, landscaping and livestock production

- The Smith-Lever Act of 1914 made provision for colleges to provide extension work in mutual cooperation with the U.S. Department of Agriculture and land grant colleges in conducting agricultural extension work; it specified that the work...."shall consist of instruction and practical demonstration in agriculture and home economics to persons not attending or resident in said colleges in the several communities, and imparting to such persons information on said subjects through field demonstrations, publications and other wise...." This act is the single most important piece of legislation in the US extension service.
- During World War I extension stressed food production, preservation and clothing conservation projects.
- During the Farm Depression of the 1920's emphasis changed from production to quality of rural life, specifically economic concerns and farm efficiency.
- During the Great Depression and post depression era extension played different roles such as state and national public affairs; soil conservation service, and rural electrification program. Today extension is the single U.S Federal agency having a direct educational link with rural people in that country.

Four major lessons are derivable from the presentation above:

- The extension practice is based on principle and legislation that provided the base and guideline for extension activities;
- Agricultural extension service, training and research are located in one place (the university);
- Recognition of the special groups notably youth, women and other vulnerable and marginalized groups; and
- It is the people served who are important. As their needs continue to change, cooperative extension's role kept changing to meet them.

Many countries of the world have legislation for agricultural extension. A few include: Japan, (1948); Thailand, (1956); Korea, (1962); Zimbabwe, (1981); Germany, (revised 1990); Vietnam, (1993); Bangladesh, (1996); Australia, (revised 1998) ; Kenya, (2001)

5.0 Concluding Remarks

Nigerian agriculture needs today more than ever, high quality extension services to serve the increasing needs of a new set of specialized clients. Through out history and the world over the primary concern of agricultural extension is to serve the needs of farmers in areas of production, processing, storage, marketing, health, education, and leadership. To achieve this, policies are

usually put in place to ensure that extension practices are targeted at meeting the real needs of farmers following some guiding principles. In articulating and legislating an agricultural extension policy for Nigeria, I recommend as follows:

1. An agricultural extension board should be created within the National Food Reserve Agency (NFRA) of the Federal Ministry of Agriculture. Membership of the board will come from the actors in the extension innovation system;

2. The Agricultural Development Programme (ADP) should be responsible for field agricultural extension activities;

3. One university in each state should be designated to coordinate agricultural extension and agricultural research within the state; and

4. Staff of ADP should be made part of the university in the state. This will shield extension staff from civil service bureaucracy and reduce politicization of extension activities. Making extension agents' part of the university system enhances their knowledge credibility and image as has been experienced elsewhere. A national scheme of service modelled along that of federal universities should be developed and adopted. The policy should provide that staff salaries should be paid from a consolidated account to which the federal, state and local government must contribute.

The role of governments should be to facilitate the development of an agricultural extension policy to guide practice in the field.

5.1. Key actors in my innovation system

Mr. Chairman, a professor is like a cooked food ready to serve the hungry. The process of having cooked food involves many activities and actors. The starting point may well be with soil preparation, planting and husbanding the plant, harvesting, using the plant to feed and husband animals, processing the plant and animal products, and cooking to produce food. In all these process human beings and cost are involved.

Mr. Chairman, permit me to mention those who served as key actors in getting me to this stage of giving an inaugural lecture. My gratitude goes to my parents Mr. Edwin E. Madukwe and Mrs. Alice I Madukwe (late) for the early guidance and support. They provided financial and moral support for my education up to the Ph.D level. Let me recall as I give this inaugural that my father used part of his gratuity to buy and present to me a gift of a Peugeot 504 Station Wagon when I completed my M.Sc examinations. My mother followed suit with a refrigerator, all in support and appreciation for education. My teacher and supervisor at the Masters degree, Prof C.T. Uwakah, I thank you. My teacher and supervisor at the Masters degree and Doctorate degree,

Prof. Lawrence. O. Obibuaku I thank you for the excellent mentoring and you insistence that I take a job with the Department. Dr. Edith Uzoma Madukwe, my wife, I respect and thank you for editing all my academic publications.

I cannot forget staff of the Department of Agricultural Extension, one of the most peaceful departments in the University of Nigeria for providing a conducive environment for academic work. In particular I place on record the wonderful academic support I received from Prof. Adebayo A. Ajala (late), Prof. Alphonsus C.Anyanwu, Prof. A R. Ajayi, Prof. E. M. Igbokwe, Dr. E. A. Onwubuya, Dr. A. E. Agwu, Dr. M. Dimelu, Dr. N Ozor, Mrs. J.C. Iwuchukwu and Mr. O. Akinnagbe. I thank my undergraduate and postgraduate students for allowing me to learn from them. Thanks to the Faculty of Agriculture for making me.

Prof. I. C. Obizoba, and Prof. J. Adichie were the first to explain to me that to teach in the university is to research and publish. I salute the two of you. Prof. C.A. Igwe gave me pressure and encouragement to research and publish more, I remember you. Dr. P. N. Uzoegwu provided the financial backing for some of my initial publications. Sir, I remember and thank you.

Mr. Chairman, I will not fail to mention actors who made it possible for me to come to good terms with the workings in the universities, and how to make positive progress in a university. They include Prof. D.O

Onyejekwe, Prof. S.O. Onyegegbu, Prof. M. Ikejian-Clark, Prof. S.O. Ikwelie, Mr. V.C. Egbuonu, and Barrister. G. Onyeozili.

Mr. Chairman, Dr. Osita Ogbu was the Executive Director of the African technology Policy Studies (ATPS) based in Nairobi. I am very grateful to Dr. Osita Ogbu for giving me national and international exposure and visibility in science and technology policy research and advocacy. Mr. Chairman, I am particularly grateful to the Senior Staff Club of the University of Nigeria, Nsukka. The Club did not only preserve my brain but helped to shape my academic thoughts and actions. Similarly, I thank the Elite International Club of Nigeria for accepting me.

Mr. Chairman, I am aware that in some universities practices and policy exist for presenting of inaugural lectures. In some universities candidates are required to give their inaugurals before they are appointed professors. Some universities insist that inaugurals must be given within one year of appointment as a professor. What exist in our university is practice without policy in the presentation of inaugural lectures in terms of when to present, when not to present and the content. I thank Prof .Obi Njoku, the Chairman of Senate Ceremonials Committee for changing the inaugural landscape of the university and for pressuring me to give an inaugural.

I thank you all for listening.

6.0 References

Ayichi, O. and M. C. Madukwe (1996) A comparative analysis of production efficiency of contact and non contact farmers in Nigeria. *Journal of Agriculture, Technology and Education,* Vol. 1 (2), pp. 40-45.

Barghouti, S. Kane, K. Sorby and M. Ali (2004). Agricultural diversification for the poor: Guidelines for practitioners. Agriculture and Rural Development Discussion paper World Bank, Washington, DC.

Carney, D. (1998) *Changing public and private roles in agricultural service provision*. London: ODI.

Clark, N.G, A.J. Hall, R. Sulaiman, and G. Naik (2003). Research as capacity building: The case of an NGO facilitated post-harvest innovation system for the Himalayan Hills. *World Development* 31(11) pp 1845-1863.

CTA (2005). Methodological Framework Analyzing the Agricultural Science Technology and Innovation (ASTI) Systems in ACP Countries CTA/UNU-

INTECH/KIT.pp10

Enwere N.J. and M.C. Madukwe (2000a). A study of the production capabilities of small-scale soymilk enterprises in Nsukka urban, Nigeria, *J. Agro-technology and Extension*, Vol. 1 pp 10-18.

Enwere N.J. and M. C. Madukwe (2000b). Extension implications of training, learning, and experience of workers in the baking industry in south-eastern Nigeria, *Nigerian J Agribusiness and Rural Development*, Vol.1 (2) , pp 39-50.

Enwere N.J. and M. C. Madukwe (2001). Private and public sector participation in the development of learning and linkage capabilities of the baking industry in south-eastern Nigeria. Proceedings of the 7th Annual Conference of Agricultural Extension Society of Nigeria, held at Bauchi, pp 42-52.

Enwere, .N.J. and M. C. Madukwe (2002a). Extension implications of learning and linkage capabilities of small-scale soymilk enterprises in Nsukka urban *J. Home Economics Research* Vol. 4, pp 46-56.

Enwere N.J. and M. C. Madukwe. (2003). Quality control and assurance practices in the baking industry in South-eastern Nigeria: Implications for policy, *J. Science of Agriculture, Food Technology and Environment*, Vol. 3 (1) pp.83-94.

Enwere N.J. and M. C. Madukwe (2004). A study of the investment capabilities of the baking industry in south eastern Nigeria and the changes in the last five years: Implications for technology transfer. *J. Science of Agriculture, Food Technology and Environment,* Vol.4 pp71-80.

Hall, A and J. Dijkman (2006). Capacity development for agricultural biotechnology in developing countries: Concepts, case studies and operational challenges of a systems perspective. N2006-003.United Nations University-Maastricht Economic and Social Research and Training Centre on Innovation and Technology).http://www.merit.unu.edu.

Hall, A.J.; L. Mytelka, and B. Oyeyinka (2004). Innovation systems: Concepts and implications for agricultural research policy and practice. Maastricht: United Nations University.

Hall, A.J., V. R Sulaiman, N.G. Clark, M.V.K. Sivamohan and B. Yoganand (2002). Public-private sector interaction in the systems perspective on installation reform. In: Byerlee, D. and R.G. Echeverrya (eds). *Agricultural Research Policy in an Era of Privatization: Experiences from the Developing World.* CABI, Wallingford.

Hall, A.J; M.V.K. Sivamohan, N. Clarks, S. Taylor, and G. Bockel (2001). Why research partnerships really

matter: Innovation theory, institutional arrangements, and implications for developing new technology for the poor. *World Development* 29(5):783-797.

Isife, B.I. and M. C.Madukwe (1995). An evaluation of the Fortnightly Training Programme in Enugu State Agricultural Development Programme. *Nigerian Journal of Agricultural Teacher Education,* Vol. IV(2) pp 9- 14.

Madukwe, M.C. (1990). An analysis of selected conditions necessary for the effective performance of agricultural extension supervisors in Anambra State, Nigeria. *Bangladesh Journal of Extension Education*. Vol. 5, (1 & 2),pp. 19-26.

Madukwe, M.C. (1992). Effectiveness of extension supervisors in Anambra State of Nigeria. *Nigerian Journal of Agricultural Teacher Education,* Vol. 1(1), pp. 62-72.

Madukwe, M.C.(1993a) Role perceptions of supervisors in functional model agricultural extension system in Anambra State of Nigeria. *Nigerian Journal of Agricultural Teacher Education,* Vol 2,(2) pp. 65-71.

Madukwe, M.C. (1993b). A framework for analyzing the effectiveness of extension supervisors in Anambra State, Nigeria. *Nigerian Journal of Rural Extension*

and Development, Vol. 1, (2 & 3), pp. 19- 27.

Madukwe, M.C. (1993c). Communication process and the effectiveness of agricultural extension supervisors in Nigeria, *Nigerian Journal of Agricultural Extension,* Vol. 8, (1), pp. 18. 25.

Madukwe, M.C. (1994a). Job satisfaction of agricultural extension agents in Nigeria. *Journal of Extension Systems.* Vol 10(2), pp 78- 96.

Madukwe, M.C. (1994b). Linkages among government agencies implementing agricultural extension programmes in Benue State. *Nigerian Journal of Agricultural Teacher Education,* Vol. IV(1), pp. 147- 156.

Madukwe, M.C. (1995), Agricultural extension systems and strategies in Nigeria's rural development. *In Eboh, E.C., Okoye, C.U. and Ayichi, D. (Eds). Rural Development in Nigeria: Concepts, Processes and Prospects,* Enugu: Auto-Century Pub. Co, pp. 265-273.

Madukwe, M .C. (1995). Restructuring field agricultural extension services in Nigeria: Issues and option. *Proceedings 8th Annual Conference of the Nigerian Rural Sociological Association.* Pp. 314-320.

Madukwe, M.C. (1997a). Community factor influencing the performance of contact farmers as

agricultural information disseminators in Enugu State, Nigeria, *The Nigerian Rural Sociologist,* Vol. 1(1), pp 12-16.

Madukwe, M.C. (1997b). Selecting effective contact farmers for agricultural

technology dissemination in Enugu State: A model. Proceedings of the 2nd Annual

Conference of the Agricultural Extension Society of Nigeria.pp.92-97.

Madukwe, M.C. (1999a) Factors affecting co-ordination among goverment agricultural extension agencies in Nigeria. *Journal of Extension Systems,* Vol. 15(1), pp 78-88.

Madukwe, M.C. (1999b). An analysis of the agricultural knowledge system for

transfer of science and technology to farmers in Nigeria. *The Nigerian Rural Sociologist* Vol.3 pp 1-6

Madukwe M.C (2008) Reshaping tertiary education in agriculture.
http://knowledge.cta.int/en/content/view/6402.

Madukwe, M.C. and A. C. Anyanwu (2000) Challenges of the Nigerian agricultural extension in the 21st Century *Agro-Science* Vol 1(1)pp85-90.

Madukwe, M.C and D. Ayichi. (1997). *An assessment of the contact farmer strategy for agricultural technology transfer in Nigeria.* Winrock International Institute for Agricultural Development. Monograph No. 6.

Madukwe,M.C and A. P. Erie (1999) Privatization and commercialization of Extension services in Nigeria: A proposal . *Proceedings to the fifth Annual National Conference of the Agricultural Extension Society of Nigeria* 12-14th April 1999 pp 106-112.

Madukwe, M.C. and S. O. Eze (1999) Comparative analysis of the agro- technology generation and transfer systems of university and agricultural development programme in Nigeria. *Agro-Science* Vol 1(1), pp105-112.

Madukwe, M.C. and Obibuaku, L.O. (1991a).Influence of organizational structure on the effectiveness of agricultural extension supervisors in Anambra State, Nigeria. *Nigerian Development Journal,* Vol. 1,(1) pp. 13-25.

Madukwe, M.C. and L.O Obibuaku (1991b). Effects of personal factors on the effectiveness of extension supervisors. *Nigerian Journal of Agriculural Extension,* Vol. 6, (1 and 2), pp. 34-39.

Obibuaku, L.O. and M. C. Madukwe (1992). Institutional framework for transfer of agricultural technology to resource poor farmers in Nigeria .

Journal of Extension Systems, Vol. 8 (1& 2), pp. 103-113.

Madukwe M.C and N. Ozor (2004) Emerging approaches and strategies in the the delivery of agricultural extension services to farmers. *Journal of Agricultural management and rural development* Vol 1 pp 50-63.

Orogbe, F.N. and M.C. Madukwe (1996). A discriminant analysis model for selecting agricultural extension supervisors in the Enugu State Agricultural Development Programme. *Journal of Agricultural, Technology and Education,* Vol, 1(1), pp. 21 . 24.

Ozor N, A. E. Agwu, N.A. Chukwuone, M.C. Madukwe and C.J. Garforth (2007) Cost-sharing of agricultural technology transfer in Nigeria:perception of farmers and extesion professionals. *Journal of Agricultural Education and Extension* Vol. 13(1), pp. 23-37.

Ozor N and M.C.Madukwe (2001) Extension professional perception of privatization and commercialization of agricultural extension service in Enugu State Agricultural development Programme. *Journal of Agricultural Extension,* Vol. 5, pp67-75.

Ozor N and M.C. Madukwe (2005) Strategies for increased private sector participation in funding agricultural extension service in Nigeria: The professionals reactions in Enugu State. *Journal of*

Agricultural extension, Vol. 8, pp7-15.

Oyeyinka .B.O (2003) Technological capacity of systems of innovation: Concepts and perspectives. Netherlands: United Nations University, Institute of New Technology.

Rivera, W.M. (1996) Agricultural extension in transition worldwide: Structural, financial and managerial strategies for improving agricultural extension. *Public Administration and Development,* Vol.16, pp.151–61.

Rivera, W.M. and Gustafson, D.J. (1991) *Agricultural Extension: Worldwide institutional evolution and forces for change.* Amsterdam: Elsevier.

Uguru, F.N. and Madukwe, M.C. (1997). Selecting agricultural extension agents in Enugu State Agricultural Development Programme: A discriminant analysis model, *Journal of Technology and Education in Nigeria,* Vol. 2, pp. 48-51.

Uzuegbunam C. O & Madukwe M.C (2005) Characteristics of linkages between the agricultural development programmes and universities in South Eastern Nigeria.*Agro-Science,* Vol. 4(1) pp. 5-9.

Wennink, B. and N. Heemskerk (2006). Farmers' organizations and agricultural innovation: Case studies from Benin, Rwanda and Tanzania Bulletin no. 374.

Royal Tropical Institute Amsterdam.

World Bank (2004). Enhancing agricultural innovation: How to go beyond the strengthening of research systems. Washington D.C. World Bank.

Publications of Professor Michael Chukwuneke Madukwe

CHAPTERS IN BOOKS

1 Madukwe, M.C. (1995), Agricultural extension systems and strategies in Nigeria's rural development. In: Eboh, E.C., Okoye, C.U. and Ayichi, D. (Eds). *Rural Development in Nigeria: Concepts, Processes and Prospects.* Enugu: Auto-Century Pub. Co, pp. 265-273.

2 Uwakah, C.T., A. A. Uwaegbute, and M.C. Madukwe, (1991). The role of rural women as farmers in Eastern Nigeria. In: Doss, C.R. and Olson, C. (eds). *Issues in African Rural Development.* U.S.A: Winrock International Institute for Agricultural Development. Pp, 411-.435.

MONOGRAPH

3 Madukwe, M.C and D. Ayichi, (1997). An assessment of the contact farmer

strategy for agricultural technology transfer in Nigeria.U.S.A.: Winrock International Institute for Agricultural Development. Monograph No. 6.

JOURNALS

4. Agwu, A.A. and M. C. Madukwe, (1999) Uruguay round agreement and agricultural extension practise in Nigeria .*Journal of Sustainable Agricultural and the Environmen,* .Vol. 1, pp 101-105.

5. Ajala, A.A. and M.C. Madukwe, (1992). The relevance of plant protection research in Nigeria to farmers' need. *Bangladesh Journal of Training and Development,* Vol. 5, (1), pp. 33-41.

6. Ajala. A.A. and M.C. Madukwe, (1996). Making crop genetics research relevant to farmers needs: The role of the extension service and the farmers. *Journal of Agriculture, Technology and Education* Vol. 1, (1), pp. 67-69.

7. Ajayi, A. R. and M.C. Madukwe, (2000) The potential role of agricultural extension in agro-

biotechnological innovation generation and adoption in developing countries: A case study of Nigeria. *Journal of the Science of Agriculture Food Technology and Environment.* Vol.1, pp. 39-46.

8. Ayichi, D. and M.C. Madukwe, (1996) A comparative analysis of production efficiency of contact and non contact farmers in Nigeria. *Journal of Agriculture, Technology and Education,* Vol. 1, (2), pp. 40.45.

9. Ezeh, P.N. and M.C Madukwe, (1999) Maintenance of home garden agro-forestry system and extension needs in Igbo - Etiti Local Government Area of Enugu State, *Nigeria Journal of Agricultural Extension,* Vol. 3, pp 83-90

10. Enwere N.J. and M.C. Madukwe (2000). A study of the production capabilities of small-scale soymilk enterprises in Nsukka urban, Nigeria, *J. Agro-technology and Extension,* Vol. 1, pp. 10-18.

11. Enwere, N.J. and M.C. Madukwe, (2000). Extension implications of training, learning, and experience of workers in the baking industry in south-eastern Nigeria, *Nigerian J Agribusiness and Rural Development,* Vol.1(2) , pp. 39-50.

12. Enwere, .N.J. and M.C. Madukwe, (2002). Extension implications of learning and linkage capabilities of small-scale soymilk enterprises in Nsukka urban *J. Home Economics Research,* Vol. 4, pp 46-56.

13. Enwere, N.J. and M.C. Madukwe (2002). Socio-economic characteristics of small-scale soymilk enterprises in Nsukka urban, Nigeria. *J. Science of Agriculture, Food Technology and Environment*, Vol. 1, (2), pp. 88- 96.

14. Enwere, N.J. and M.C. Madukwe (2002). An analysis of the strategic marketing capabilities of the baking industry in south-eastern Nigeria, *J Agro-technology and Extension,* Vol. 2, pp. 4-10.

15. Enwere, N.J. and M.C. Madukwe (2002).Extension implications of the social and economic characteristics of human resources in the baking industry in south-eastern Nigeria. *Agroscience,* Vol.(1), pp. 50-60.

16. Enwere, N.J. and M.C. Madukwe (2003). Socio-economic characteristics of bread retailers and consumers in south-eastern Nigeria: Areas of

extension intervention. *J. Home Economics Research,* Vol. 5, (1), pp.74-80.

17. Enwere, N.J. and M.C. Madukwe (2003). Quality control and assurance practices in the baking industry in South-eastern Nigeria: Implications for policy. *J. Science of Agriculture, Food Technology and Environment,* Vol. 3, (1), pp. 83-94.
.
18. Enwere, N.J. and M.C. Madukwe (2004). A study of the investment capabilities of the baking industry in south eastern Nigeria and the changes in the last five years: Implications for technology transfer. *J. Science of Agriculture, Food Technology and Environment,* Vol.4, pp71-80.

19. Enwere, N.J. and M.C. Madukwe (2004). A study of the organizational structure and some management practices of the baking industry in south-eastern Nigeria. *J. Home Economics Research, Vol. 5, pp. 54-59*

20. Enwere, N.J. and M.C. Madukwe (2005). Work force and gender task analysis of the baking industry in south eastern Nigeria: Implications for technology transfer and extension. *J. Science of Agriculture, Food Technology and Environment,* Vol. 5, (1). pp 1-9.

21. Faturoti, B.O, M.C. Madukwe, A. Tenkouano, and A.E. Agwu (2007) A review of policy acts and initiatives in plantain and banana innovation system in Nigeria. *African Journal of Biotechnology* Vol. 6 (20), pp. 2297-2302.http://www.academicjournals.org/AJB

22. Isife, B.I. and M.C. Madukwe, (1995). An evaluation of the Fortnightly Training programme in Enugu State Agricultural Development Programme. *Nigerian Journal of Agricultural Teacher Education,* Vol. IV,(2), pp. 9-14.

23. Madukwe, M.C. (1990). Evaluation of the school to land programme in Anambra State. *Journal of Rural Extension and Development,* Vol. 1, (1), pp. 37-45.

24. Madukwe, M.C. (1990). An analysis of selected conditions necessary for the effective performance of agricultural extension supervisors in Anambra State, Nigeria. *Bangladesh Journal of Extension Education*. Vol. 5, (1 & 2), pp. 19-26.

25. Madukwe, M.C. (1992). Effectiveness of extension supervisors in Anambra State of Nigeria. *Nigerian*

Journal of Agricultural Teacher Education, Vol. 1(1), pp. 62-72.

26. Madukwe, M.C. (1993). A framework for analyzing the effectiveness of extension supervisors in Anambra State, Nigeria. *Nigerian Journal of Rural Extension and Development*, Vol. 1, (2 & 3), pp. 19- 27.

27. Madukwe, M.C. (1993). Communication process and the effectiveness of agricultural extension supervisors in Nigeria. *Nigerian Journal of Agricultural Extension*, Vol. 8,
(1), pp. 18. 25.

28. Madukwe, M.C. (1993) Role perceptions of supervisors in functional model agricultural extension system in Anambra State of Nigeria. *Nigerian Journal of Agricultural Teacher Education*, Vol, 2 (2), pp. 65- 71.

29. Madukwe, M.C. (1994). Job satisfaction of agricultural extension agents in Nigeria. *Journal of Extension Systems.* Vol 10 (2) pp. 78- 96.

30. Madukwe, M.C. (1994). Linkages among government agencies implementing agricultural extension programmes in Benue State. *Nigerian Journal of Agricultural Teacher Education,* Vol. IV,(1), pp. 147- 156.

31. Madukwe, M.C. (1995). Obstacles to the adoption of yam mini-sett technology by small scale farmers of south-eastern Nigeria. *Agrosearch,* Vol. 1,(1), pp. 1-6.

32. Madukwe, M.C. (1996). Factor analysis as a research design in agricultural extension. *Journal of Agricultural, Technology and Education,* Vol. 1,(2), pp. 103-116.

33. Madukwe, M.C. (1997). Community factor influencing the performance of contact farmers as agricultural information disseminators in Enugu State, Nigeria, *The Nigerian Rural Sociologist,* Vol. 1,(1), pp 12-16.

34. Madukwe, M.C. (1997). Categorization of target group as an agricultural extension survival policy: A case study of the yam mini-sett technology in Southeastern Nigeria. *Journal of Agricultural Extension,* Vol. 1, pp 1-8.

35. Madukwe, M.C. (1999) An analysis of the agricultural knowledge system for transfer of science and technology to farmers in Nigeria. *The Nigerian Rural Sociologist,* Vol.3, pp. 1-6.

36. Madukwe, M.C. (1999).Factors affecting co-ordination among government agricultural extension agencies in Nigeria. *Journal of Extension Systems,* Vol. 15,(1), pp.78-88.

37. Madukwe, M.C. (1999). Factors constraining on-the-job training and farm visits of extension agents in Enugu State. *Journal of Education and Vocational Studies,* Vol. 5, (1), pp.1-7.

38. Madukwe, M.C (2008) Reshaping tertiary education in agriculture. *http://knowledge.cta.int/en/content/view/6402*.

39. Madukwe, M.C. and A. C. Anyanwu, (2000) Challenges of the Nigerian agricultural extension in the 21st Century. *Agro-Science,* Vol. 1,(1), pp. 85-90.

40. Madukwe, M.C. and S.O. EZE, (1999) Comparative analysis of the agro-technology generation and transfer systems of university and agricultural development programme in Nigeria. *Agro-Science,* Vol. 1,(1), pp.105-112.

41. Madukwe, M.C. and L.O. Obibuaku, (1991).Influence of organizational structure on the effectiveness of agricultural extension supervisors in Anambra State, Nigeria. *Nigerian Development Journal,*. Vol. 1, (1), pp. 13- 25.

42. Madukwe, M.C. and L.O. Obibuaku, (1991). Effects of personal factors on the effectiveness of extension supervisors. *Nigerian Journal of Agricultural Extension,* Vol. 6, (1 & 2), pp. 34-39.

43. Madukwe, M.C and N. Ozor (2004) Emerging approaches and strategies in the delivery of agricultural extension services to farmers. *Journal of Agricultural Management and Rural Development,* Vol. 1, pp. 50-63.

44. Obibuaku, L.O. and M.C. Madukwe (1992). Institutional framework for transfer of agricultural technology to resource poor farmers in Nigeria .

Journal of Extension Systems, Vol. 8, (1& 2), pp. 103-113.

45. Obiora, C.J. and M.C. Madukwe (2007). The extent of institutional involvement and linkages in watershed management: A case of Enugu State. Nigeria. *Journal of Business Administration and management.* Vol. 2, (4), pp.84-91.

46. Onu, M.O. and M.C. Madukwe. (2002). Adoption levels and information sources of brood and sale poultry operators. *Agro-Science*, Vol. 3, (1), pp.63-67.

47. Onu, M. O, M.C. Madukwe, and A.E. Agwu, (2005). Factors affecting job satisfaction of frontline-line extension workers in Enugu State Agricultural Development programme, Nigeria. *Agro-Science* Vol. 4, (2), pp 19-22.

48. Orogbe, F.N. and M.C. Madukwe, (1996). A discriminant analysis model for selecting agricultural extension supervisors in the Enugu State Agricultural Development Programme. *Journal of Agricultural Technology and Education,* Vol. 1,(1), pp. 21-24.

49. Ozor, N, A. E. Agwu, N.A. Chukwuone, M.C. Madukwe and C.J. Garforth (2007). Cost-sharing of agricultural technology transfer in Nigeria: Perception of farmers and extension professionals. *Journal of Agricultural Education and Extension,* Vol. 13, (1), pp. 23-37.

50. Ozor, N. and M.C. Madukwe (2001). Extension professional perception of privatization and commercialization of agricultural extension services in Enugu State Agricultural development Programme. *Journal of Agricultural Extension* Vol. 5, pp.67-75.

51. Ozor, N. and M.C. Madukwe (2005). Strategies for increased private sector participation in funding agricultural extension service in Nigeria: The professionals reactions in Enugu State. *Journal of Agricultural extension,* Vol. 8, pp. 7-15.

52. Ozor, N. and M.C. Madukwe (2005). Obstacles to the adoption of improved rabbit technologies by small scale farmers in Nsukka Local Government Area of Enugu State. *Agro-Science,* Vol. 4, (1), pp. 70-73.

53. Uguru, F.N. and M.C. Madukwe (1997). Selecting

agricultural extension agents in Enugu State Agricultural Development Programme: A discriminant analysis model. *Journal of Technology and Education in Nigeria,* Vol. 2, pp. 48-51.

54. Uzuegbunam, C. O. & M.C. Madukwe (2005). Characteristics of linkages between the agricultural development programmes and universities in South Eastern Nigeria. *Agro-Science,* Vol. 4 (1), pp. 5-9.

REFERRED CONFERENCE PAPERS.

55. Ajala, A.A. and M.C. Madukwe (1990). Dry season goat feeding in the traditional farming system of South Eastern Nigeria: Implications for research and extension. Conference Proceedings, Nigeria Society for Animal Production, pp. 142-7.

56. Enwere, N.J. and M.C. Madukwe (2000). Identifying the socio-economic characteristics of commercial small-scale soymilk processors for poverty alleviation in urban Nigeria: A case study of Nsukka town. Proceedings of the 6th Annual Conference of Agricultural Extension Society of Nigeria, pp. 41-49.

57. Enwere, N.J. and M.C. Madukwe (2001). Private

and public sector participation in the development of learning and linkage capabilities of the baking industry in south-eastern Nigeria. Proceedings of the 7th Annual Conference of Agricultural Extension Society of Nigeria, pp. 42-52.

58. Enwere, N. J. and M.C. Madukwe (2002) Identification of problems and improvements in the baking industry in south-eastern Nigeria through the participation of five stakeholders: Implications for extension. Proceedings of the 8th Annual Conference of Agricultural Extension Society of Nigeria, pp. 148-161.

59. Isife, B.I. and M.C. Madukwe (1999) Non-governmental organizations and agricultural extension services in Nigeria: Features, activities and policy issues. Proceedings of the Fifth Annual National Conference of the Agricultural Extension society of Nigeria, pp.164-168.

60. Madukwe, M. C. (1995) Issues in Nigeria's agricultural extension services and their training implication for tertiary education institutions. Proceeding of the Inaugural Conference of the Agricultural Extension Society of Nigeria. Pp. 167-172.

61. Madukwe, M .C. (1995). Restructuring field agricultural extension services in Nigeria: Issues and options. Proceedings of 8th Annual Conference of the Nigerian Rural Sociological Association, pp. 314-320.

62. Madukwe, M.C. (1997). Selecting effective contact farmers for agricultural technology dissemination in Enugu State: A model. Proceedings of the 2nd Annual Conference of the Agricultural Extension Society of Nigeria, pp.92-97.

63. Madukwe, M.C. and A.P. Erie (1999) Privatization and commercialization of extension services in Nigeria: A proposal. Proceedings of the Fifth Annual National Conference of the Agricultural Extension Society of Nigeria, pp. 106 - 112.

64. Madukwe, M.C. and I.K. Ndukwo (1999) Linkages between public agricultural extension services and private agricultural input support agencies in Abia State, Nigeria Proceedings of the Fifth Annual National Conference of the Agricultural Extension Society of Nigeria, pp. 158 - 163.

65. Ozor, N. and M. C. Madukwe (2001) Adoption of improved rabbit technologies by farmers in Nsukka L.G.A: Implication for livestock extension. Proceeding of the 6th Annual Conference of Animal Science Association of Nigeria, pp.199-202.

TECHNICAL REPORTS

66. Madukwe, M.C. (1996).Issues in yam minsiett technology transfer to farmers in Southeastern Nigeria. Technical Report. African Technology Policy Studies (ATPS) IDRC, Kenya, pp.44.

67. Madukwe, M.C. (1999).Analysis and comparison of the agricultural technology transfer systems of the Agricultural Development Programme and University in Nigeria. Technical Report African Technology Policy Studies (ATPS). IDRC, Kenya, pp.58.