

Linkage between Gown and Town: My experience in Sub-Saharan Africa and South East Asia

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AN INAUGURAL LECTURE

By

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North West University (Mafikeng Campus), Mmabatho, South Africa

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Linkage between Gown and Town: My experience in Sub-Saharan Africa and South East Asia

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Beloved Students
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Distinguished Guests
Ladies and Gentlemen.

INTRODUCTION

It is my pleasure to stand before this audience today to give an account of my stewardship in the wilderness of scientific research in the field of Agriculture majoring in **Agricultural Extension**. The research journey has been interesting taking me through the road, many times smooth, sometimes tedious, seldom tiring and once-a-while frustrating. I am euphoric because this is ideally a once in a life time event. According to Adeboye (2011) "Imperial's Inaugural Lecture series provides a platform to showcase and celebrate the College's new professors. Each lecture represents a significant milestone in an academic's career, providing official recognition of their promotion to professor, bringing benefits to the lecturer, their Department and Imperial as a whole. For *new professors*, the lecture provides an opportunity to present an overview of their research career so far, update colleagues on current and future research plans, and introduce their research to wider audiences. An Inaugural Lecture, scheduled for about one hour only, represents a significant milestone in any academic's career." Mr Campus Rector Sir, the above illustrates exactly what I will do in the process of delivering this lecture titled **Linkage between Gown and Town: My experience in Sub-Saharan Africa and South East Asia**. I will raise questions that informed all my scientific investigations and subsequently give answers or at best; hypothesize on what I think about the questions. I will also use questions to answer questions being serendipitous, and sometimes I will tell the audience that only God knows! I will mention the details of how each problem were identified and what was done to; subdue the problem. Finally I will make recommendations regarding what I expect from the larger community, as a response to the issues that I will raise so that at the end of this presentation, this entrance into full professorship category, which depicts contribution to knowledge, stimulation of discourse and opening of new realms of thought will be achieved and would not be a mere routine gathering of the academic culture.

Gown in this lecture represents the Ivory towers, citadel of learning and fountain of knowledge. In graduation ceremonies which differs from matriculation, the hood are diverse in quality and colours signifying streams of knowledge, expertise albeit clustered in broad categories. Commonly and with reference to this university, yellow- white, green, maroon.

The origin and philosophy of university in the then civilisation showed careful study, research removing inability, selflessness and objectivity. Several theories and deductions have been made and are continuously coming out of the ivory towers with the same originality, pushing further the frontiers of knowledge. It goes beyond reading, writing, publishing but mentoring and developing the critical mass who will take over the batons. We wear gowns but do we generate knowledge symbolised by the gowns exhibited by productive independence and capabilities of lettered disciples of the knowledge we profess to have given in our life time.

Town represents the individuals, families, communities, villages, nations and the whole world at large. These entities that make up the town in my above definition will cease to exist if isolated from their means of livelihoods (an excerpt from the wisdom of God when He ordered man after his creation in Genesis to till the land, a statement that might have informed the Greek synthesis of the word agriculture; Land or field which is Ager in Greek and Till which is Cultura in Greek). Agriculture forms the basis of civilization and other forms of livelihoods.

Linkage is the exposé of how knowledge flows from gown to town in order for town to be better and sustainable giving us the real quality of life as it were in the beginning. It then suffices to state that whatever gown you wear and whichever calling you choose, without the linkage it can be said to be vanity. The linkage in another term is service to humanity, relevance to society, community engagement which sometimes is very rewarding when practiced or just for the service to mankind. Typologies of linkage very strong in our mind and sub-consciousness are Mandela, Apartheid, Osama Bin Laden, Obama and Jesse Jackson. These individuals in their life time represent examples of services that are rendered to humankind. It is important to note that whatever example we have chosen to follow there is linkage after all and posterity will determine whatever that has been chosen as right or wrong. The linkage in agricultural profession is aptly described as agricultural extension and very recently rural advisory services. **Agricultural extension** is a general term meaning the application of scientific research and new knowledge to agricultural practices through farmer education. The field of **extension** now encompasses a wider range of communication and learning activities organized for rural people by educators from different disciplines, including agriculture, agricultural marketing, health, and business studies.

History of agricultural extension

The use of the word "extension" derives from an educational development in England during the second half of the nineteenth century. Around 1850, discussions began in the two ancient universities of Oxford and Cambridge about how they could serve the educational needs, near to their homes, of the rapidly growing populations in the industrial, urban area. It was not until 1867 that a first practical attempt was made in what was designated "**university extension**," but the activity developed quickly to become a well-established movement before the end of the century. Initially, most of the lectures given were on literary and social topics, but by the 1890s agricultural subjects were being covered by peripatetic lecturers in rural areas (Jones, 1994). The growth and success of this work in Britain influenced the initiation of similar activity elsewhere, especially in the United States. There, in many states, comparable out-of-college lectures were becoming established by the 1890s (True, 1900, 1928). During the first two decades of this century, the extramural work of the land-grant colleges, concerned with serving the needs of farm families, was to expand dramatically and become formally organized; but the use of the term "extension" continued and has persisted as the designation for the work (FAO, 1997).

The overt use of the notion of "extending" relevant and useful information to the adult population at large, however, predates the **university extension movement**. Earlier in the nineteenth century, a British politician, Lord Henry Brougham, an influential advocate of formal education for the poor and of mass adult education, founded the Society for the Diffusion of Useful Knowledge in 1826. Its objective was **"imparting useful information to all classes of the community, particularly to such as are unable to avail themselves of experienced teachers, or may prefer learning by themselves."** The society sought to do this largely through producing low-priced publications and establishing local committees throughout the country "for extending the object of the Society" (Society for the Diffusion of Useful Knowledge 1827). During its twenty years' existence, agricultural topics were well covered in the society's publications. Similar, albeit short-lived, societies were also established before 1840 in several other European countries, India, China, Malaysia, and the United States (in Virginia) (Grobel, 1933; Smith, 1972).

In making meaning out of the abstractive research findings and reports in order to make it bear on farmers and rural dwellers extension as the link between research and end users interprets in simple language for the end users to gain understanding.

Examples:

- i. Multitude! Multitude!! conflagration is consuming my domiciliary edifice, congregation with mass rapidity; extinguish occur! : **help to put out a fire**
- ii. The electrochemical reaction that include anode, cathode, electrolyte and electronic circuit, which causes loss of energy and change the metal state - **Rust** (Ebenso, 2011)

(a) *Conservation of mass equations for phases and the interface*

We have the equations

$$\frac{D^l(\varepsilon^l \rho^l)}{Dt} = -\varepsilon^l \rho^l \mathbf{I} : \mathbf{d}^l + \sum_{k \in \mathcal{J}_{cl}} \overset{k \rightarrow l}{M}, \quad \text{for } l \in \mathcal{J} = \{w, s, ws\}, \quad (7)$$

where ρ^l is the macroscale density of the l -th entity, $\mathbf{I}$ is the rank two unit tensor, $\mathbf{v}_l$ is the microscale velocity for entity l and $\mathbf{v}^l = \langle \mathbf{v}_l \rangle_{\Omega_l, \Omega_l, \rho_l}$ is the mass averaged intrinsic velocity. Furthermore,

$$\mathbf{d}^l = \frac{1}{2} [\nabla \mathbf{v}^l + (\nabla \mathbf{v}^l)^T]$$

is the rate of strain tensor,

$$\frac{D^l}{Dt} = \frac{\partial}{\partial t} + \mathbf{v}^l \cdot \nabla$$

- iii. The meaning of the equation above is that : The rate of flow of a liquid is influenced by the thickness and mass
- iv. **MC = P = MR** - Profit is maximized when the marginal revenue from production is the same as the marginal cost (extra amount used in producing the extra additional one unit)- **there is no gain from producing the last unit.**

Definitions and Diversity of Terminologies in Extension

A number of other terms are used in different parts of the world to describe agricultural extension: Arabic: *Al-Ershad* ("Guidance"), Dutch: *Voorlichting* ("lighting the path"), German: *Beratung* ("advisory work"), French: *Vulgarisation* ("popularization"), Spanish: *Capacitación* ("Training" "Capacity Building"), Thai, Lao: *Song-Suem* ("to promote"), Persian: *Tarvij & Gostaresh* ("to promote and to extend").

Following the trend of over 50 years, agricultural extension has been variously defined as:

1949: The central task of extension is to help rural families help themselves by applying science, whether physical or social, to the daily routines of farming, homemaking, family and community living (Brunner, and Hsin Pao Yang, 1949).

1965: Agricultural extension has been described as a system of out-of-school education for rural people (Saville, 1965)

1966: Extension personnel have the task of bringing scientific knowledge to farm families in the farms and homes. The object of the task is to improve the efficiency of agriculture.

1973: Extension is a service or system which assists farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income, bettering their standard of living and lifting social and educational standards.

1974: Extension involves the conscious use of communication of information to help people form sound opinions and make good decisions.

1982: Agricultural Extension: Assistance to farmers to help them identify and analyze their production problems and become aware of the opportunities for improvement.

1988: Extension is a professional communication intervention deployed by an institution to induce change in voluntary behaviors with a presumed public or collective utility.

1997: Extension is the organized exchange of information and the deliberate transfer of skills.

1999: The essence of agricultural extension is to facilitate interplay and nurture synergies within a total information system involving agricultural research, agricultural education and a vast complex of information-providing businesses.

2004: Extension is a series of embedded communicative interventions that are meant, among others, to develop and/or induce innovations which help to resolve (usually multi-actor) problematic situations.

2006: Extension is the process of enabling change in individuals, communities and industries involved in the primary industry sector and with natural resource management (SELN, 2006).

The colours of gowns in agricultural extension are shown below



Extension Paradigm

From the above trend of definitions, any particular extension system can be described in terms of both *how* communication takes place and *why* it takes place. Extension system can be paternalistic which are often persuasive or participatory which is educational. These are not mutually exhaustive and exclusive but there are different combinations which have led to different extension paradigm (NAFES, 2005), as follows:

Technology Transfer (persuasive + paternalistic): This paradigm was prevalent in colonial times, and reappeared in the 1970s and 1980's when the Training and Visit system was established across Asia. Technology transfer involves a top-down approach that delivers specific recommendations to farmers about the practices they should adopt.

Advisory work (persuasive + participatory): This paradigm can be seen today where government organizations or private consulting companies respond to farmers enquiries with technical prescriptions. It also takes the form of projects managed by donor agencies and NGO's that use participatory approaches to promote pre-determined packages of technology.

Human Resource Development (educational + paternalistic): This paradigm dominated the earliest days of extension in Europe and North America, when universities gave training to rural people who were too poor to attend full-time courses. It continues today in the outreach activities of colleges around the world. Top-down teaching methods are employed, but

recipients are expected to make their own decisions about how to use the knowledge they acquire.

Facilitation for empowerment (educational + participatory): This paradigm involves methods such as experiential learning and farmer-to-farmer exchanges. Knowledge is gained through interactive processes and the participants are encouraged to make their own decisions. The best known examples in Asia are projects that use Farmer Field Schools (FFS) or participatory technology development (PTD).

Extension Approaches

Over the years of its recognition and institutionalisation, extension has been practiced using different approaches which include:

Ministry-Based General Extension: This is an imported pre-colonial ministry based agricultural extension delivery system. The experiment is dual purposed with extension integrated with research. The extension workers are also generalist giving technical support in all fields of agriculture. This extension delivery system is dictatorial in the planning and delivery of extension messages and its services is weakened by a lot of red tapism and its fluctuating budgetary status determined by the wealth of state. The number of personnel is inadequate to cater for the large number of farmers (FAO, 1997)

Training and Visit Extension (T&V): T&V is a re-invented ministry-based extension approach. The arrangement under this system is the use of contact farmers to reach other farmers. It has an inbuilt updating and monitoring techniques that enhance the effectiveness of the extension agents. However, T&V gives little room for feedback from farmers and benefits from technological package seem skewed towards the contact farmers. The quality of messages passed on to other farmers is inadvertently eroded due to the limited knowledge and skills of these contact farmers (Jones and Garforth 1997).

The Integrated (Project) Approach: Integrated approaches aim at influencing the entire rural development process. It is a multi-sectorial approach aimed at alleviating mass poverty in rural areas on the basis of "a simultaneous improvement in the utilization of natural resources and of human potential" (Rauch, 1993). The impetus in this approach is self-help. However, only very few people are reached contrary to the larger focus it was meant to have. It failed to allow reasonable input by other stakeholders and thereby making its impact non-sustainable.

University-Based Extension: This is an integration of the educational institutions into practical extension work. This approach which is common in the United States of America and India performs extension functions which are not adequately performed by the ministry, thus supporting general extension work. Functions performed by this outfit apart from technology transfer include testing of communication strategies and helping farmers to organize themselves (Jones and Garforth 1997).

Animation Rurale: Animation Rurale which originated from francophone African countries was an answer to the authoritarian and often repressive nature of intervention before independence. The principle behind this context of extension delivery was a participatory approach to integrating rural areas into the national system by initiating a dialogue between rural communities (collectivites) and the state through community appointed collaborators referred to as animateurs. This mechanism which facilitates discussing the needs of the communities also allows the community members to be intimated with government plans

and services. This approach made some impact on its little focus but did not achieve a wide scale impact as rewards and benefits were not clearly defined nor felt (Jones and Garforth 1997)..

Commodity Based Extension: This is an extension system similar to the ministry based approach but with a focus on generation of revenue as well as ensured supply of tropical products for the colonial powers. This extension delivery approach allows the infusing of modern technologies and monetary incentives into traditional farming which triggers cumulative chain effects that leads to an overall development of agriculture. Paradoxically the strengths as well as limitations of the commodity approach lie in its narrow focus. It is useful in terms of technology transfer but pay no attention to issues of public interest such as environmental protection (Jones and Garforth 1997).

Extension as a Commercial Service: Commercial extension is a rather recent phenomenon and typical of either industrialized forms of agriculture or the most modern sector of an otherwise traditional agriculture. It may be either part of the sales strategy of input supply firms or a specialized consultancy service demanded by an agricultural producer. In both cases, the goal of the organization or the individual is profit earning, which in turn is tied very closely to customer satisfaction. Most directly this is the case for private consultants who will be retired only if their clients feel that expenses made have been profitable. Large input supply firms or rural banks that use their own extension workers as sales personnel must also have a long-term perspective with regard to the competitiveness of their products and services. Negative effects of incorrect application or use will be attributed to the product itself. The clients of commercial extension will also be profit oriented. Their objective is the optimal utilization of purchased inputs or contracted expertise(FAO, 1997).

Client-Based and Client-Controlled Extension: This is a decentralized, participatory and problem oriented approach to extension delivery. The extension programmes and approaches are demand driven with the community members majoring in things that affect them. Although client-based approach of extension delivery impact much on the clients because the extension programmes addressed their needs as identified by them, the diversity and large number of small projects involved makes a general evaluation of its effectiveness difficult. It is also have a weak technical base (Jones and Garforth 1997).

Cyber Extension: Cyber extension is an agricultural information exchange mechanism over cyber space, the imaginary space behind the interconnected computer networks through telecommunication means. It utilizes the power of networks, computer communications and interactive multimedia to facilitate information sharing mechanism (Wijekoon, 2003).

Extension Services by Non-Governmental Organisations: A major feature of the agricultural Extension Service in the recent past is the entrance of Non-governmental Organizations in extension delivery. Many of these NGOs were reported and they fall into two major groups, viz: The non-profit, charity or faith-based NGOs or community/ commodity - based NGOs and the private commercial organizations, which have, profit motive associated with their activities. These NGOs in the agricultural and rural development sector, provide a wide range of extension education and technical support services including micro-credit financing and supply of essential inputs in several communities in the country (Oladele, Koyama and Sakagami, 2004)

Frameworks of supply and demand of agricultural innovation

Several alternative frameworks that are concerned with the supply and demand of agricultural innovation in developing countries are discussed below. These are not mutually exclusive, in fact all of them contain elements of descriptive and prescriptive approaches.

Transfer of Technology (TOT): The pure transfer of technology model was the dominant approach of agricultural research in the 1950s. In this, the generation and diffusion of innovation is a linear process from rich-country research institutes to poor-country research stations and from them to extension officers and to farmers. The underlying assumptions were: i) The most modern is the best, there is a single frontier of world scientific knowledge, agricultural technology has global transferability irrespective of local ecological conditions; and poor-country farmers are traditional and must undergo a quantum transformation to be modern (Ellis, 1992). The transfer of technology model sees the farmer as a passive recipient of new technology. If a farmer adopts the technology then the farmer is progressive. Failure of adoption is attributed mainly to psychological factors such as irrationality, conservatism and traditionalism (Oladele, 1999).

Adaptive technology transfer: This model recognised the location-specific requirement of technology and farmer behaviour is no longer seriously regarded as a barrier to adoption. The focus is to adapt new technology to local conditions and to remove the socio-economic constraints to adoption by farmers, such as the availability of complementary inputs of credit. This model was prevalent in 1970s and early 1980s. In this model, the generation and diffusion of innovation remains a predominantly linear process with limited feedback from the farmers. The Training and Visit (T&V) extension system is based on this model. The model proved a disappointing failure for resource poor farmers operating under diverse ecological conditions with complex cropping systems, poor or absent input markets and high risk climatic conditions (Chambers and Jiggins, 1987).

Farming Systems Research (FSR): FSR emerged in the mid-1970s and became prevalent in the 1980s to ensure the reach of innovations to resource-poor farmers. FSR greatly changed the status of the farm household and the farm system in the generation and diffusion of new technology. This it did by placing emphasis on discovering from farmers their goals and constraints. Also, farmers participate in the testing of new varieties or methods; and institutes iterative and interactive feedback mechanism between farmers and researchers. Under the FSR philosophy, the constraints faced by resource - poor farmers are taken seriously and the likelihood that such constraints can be removed is treated with caution. The technology must be adapted to the constraints, not vice versa (Ellis, 1992).

Farmer-First Research (FFR): FFR came out of the argument against the FSR solution to the matching of research priorities with farmer needs did not go far enough in drawing on the knowledge and experimental skills of farmers. The expert staff of the research station - scientist, social scientist and their assistants remain firmly in control of the data elicited from farmers, the design of on-farm trials and the nature of the technology eventually recommended for wide spread adoption. The farmer-first model (so-called due to Chambers *et al*, 1989) but originating in the 'farmer-back-to-farmer' model of Rhoades and Booth (1982) envisages the supply and demand for innovations as a circular process beginning and ending with farmer, rather than a linear process beginning with scientists and ending with farmers. The circle has no particular point of departure since it involves a continuous interaction, on a basis of partnership between scientists and farmers and the components of the process need not take a particular order.

Multiple sources of innovation: This model is concerned with the factors affecting the supply of innovations, and the criteria used to select between alternative technologies that become available. Its main emphasis is on showing how different political, economic and institutional contexts determine what is considered good or bad, relevant or irrelevant and

cost effective or inefficient in research. The multiple sources of innovation model (Biggs, 1985; Biggs and Clay, 1981) proposes that ideas and genetic resources for new technology spring from multiple sources, not just from a narrow sequence of basic and applied research carried out by scientists within the formal research system. The model is complementary to the farmer-first model. It emphasizes the non-linearity of the process by which new farm technology is generated and the many different sources in space and time of genetic materials and farming methods.

Farmer-First-and-Last (FFL): Chambers and Ghildyal (1985) proposed the FFL model. Its proposition is that for technologies to better satisfy the needs and conditions of resource-poor farmers there should be a systematic process of scientist learning from and understanding of their resources, needs and problems. They stated that the main focus of research and learning is the resource-poor farmers rather than the station and laboratory. The FFL asserts that the major reversal is that explanation of non-adoption shifts from deficiencies of the farmers and the farm level, to deficiencies in the technology and technology-generating process.

Beyond Farmer-First (BFF): Scoones and Thompson (1994) introduced the BFF. It points to where the farmer-first approach lacks certain analytical depth and presents a more radical programme that incorporate socio-politically differentiated views of development. The model highlights gender, ethnicity, class, age and religion having important implications for research and extension practice. It emphasizes that different types of local and non-local people hold many divergent, sometimes conflicting, interests and goals, as well as differential access to vital resources. Knowledge, which is diffuse and fragmentary, emerges as a product of the discontinuous and inequitable interactions between the actors i.e. researchers, extensionists and farmers (IIED, 1994).

Analysing agricultural technology system

The macro-agricultural production system was described as consisting of research, extension and farmers (Havelock 1972). This has been recently expanded to include other stakeholders in the concept of value chain. A '**value chain**' in agriculture identifies the set of actors and 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. A value chain can be a vertical linking or a network between various independent business organizations and can involve processing, packaging, storage, transport and distribution. The terms "value chain" and "supply chain" are often used interchangeably. **Traditional agricultural value chains** are generally governed through spot market transactions involving a large number of small retailers and producers. **Modern value chains** are characterized by vertical coordination, consolidation of the supply base, agro-industrial processing and use of standards throughout the chain. More recently the Agricultural Innovation system (AIS) was more encompassing stressing the need of linkage and collaboration. **Innovation** is the process by which individuals or organizations master and implement the design and production of goods and services that are new to them, irrespective of whether they are new to their competitors, their country, or the world (FAO, 2010). An **innovation system** is a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance (World Bank 2006).

Agricultural technology system (ATS) is defined by Kaimowitz *et al* (1991) as consisting of all the individuals, groups, organisations and institutions engaged in developing and delivering new or existing technology. Echeverria and Elliott (1988) described ATS as a national agricultural research system (NARS) - this includes many organisations, public and private, that are involved in generating various forms of agricultural technology. Swanson *et al* (1988) described the following indicators in analysing ATS. **Public policy:** This guides the

direction of agricultural development by establishing a course of action and goals at national level. Priorities are set; a resource allocated and rules are elaborated which create the environment for technological progress. Under this are the following indicators: government financial commitment to agriculture, investment in research and extension, availability and utilization of agricultural credit, pricing policy, farmers participation in technology system.

Technology development: The indicators under this section measure factors that affect the performance of the research subsystem, these are: access to external knowledge and technology, human resources for agricultural research, resource allocation to research salaries and programme, resource allocation to commodity focussed research. **Technology transfer:** This provides information on various resources and activities with knowledge transfer from researchers to farmers through extensionists. This considers the following: access to and availability of internal technology, personnel administration and supervision, time allotted to technology transfer, resource allocation between extension salaries and programmes, technology dissemination, personnel resources for extension. **Technology utilization:** This is concerned with the primary objectives towards which the entire technology system has been aimed. It focuses on: availability of technology, access to technology, technology adoption

Kaimowitz and Merrill-Sands (1989), explaining the institutional agricultural technology system posited that links between research and technology transfer have both functional and institutional meaning. Thus, the links between them may be discussed from two points of view, they may be seen as functional links, which relates to the institution and personnel were identified to be influencing research technology transfer namely: **Political factors:** consider the historical legacy, current political and social structure and external pressure in terms of national policy, foreign donor and private sectors. **Technical factors:** measure the farmer input and targeting; environmental diversity, communication channels and infrastructure, level of pre-existing knowledge about the environment, the dispersion and accessibility of the farming population. **Organisational factors:** examine the interdependence between components and compatibility of management style, size consideration, different staff orientation and functional or market based organisations.

Rolings (1991) in his analysis of Agricultural Knowledge Information System (AKIS) identified four basic processes in which all participants in an AKIS are engaged. These basic processes are: **Generation** - This is often attributed only to research, yet public agricultural research is not more than 100 years old in most countries. Farmers have, however, managed to develop their agriculture for thousands of years. Knowledge generation appears to be more effective when carried out in-groups than when attempted individually. **Transformation** - This is perhaps the most crucial process-taking place in the AKIS. The essence of an AKIS is that knowledge generated in one part of the system is turned into information for use in another part of the system. The following transformations take place: from information on local farming systems to research problem; from research findings to tentative solutions to problems technologies; from research problems to research findings; from technologies to prototype recommendations for testing in farmers field, from recommendation to observation of farmers' behaviour; from technical recommendation to information affecting service; behaviour; from adapted recommendations to information disseminating by extension; and from extension information to farmer knowledge. **Integration** - This is carried out by all participants in an AKIS. The review articles produced by scientific disciplines to pull together research results are obvious examples. Leaders of multi-disciplinary research teams are engaged in a continuous effort to integrate research results produced by different disciplines. **Storage and retrieval** - These processes would seem to be typically the taste of specialized libraries but most researchers, extension workers and farmers store and retrieve information.

Rolings (1991), therefore stated that the analysis of AKIS must be examined against the back drop of, policy environment which formulates the laws, incentives that influence

agricultural performance; structural conditions, such as markets inputs the resource base, infrastructure and the structure of farming; political and bureaucratic structure through which interest groups influence the system; and external sector comprising of the donor agencies, international agricultural research centers (IARCs) and/or commercial farms. The analysis could cover the comparison of major components, linkage mechanisms, management decisions, and actual and formal systems. Also identifying institutional and functional gap and investigating how actors see them as playing complementary roles.

Horton (1988) identified twelve critical factors that affect NARIS capacity and management. These are: interaction between national development policy and agricultural research; formulation of agricultural research policy: priority setting; resource allocation and long-term planning; structure and organisation of research system; linkages between national agricultural research system (NARS) and policy makers; linkages between NARS and the technology-transfer system and users; linkages between NARS and external source of knowledge; programme formulation and programme budgeting, monitoring and evaluation; information management; development and management of human resources; development and management of physical resources; and acquisition and management of financial resources.

My research take off

The takeoff point was Oladele (1999): Analysis of the Institutional Research – Extension – Farmers Linkage System in South Western Nigeria, which stated that an agricultural technology system is a complex set of functions and linkages. To increase agricultural productivity and farm household income, while maintaining the resource base and addressing equity concerns, requires an interactive technology system whereby farmers and farm organization, research, extension, input suppliers, Non - Governmental Organization (NGOs) and other agencies work together in a co-ordinated manner (Swanson, 1995). The United State Agency for International Development (1992) and the World Bank (1985) noted the problem of poor links between research and technology transfer in developing countries, as weak linkages and gap between research and extension as being the most significant institutional problem in developing an effective research - extension system. Also, the Food and Agriculture Organization (FAO, 1984) reported that in all the twelve countries in which research projects were evaluated, there were difficulties of communication between research institutions and extension agencies. This poor inter-organizational relationship between the extension agency and research organization almost guarantees that research results will not reach farmers and if they do, farmers will not be able to use them (Syder, 1986). The technology transfer mechanism has been institutionalized with the establishment of agricultural research and extension organizations in the South Western Nigeria.

However, the most obvious cases are those where researchers and technology transfer workers are ignorant of each other's activities. In practice, research stops too early and extension starts too late in what should be a continuous process. Also, basic extension directors as well as middle level managers within these respective organisations (research and extension) operate in an independent manner with little appreciation or understanding of how the management of their organisation or programme affects the overall system performance. Despite the fact that the linkage mechanisms (institutions) are heavily invested in by the government, the problem of weak linkages, existing gaps and poor inter-organisational relation still exist.

Experience from South East Asia

The continuing saga of efforts to stimulate economic growth in Africa through agricultural development reflects the rise and fall of the many 'fads and fashions' in international development over the past 50 years. Following the poor performance of rural development projects to significantly improve the welfare of the rural poor through the mid-1980s, the region has witnessed an almost universal abandonment of support for large-scale, state-run extension programs (Oladele 2005). After pursuing alternative policies, such as support of non-governmental organizations and, to a lesser extent, producer associations, a growing number of donors and governments have shown interest in a renewed backing of state sponsored agricultural extension programs. Despite the potentials of a new era of support for national extension programs, a number of serious issues within the domain of extension practice remain to be addressed. While often masked under the new titles and phrases of the current development discourse, the challenges faced today reflect many of the perennial problems that have plagued development efforts over the past 50 years. These include the challenges of: becoming truly responsive to local conditions and concerns; facilitating constructive inter-organizational collaboration; fostering greater local self-reliance through individual capacity building and local institutional development; addressing financial insecurity and low educational levels of extension staff; and the specific interests of engaging indigenous knowledge, farmer inventiveness and farmer-to-farmer communication. In the case of West African agricultural extension, attention has increasingly turned towards

a loosely defined collection of 'participatory' approaches, none of which has asserted itself in any form of operational dominance. In Asia and particularly Japan, however, agricultural extension services have undergone several changes in terms of aims, tasks and trends, particularly the impact of Information Communication Technology (ICT). The global challenges of increased globalisation and competition, highly differentiated and segmented food production, complex requirements on quality assurance, reliability and flexibility in the provision of food, sustainability in people's trust, control on environmental effects, and efficiency in the sector's organization and processes have led to the quest for more efficient technology for farming activities and the dissemination of agricultural information. The following sections of the treatise give the description of extension delivery in some Asian countries and how they compare with selected countries in West Africa (Oladele 2005).

Extension Services in China

Yonggong (2002) reported that, a top-down extension approach was adopted during the period of collectivization (1953 to 1958) and in the People's Commune (1958 to 1982). The basic extension method used in the top-down approach was "administrative intervention. Agricultural extension was seen as a government instrument for implementing agricultural development programmes and a number of extension programmes were implemented as political campaigns. During this time, it was difficult to separate extension activities and government administration. The process consisted of the following steps: technological development (research done according to the government's priorities and the conditions on the research stations); demonstration trials in the production units; and adoption and diffusion over a large area using an administrative approach. The main role of fanners in the top-down extension system was to attend demonstrations and participate in trials which were selected according to government's priorities. In this approach, extension activities were linked to the administrative line (a four-level agricultural technical network), making it easy to implement programmes. However, the programmes were focused so closely on government policy that different socio-economic conditions and resources in the communities were not given sufficient consideration and local interests were poorly represented. In the beginning of the 1980s, a rural reform policy was initiated, which contracted collectively owned land resources to individual households for long periods (more than 30 years). Farmers had the right to decide how they would use their land. It also reduced government control of the agricultural market. With the establishment of a market economic system in the 1980s, there was a need to revise the structure and approach of some extension services.

The conventional extension approach ensures that extension programmes are implemented by public extension agents and by government administrative interventions at different levels through the development of policy, programmes and projects. It also does this by conducting research and demonstrations, implementing extension programmes, organizing, monitoring and evaluating extension activities. *Technical contracts between extension agents and farmers' households:* This approach was developed after the reduction of extension fund by government in 1985. Under financial pressure, some local extension agents have changed from providing free-of-charge services to entering into paid technical contracts. This extension model concentrates on the provision of technical advice during the production period to increase output. While the extension agent is responsible for improving production levels, farmers seek for marketing avenues.

Company-led extension approach ("dragon head" approach). Under this approach, farmers' marketing risks are reduced by contracting with companies. Companies, as the "dragon head" of the whole system, provide relevant technologies, training and information to farmers. By providing services to farmers, companies ensure the supply of raw materials at fixed prices. This approach is implemented through contracts signed between companies and households. This links the two parties by a commercial mechanism.

Participatory extension approaches. This approach was developed and introduced gradually by the Center for Integrated Agricultural Development (CIAD) at the beginning of the 1990s. Its objective is to develop farmers' abilities and skills in sustainable rural development. The institutional structure of the public rural extension system consists of extension institutions that include:

National institutions: All national extension administrative institutions are directly under the Ministry of Agriculture. There are four extension centres subordinated to the Department of Agriculture within the Ministry. These are: the National Agricultural Extension Centre (NETEC); the National Plant Protection Centre (NPPC); the National Soil and Fertilizer Centre (NSFC); and the National Seed Management Centre (NSMC). The Forestry Ministry is responsible for extension in forestry as there are no special national centres for mechanical, livestock and fisheries extension. The main functions of the national extension institutions are: formulating extension policy; drawing up extension programmes that link to agricultural development programmes; connecting institutions with other national agencies; and training and supervising provincial agents.

Provincial institutions: All provincial extension institutions are directly administrated by the Department of Agriculture. They also act as professional agencies of national extension centres. In 1996, fifty-nine provincial centres were set up. The centres are involved in formulation of policy, coordination of relevant agencies and training of lower level agents.

Prefecture institutions: A prefecture is a government administrative unit assigned by the provincial government to be responsible for a number of counties with similar geological and natural conditions, extension agents at this level serve a bridging function between provincial and county agents.

County extension centres: County extension centres are the most important extension units in the public extension system. Since 1985, the central and provincial governments have invested in the establishment of county centres. At the end of 1997, 1 800 county centres had been established. The functions of the county centres include: managing and planning extension; conducting extension work on crop cultivation, soil and fertilizer use, pest management and seed quality control; organizing demonstrations and trials; training farmers and township technicians; and providing relevant assistance for purchasing production inputs and marketing agricultural products.

Township stations: The township station is the agent at the grassroots level working directly with farmers. The township station focuses on: on-site advice, training and supervision for new technology adoption; providing information and developing technical hand-outs for farmers as well as assisting village farmers' associations. According to national statistics, the number of extension staff paid by the government and working at the township level has reached one million.

Figure 1 illustrates the figurative expression of the institutional structure of the public rural extension system in China. The mechanisms of cooperation and the relationship between research, education and extension are market mechanisms, policy coordination and cooperative project planning. All the fifty nine agricultural universities, 250 agricultural schools and 50 agricultural research institutes of the Chinese Agricultural Academy have set up research and extension bases in all provinces of the country. Public extension, as a public sector service, was fully financed by central and local government, but after the rural reform, the government decentralized funding to the level of local government and extension

agents. The pattern indicates that all construction costs are paid by the governments at the central and local levels. Government funds for running costs and staff salaries are allocated in accordance with local and national extension projects. Extension agents pay for running costs (30 percent) and staff salaries (50 percent) from the income generated from their services. Funds for extension activities are included in research budgets, which are provided mostly by the central and provincial governments. Funds for extension account for 15 to 20 percent of the total funds of research projects such that the research institute, the extension target areas and the beneficiaries provide the deficits. Funds for extension services of farmers' associations are mainly from: membership fees, revolving funds collected from members and overheads from marketing products. It is implied that direct extension services to members are free of charge.

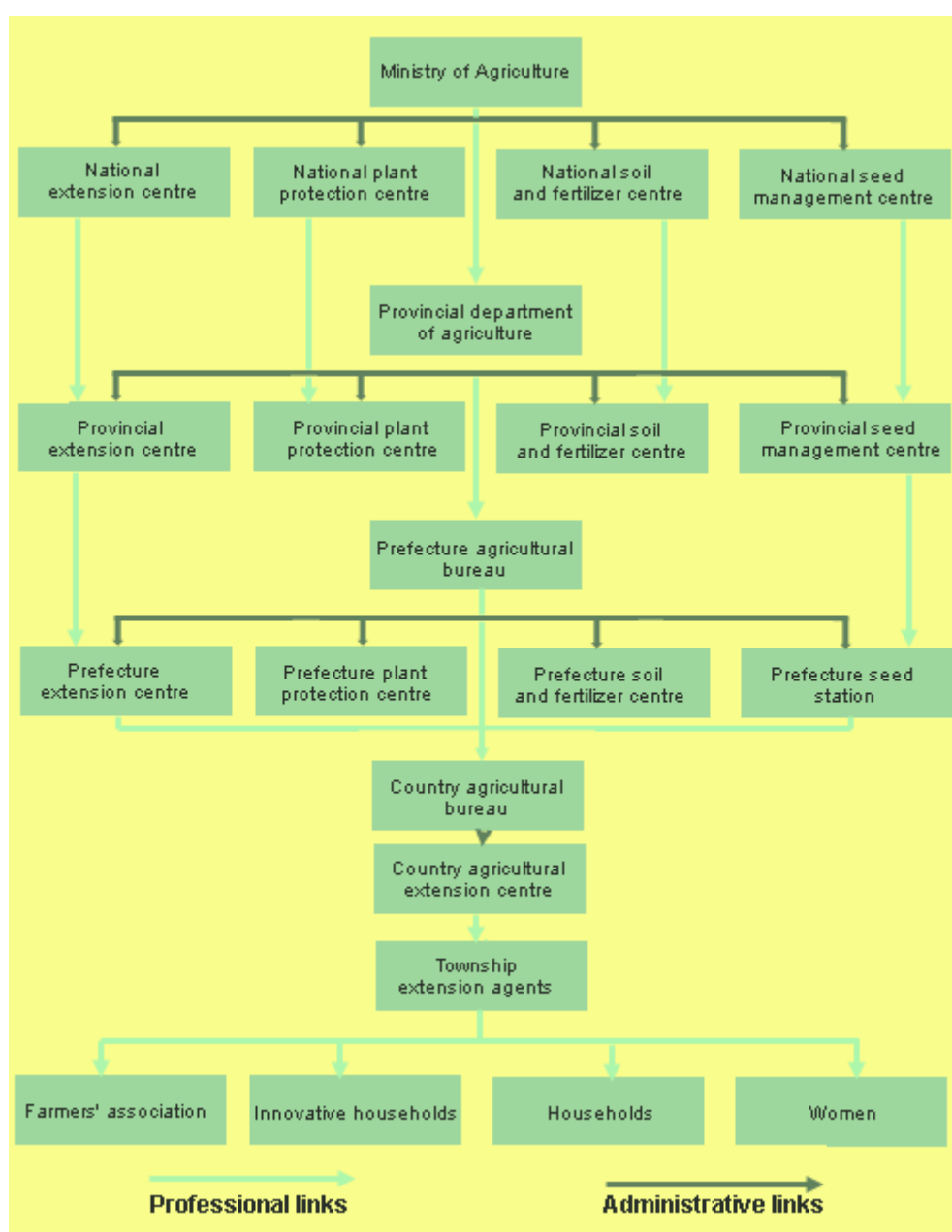


Figure 1: Structure of extension delivery in China

Extension Services in Thailand

The report on extension services in Thailand by APO (2003) shows that the Ministry of Agriculture and Cooperatives (MOAC), which is under the jurisdiction of the Undersecretary of State for Agriculture, consists of nine departments, including the Department of Agricultural Extension (DOAE). Extension services under the DOAE are currently organized through 12 divisions with six regional offices in 73 provinces and 759 districts. The regions have from six to 16 provinces with an average of nine districts in each province. Within each district there are from seven to 15 sub-districts and each sub-district has about 10 villages, each having an average of 100 farm families. The organizational structure of extension services in Thailand is presented in Figure 2. At the national level, the DOAE is organized into administrative, technical and extension divisions, each of which is headed by a Deputy Director General. In the Technical Division, there are senior Subject-Matter Specialists (SMSs) dealing with major crops; farm management and economics; and marketing. They guide and support the field SMSs and assist them in the training activities in the region and in the provinces. The information from both the local and the research sources are examined and passed on to the field SMSs with suggestions for application in the provinces. This is done through the special short- or medium-term training courses and through the direct supply of information to relevant officers. The Deputy Director General for Extension Service heads the Training, the Communication, the Agricultural Administration Divisions, and the implementation units. There are special assistants who are responsible for the implementation of extension services in rural development projects in the region and in the provinces. They are also responsible for the pre-service and in-service training of all extension personnel. The preparation of extension aids, as well as the supervision of the operation of mass communication programs is also within their scope of responsibility. There are six Regional Extension Offices (REOs) that direct and supervise all the extension and training activities in the provinces under their jurisdiction.

The regional operating budgets are allocated directly from the national headquarters. In each of the regions, there are about five senior SMSs for the major crop, plant protection, planning, farmer groups and training. The Provincial Extension Offices (PEOs), aided by two assistants, are responsible for all extension activities in the province. They supervise and direct the activities of six to eight SMSs who are responsible for the formulation of the extension programmes. They also oversee the transfer of agricultural technologies to the district level and direct the extension activities in the field. The provincial extension budget is allocated at four-monthly intervals by the national headquarters and partly by the provincial government. Field level extension services are organized and directed from the District Extension Offices which are assisted by one deputy where nine or more sub districts are located in the district. Each of the eight extension workers is responsible for the extension activities in about 10 villages, with an average of 1,000 farm families. The EAs work through contract farmers who are chosen by the EAs and the farmers. The PEO and deputy PEO spend about 75 percent of their time in the field in the sub-districts to which they have been assigned, supervising and guiding EAs. The SMSs from the province function as trainers of all district extension personnel and support them in their fieldwork: The DOAE is mainly responsible for promoting crop production with most of its technology coming from the research institutes. The linkage between the DOAE and the research institutes is in the form of setting up committees and working groups at various levels from the policy to the operational unit. The coordination is operationalized as follows:

The coordination on researches and agricultural extension between the DOAE and the Department of Agriculture (DOA) deals mainly with research on crops. The coordinating bodies are set up in terms of committees at three levels which comprise the Coordinating Committee on Research and Agricultural Extension; the Central Coordinating Sub-Committee on Agricultural Extension; and the Regional Coordinating Sub-Committee on Research and Agricultural Extension. Both departments have cooperatively formulated

policies in line with those of the National Economic and Social Development Plan, the Ministry of Agriculture and Cooperatives, and their respective departments to further formulate work plans and operational plans. The areas of cooperation emphasise research, seed multiplication, on-farm trials, multi-location trials, demonstration plots, information on research results and technology transfer. As regards the coordination on agricultural extension between the DOAE and the academic institutions, the coordination bodies are in the form of committees at two levels which include: (i) the Coordinating Committee on Agricultural Extension; and (ii) the Regional Coordinating Committee on Agricultural Extension. The major work plans of these committees "are concentrated on joint research and extension activities, personnel development, technical service and information dissemination.

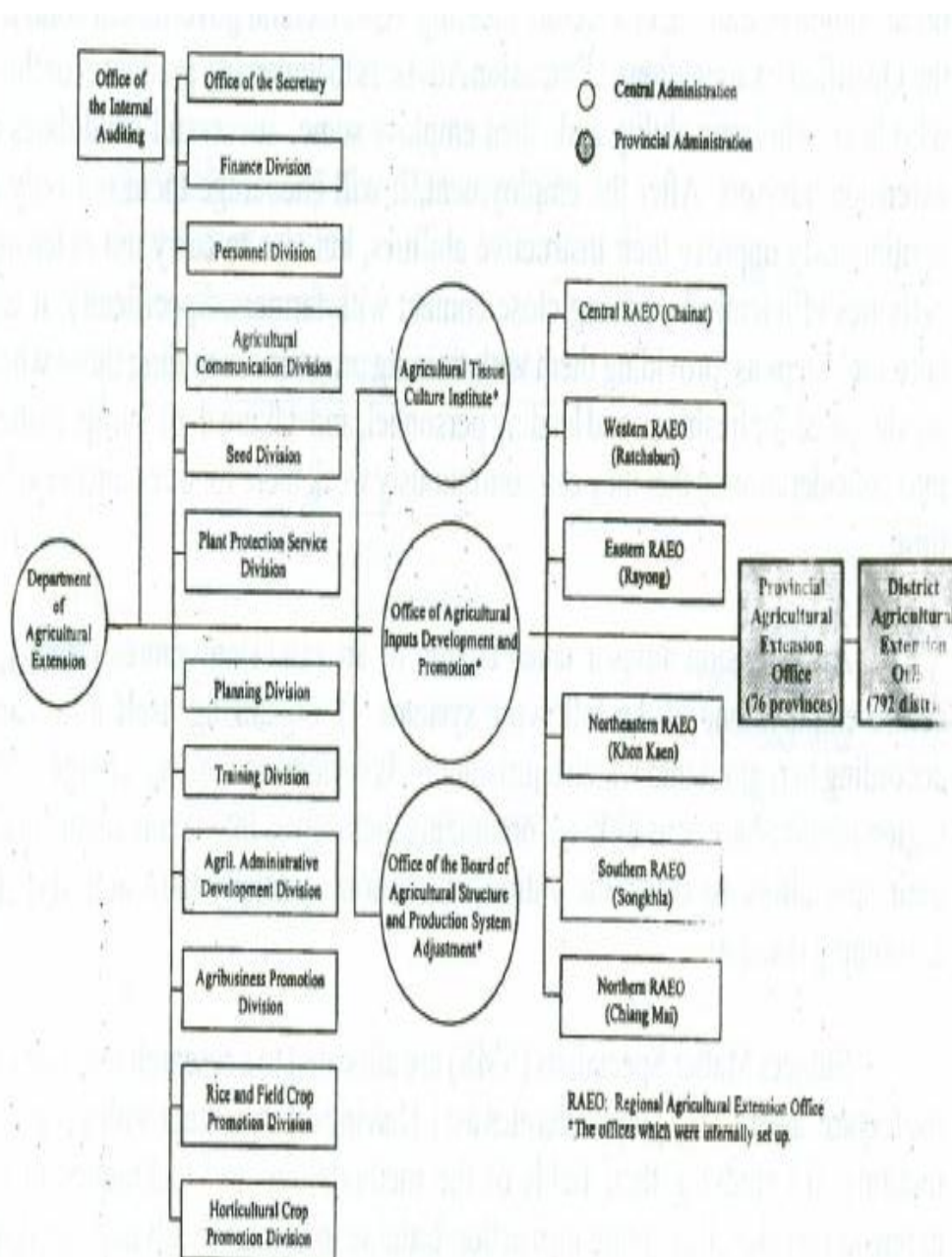


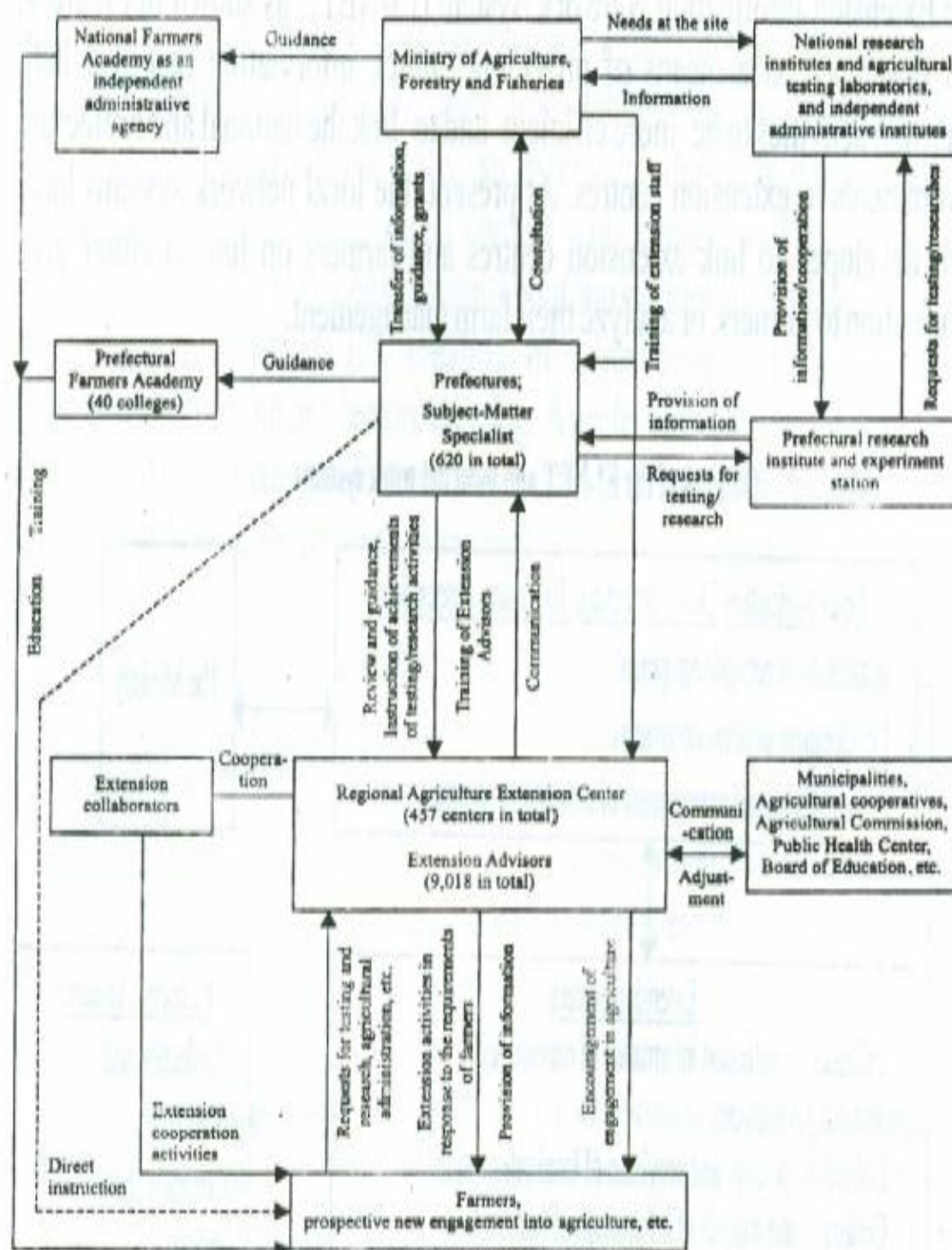
Figure 2: Structure of extension services in Thailand

Extension Services in Japan

Ministry of Agriculture, Forestry and Fisheries (MAFF), (2003) reported that the extension service in Japan is implemented based on the Agricultural Improvement Promotion Law (No. 165 of 1948.). It is based on the cooperative work performed by national and prefectural governments. It serves as a bridge between research institutes and farmers, and supports farmers in their challenges to improve agricultural and managerial techniques. It also provides an integrated approach to the problems of both agriculture and daily life. Figure 4 shows the structure of the cooperative extension system in Japan. A prefectural government employs extension advisors and subject matter specialists as the technical personnel who are exclusively in charge of the extension service. Further, it sets up regional agricultural extension centres (extension centres) that form the base from which the extension advisors perform various activities. Basically, an extension advisor is stationed in an extension centre that provides direct contact with farmers, and performs such combined activities as: i). consultation about agriculture or management; ii). provision of information; iii). creation of a demonstration farm; and iv). organization of training or a lecture meeting. A prefectural government conducts the Qualified Examination of Extension Advisors to university graduates or those who have scholastic ability and then employs some successful candidates as extension advisors. After the employment, it will encourage them not only to continuously improve their instructive abilities, but also to carry out extension activities efficiently by having close contact with farmers. Specifically, it will take such steps as providing them with training programs including those which are designed for freshmen and leading personnel, and taking their family matters into consideration so that they can continuously work there for a certain period of time. An extension advisor takes charge of an extension centre. Usually, a centre employs one of the following systems: i). organizing itself into teams according to regions into which a jurisdiction is divided and taking charge of the region (region-base activity); ii). organizing themselves into teams according to their specialties, to cover the entire jurisdiction (specialty-base activity); iii. combining i) and ii). Subject Matter Specialists (SMS) are allocated to a research institute or a prefecture. There, they play such roles as: i.) having close contact with a research institute; ii.) studying their fields or the methodology and techniques of the extension service; iii.) giving instruction/training to extension advisors working in the field. Notably, they assume the leadership of extension advisors. Subject

The Farmer's Training and Educational Institute (Fanner's academy) is a part of the extension service meant to educate and train new entrants in agriculture as well as the children of farm households. The programs emphasize advanced agricultural and managerial techniques. It is composed of three departments: i) fostering department in which high school graduates take two year practical training, ii) training department where short-term training is given to those who will go back to their home towns to start farming; and iii) research department which gives one or two years advanced training to graduates. It should be noted that an institute is structured around the fostering department. At present, forty-one prefectures run the institutes by the grant-in-aid.

Mechanism of Cooperative Agricultural Extension Service



Note: The figures are those of April 1, 2003 (a survey by Agricultural Extension Division).

Figure 4: Mechanism of Cooperative Agricultural Extension Service

Prefecture Agricultural Center (Ibaraki)

Ibaraki prefecture is an example of a prefecture that cooperates with the national government in the provision of extension services to farmers. The activities of the centre revolve round experiment (development of new technology), education (fostering of competent personnel) and extension (dissemination of new technology). These activities are linked in a triangular pattern. The prefecture centre oversees extension and research functions to meet the needs of the farmers within the prefecture. The structure of the centre is shown in Figure 5.

The Structure of Ibaraki Agricultural Center (Work Allocation)

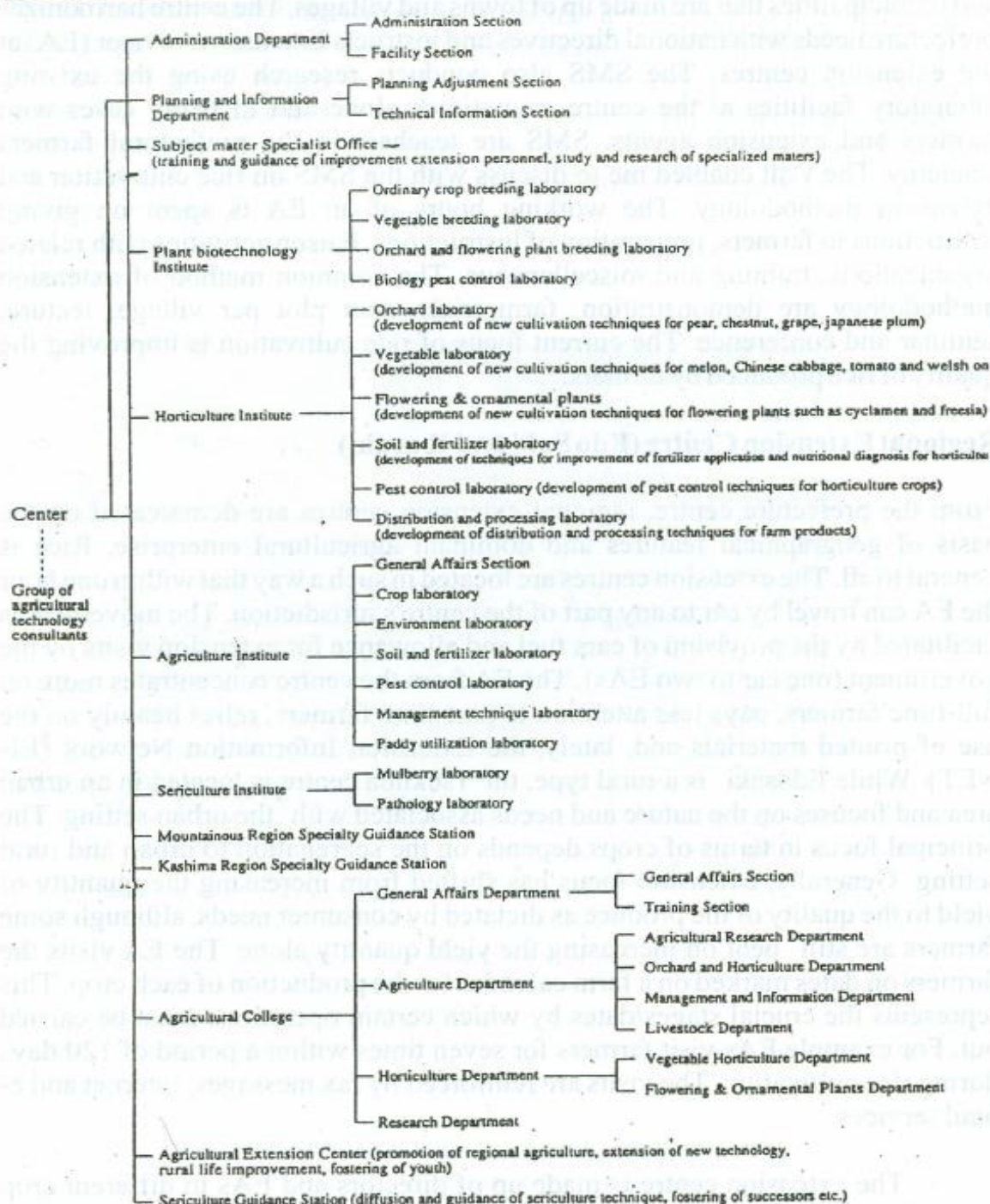


Figure 5: The structure of Ibaraki agricultural Centre.

The research can take charge of 30% national and 70% prefecture activities. The Subject Matter specialists (SMS) office exists within areas of specializations such as home life, farm management, extension methodology, soil, insect and disease, rice and wheat, animals, vegetables, fruits and flowers. The centre divides the whole prefecture into extension centres, which comprise of districts and municipalities that are made up of towns and villages. The centre harmonizes prefecture needs with national directives and instructs Extension Advisor (EA) at the extension centres. The SMS also conducts research using the existing laboratory facilities at the centre, sometimes alone and in many cases with fanners and extension agents. SMS are teachers in the prefectural famers' academy. The visit enabled me to discuss with the SMS on rice cultivation and extension methodology. The working hours of an EA is spent on giving instructions to fanners, preparation of instructions, liaison activities with related organizations, training and miscellaneous. The common methods of extension methodology are demonstration, farm trials, spot plot per village, lecture, seminar and conference. The current focus of rice cultivation is improving the quality of rice produced by famers (Oladele 2005).

Regional Extension Centre (Edo Saki and Ibaraki)

From the prefecture centre, regional extension centres are demarcated on the basis of geographical features and dominant agricultural enterprise. Rice is general to all. The extension centres are located in such a way that within one hour the EA can travel by car to any part of the centre's jurisdiction. The movement is facilitated by the provision of cars fuel and allowance for extension visits by the government (one car to two EAs). The EA from the centre concentrates more on full-time farmers, pays less attention to part-time fanners, and relies heavily on the use of printed materials and, lately, the Extension Information Network (EINET). While Edosaki is a rural type, the Tsukuba centre is located in an urban area and focuses on the nature and needs associated with the urban setting. Generally, extension focus' has shifted from increasing the quantity of yield to the quality of the produce as dictated by consumer needs, although some fanners are still bent on increasing the yield quantity alone. The EA visits the famers on dates marked on a farm calendar for the production of each crop. This represents the crucial stages/dates by which certain operations must be carried out. For example EAs visit fanners for seven times within a period of 120 days during rice cultivation. The visits are reinforced by fax messages, internet and email services. The extension centre is made up of directors and EAs in different crop specializations. The specialization of EAs began about 12 years ago to improve the effectiveness of the EA who are usually transferred within and not between prefectures. EAs receive training four to five times a year from SMS and conduct joint field trials. They determine the topic of training for the SMS. They are the only ones that provide information on input to farmers. Inputs by private companies are passed through EAs to farmers after they must have been validated through experimental tests by SMS at the research arm of the prefecture centre. Within the scope of the extension centre is the field laboratory where specific experiments peculiar to areas within the extension centre coverage are performed with or without the farmers. The farmers themselves have the opportunity to receive training from the field laboratory and can carry out their own experiments with or without the EA and SMS on areas such as rice palatability, soil and growth conditions (Oladele 2005).

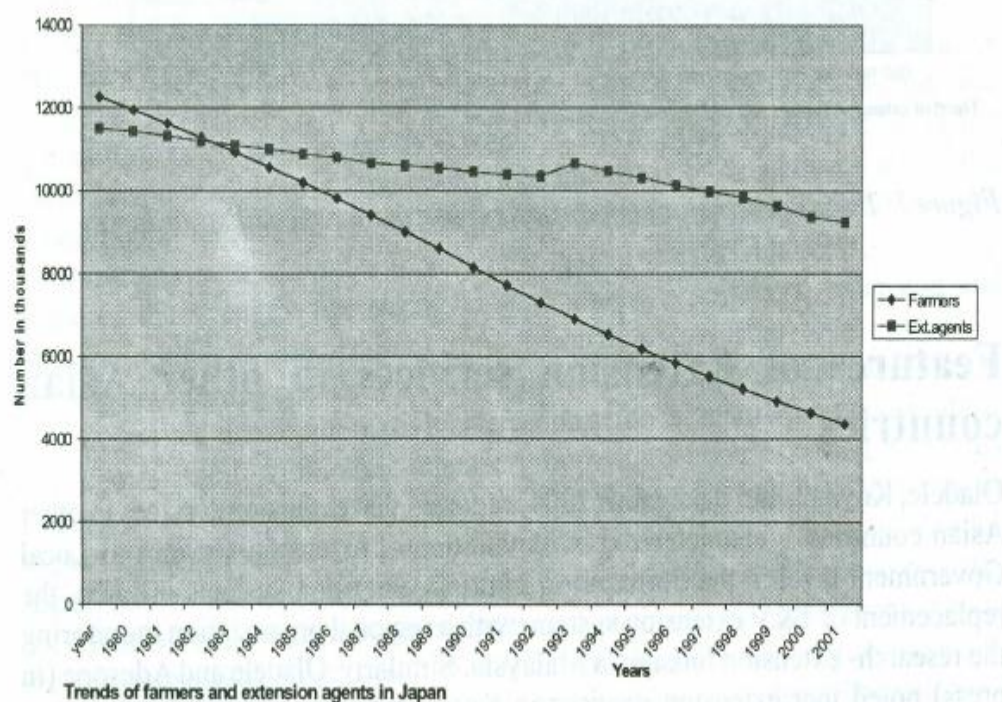


Figure 6: Trends of farmers and extension agents in Japan

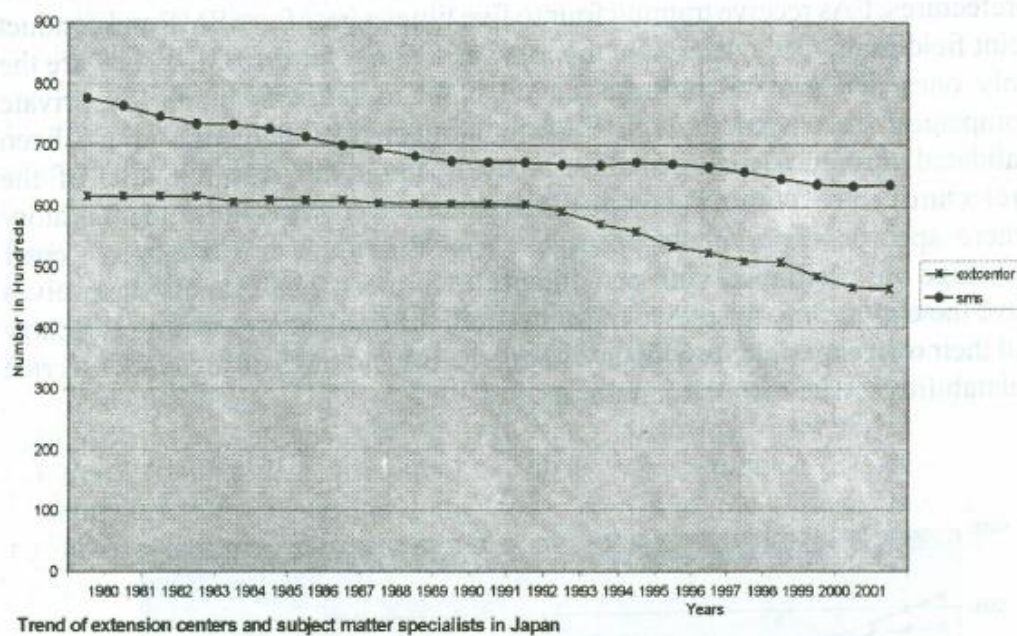


Figure 7: Trend of extension centers and subject matter specialists in Japan

Features of Extension services in other Asian countries

Oladele, Koyama and Sakagami (2004) reported that extension services in other Asian countries is characterized by devolution of extension services to local government level in the Philippines, multiple extension systems in India, the replacement of T & V extension system, with a regional organization monitoring the research- extension linkage in Malaysia. Similarly, Oladele and Adesope (2005) noted that extension services in Korea is based on rural development administration involving the ministry of agriculture, provincial, city and county governments. Indonesia extension service is based on the BIMAS system which is operated alongside the T and V extension system where activities of all institutions providing extension services are integrated and coordinated to prevent overlaps. There is devolution of authority from the national to provincial and rural communities for extension services in Sri Lanka. In Mongolia, extension policies differ from region to region, depending on the approach used by the regional government. Extension service in Nepal is based on Extension Delivery and Extension Acquisition systems (APO 2003).

SWOT analysis of extension service system in Asian and West African countries.

SWOT analysis makes it possible to assess the various strengths, weaknesses, opportunities and threats (SWOTs) within the agricultural extension system as a whole. SWOT analysis determines the internal scenario of an organization by considering the organizational structure, planning, coordination, staffing, supervision, training and management information system. These in addition to capacity and quality for programming capabilities are indicators of management capabilities while, self-financing and outside funding sources represent financing capabilities (Hanyani-Mlambo, 2002). In the application of the SWOT technique for the analysis of extension organizations in the countries studied, the organizational setting of extension services and the indicators for determining their effectiveness, capabilities and efficiency were examined. SWOT analysis makes it possible to assess the various strengths, weaknesses, opportunities and threats (SWOTs) within the agricultural extension system as a whole. Carrying out an analysis using the SWOT framework helps to focus activities into areas of strength and where the greatest opportunities lie. In this study, a SWOT analysis was carried out on the organizational setting, with a focus on the system of extension service delivery. Some of the strengths are strong linkage among researchers, extension and farmers, complete organization from national to township level, extensive coverage of farming populations, and high feasibility of plans. The weaknesses include limited use of alternative extension methods, insufficient cooperation, and coordination with other agencies, high bureaucratic setting and poor financial decentralization. On the other hand, the opportunities that can be explored are potential for improved effectiveness and efficiency through transformations, emergence of private extension service providers and potential for effective programme implementation. The threats to these organizations include very rigid structures, limited use of alternative extension methods, multiplicity of extension advisors roles and inadequate budget. The extension managers and policy makers should focus on the identified strengths, weaknesses, opportunities, and threats with a view of evolving an effective and sustainable extension system. From the foregoing, Oladele et al (2004) reported the comparison of six countries from Asia and West Africa. The results are presented in following tables:

Table 1. Strengths of extension system in Asia and West Africa.

Japan	China	Thailand	Nigeria	Cote D'Ivoire	Ghana
Strong linkage among research, extension and farmers	Complete organization from national to township level	Extensive coverage of farming population	Extensive grass root coverage	Extensive coverage of the farming population	High feasibility of plans
Simple management style and extension organization based on Act	Unified coordination, planning and policy framework	Effective training by subject matter specialists	Public research has a broad spectrum of researchers	Effective and systematic training of extension workers	Improved personnel qualifications, competence and experience
Effective communication flow and high usage of ICTs	Compensation from private extension services	Use of committees for research and extension linkages	Abundant manpower	Effective organizational setting of extension administrative units	Development work to improve rural communities
Public research has a broad spectrum of researchers and highly qualified personnel Adequate funding	Large number of extension staff Support by government at different levels			Improvement of extension systems and methods	More officers working at grass root level

Table 2. Weaknesses of extension systems in Asia and West Africa.

Japan	China	Thailand	Nigeria	Cote D'Ivoire	Ghana
Limited use of alternative extension methods	Insufficient cooperation and coordination with other agencies	High bureaucratic setting	Poor logistic support	Poor distribution network	Poor financial decentralization and districts do not have full complement of staff
	Weak professional and institutional linkages between research, extension and education	Over centralization of budget for extension works	Slow integration of the non-crop subsectors	Inappropriate technologies	Conflict between MoFA and the Ministry of Local Government and Rural Development (MLGRD)
	Poor extension facilities	Poor information flow	Institutional ineffectiveness and weak institutional linkages	Poor socio-economic status of farmers	Conflict between Regional and district staff
	Shortages of funds	Low educational status of extension advisors	Conflict between ministries	Low educational status of extension agents	Poorly defined roles and responsibilities of staff
	Poor educational qualification of extension staff	Poor coverage of farming enterprises	Conflict between researchers and extension agents	Inadequate manpower in the service	Inadequate training of district directors of agriculture in extension management

Table 3. Opportunities for extension systems in Asia and West Africa.

Japan	China	Thailand	Nigeria	Cote D'Ivoire	Ghana
Potential for improved effectiveness and efficiency through transformations	Excellent opportunities for collaboration with research	Adequate funding of extension services	Emergence of private extension services providers	Potential for effective programme implementation	Potential for effective programme implementation
Expansion in the use of ICTs	Potential for effective programme implementation	High involvement of farmers in extension plans	Excellent opportunities for strategic government agency/NGO alliances	Well-designed programmes with demonstrated impact can attract donor funds	Conducive environment for donor sponsored programmes
		Adequate supervision and monitoring of extension advisors	Donor will fund well designed programmes with demonstrated impact		
			Potential for effective programme implementation		

Table 4. Threats to extension systems in Asia and West Africa.

Japan	China	Thailand	Nigeria	Cote D'Ivoire	Ghana
Too rigid structure	Limited use of alternative extension methods	Multiplicity of extension advisors roles	Inadequate budget	Inadequate budget	Inadequate budget
Over reliance on government	Insufficient participation of farmers in the planning, implementation and evaluation of extension programmes	Poor participation by private sector at province level	Weak feedback	Poor group formation and group dynamics	Donor fatigue and withdrawal of investments
Stereotype services		Non exploitation of alternative sources of solutions to farm problems	Donor fatigue and withdrawal of investments	Unstable government policy	Untimely release of fund
Delay response to exigencies			Unstable macro-economic policy	Untimely release of fund	Over utilization of the group approach in extension delivery

Information Technology and Agricultural Extension

This refers to a rapidly expanding range of services, methods, techniques, applications, equipment, and electronic technologies used for the collection, manipulation, processing, classification, storage, and retrieval of recordable information and knowledge such as data, sound, and graphics, including video. Examples are computers, software, high-capacity storage networks, telecommunications, databases, data warehouses, multimedia, the internet and World Wide Web, geographic information systems (GIS), computer-aided design (CAD), online services, video conferencing, executive information systems (EIS), electronic mail, and expert systems (CTA2005). Though Information technologies (ITs) have the potential to support the agro- food sector in coping with the challenges, they are also key enablers for some of the developments to take place. Today's drive towards globalisation builds on modem communication technology. The appearance of various types of media and computers in the last 30 years was the driving force for the promotion of information systems, but the appearance of multi-media and high speed networks seem to be a major turning point. Advances in telecommunication lines and the greater speeds and performance of computers ensure that they are no longer limited to text based information. Multimedia refers to the use of audio, images and video information in computers. The expansion of multimedia, personal computers and the internet are promoting multimedia so that information processing and information telecommunication handled in agriculture and rural villages is becoming easier. The internet is referred to as the network of networks since it is a network that connects all the countries throughout the world. This has brought the realization that the multimedia age is upon us. In the past, nearly all data processing could be summed up in a single word: computers. Today, this term has given way to the broader descriptor information technology, which has become generally accepted.

Japan's experience

IT policy for agriculture and rural development started late 1980s in Japan but the policy gave higher priority to hardware than software. This resulted in insufficient data resources and poor applications that were not useful enough to convince farmers of beneficial agriculture with IT. Poor rural network infrastructure and IT literacy doubled this failure. Following the e-Japan Strategy announced by the Japanese government in 2000, the Ministry of Agriculture Forestry and Fisheries (MAFF) of Japan drew up the IT strategy for agriculture in the 21st century. This strategy is substantially different from the former policy by emphasizing the importance of enrichment of digital contents and rural IT literacy issue. After the e-Japan strategy, severe commercial competition has brought us a rapid extension of very cheap broadband Internet in urban areas. However, the broadband connectivity is still quite poor in rural areas because of absence of commercial competition. This fact also limits the IT extension in rural areas, as the Internet is apparently an inevitable core infrastructure in IT utilization (Ninomiya, 2003).

Technology Development Lines

Major IT development lines that could directly be linked to future developments of the agro-food sector are digital integration, which eliminates technology breaks (EDI- Electronic Document Interchange, and ERP- Enterprise Resource Planning), Multi-media interaction that utilizes the full potential of human perception (multi-dimensional communication), electronic communication networks which provide communication infrastructure (electronic market networks). Others are information portal technology which provides access points to digital knowledge spheres (horizontal and vertical chain, information portals), virtual platforms for collaboration, that facilitates digital group interaction (E-commerce trading platforms) and agent technology, which reduces the need for human intervention (sector market information and supply chain communication systems). They all build on the ongoing digital integration (that allows uninterrupted information flow from the source to the end) and on the emergence of the multi-dimensional information sphere (that builds on internet information technology and defines a digital information environment in its own right). It allows, within its sphere, the creation of all types of communication infrastructures,

communities, warehouses, shops, meeting places, services, -that is a digital duplication of our visible world (Fritz, Kreuder, and Schiefer, 2001). Machida (1998) reported that the development of agricultural information technology in Japan can be summarized as follows: The expansion of facsimile communication systems which use multiple function telephones, the expansion of large scale member information systems at agricultural cooperatives, new developments in local networks through the introduction of high performance Cable Television (CATV) systems Multi Channel Access on Cable (MCA/C), the implementation of multi-media in agricultural and rural village information systems through the use of PC communications and the internet and the extension of systems which incorporate both information systems and machine work systems which include the facilities monitoring and selection. Others include the use of satellite communication in agriculture and at rural villages, the expansion of precision farming-the use of Geographical Information System (GIS), Global Positioning System (GPS) field management and precision management, the increase in the strategic use of information systems and creation of databases and promotion of their use. The three elements for the advance of information systems are the creation of databases and information sources, the creation of networks and their improved speed as well as the extension of information terminals.

Cable Television (CATV): In 1995, the rural village type common access CATV and urban CATV were deregulated so that both broadcasting and telecommunications were made possible. This made the introduction of Multi-Channel Access on Cable (MCA/C) possible and CATV could be used for telephone services, PC communications, facsimile services, video on demand systems and other data communication.

Multiple function telephone and facsimile communication systems: In addition to the telephone function" multiple function telephones have such functions as facsimile, display, data communication, magnetic cards reading functions, password.

Precision farming: Through the connection with other systems such as the green house environment monitors, pocket pagers, cellular phone circuits, facsimile, GPS and GIS the new goal for farming which is the creation of precision farming which uses various networks, information systems and sensors was achieved. Satellite media-Green Channel, Cable Broadcast telephones, Disaster Prevention Radio.

Key points for successful IT applications in agriculture and rural development

Looking at the present status in Japan, we can realize the existing issues that we need to solve in order to extend IT to the agricultural domain. Agriculture stands on the very complex interaction between biological, climatic and geographical factors in addition to human economic activities. The information under such a complicated system is unpredictable, unstable, subjective, site-specific and reliant on empirical decisions given the inherent variability of biological phenomena. Agricultural information with these features is typically beyond the scope of the information science used in industrial information systems, and this has surely led to the failure of IT in agriculture. We should also consider how to easily collect field data. Though field data are the basis for farm decision supports, few people realize the importance of supporting while developing several decision support programmes that need such data. Poor network infrastructure in rural areas is also one of the obstacles for IT in agriculture because the internet is an important factor in whatever information system we develop nowadays. It helps in reducing cost of system development and (Ninomiya 2004). Another difficult problem is computer literacy in rural areas Figures 8 and 9 below show the various types of information navigation system that are used to complement data collection and sharing which are useful in extension services and decision making process. The field monitoring server is installed on the field and data related to the field production characteristics are collected through a remote sensor in the in server. The data is made accessible to the user through Local Area Network (LAN) or the wireless internet services on the server grid. The field server could be connected to solar energy electricity To make

information more accessible to user, the use of mobile data collection and on-site decision support systems have been introduced. The mobile phone can be used to access and request information for farming operations. Similarly, on-site decision support instrument can be worn as part of dressing for data collection, sharing and acquisition.

Data publication & sharing

According to Ninomiya (2004), efficient data publication and sharing involves:

- Keeping data in Spread sheet-based software (e.g. MS Excel), to enhance its automatic availability over the Internet. For this activity, no skill is required. Only everyday data management is needed. Uniformity of tables is not required.
- Efficient data sharing and utilization is based on the distributed data sharing (Data Grid) due to the fact that data heterogeneity is a problem and Data Brokers are developed to remove the imposed limitations. Examples include: Meteorological Dbs- Met Broker Databases, covering more than 6000 weather stations, Map Dbs Chizu Broker 3DB, Japan-NZ- World Digital Elevation DBS DEMBrokerDB, Japan SOM, World 1Km, Soil DBs Soil Broker
- Multilingual information exchange enhances efficient data sharing and utilization through effective knowledge management with huge amount of data. This can be achieved through automatic menu localizer, and text-mining -to extract new knowledge from compiled text data sets, case-based reasoning , intelligent search engine, automated Q&A system and case - base modeling. Data - mining is to extract new knowledge from huge amounts of data sets including image data and modeling (statistical model or mechanistic model)
- eAgriBusiness and Web Marketing allow for link between live growth process to consumers with remote camera, and virtual farming by consumers. Also, food traceability system ensures the identification of the production area and farmer, Reliability on quality and tight relationship, and link to farm diary (agrochemicals, organic information)
- Institutionalization of IT in agriculture is enhanced through organizations and laboratories which are established in each country (National and Regional). There is also a regional body organizing biannual conferences and coordinating the countries with examples of EFITA (European Federation of Information Technology in Agriculture), AFITA (Asian Federation of Information Technology in Agriculture) and World Congress of Computers in Agriculture and Natural Resources.

My contribution to knowledge in linking gown and town

The linkage between gown and town has a road path punctuated with a lot of intrigues at the different notable milestones which are the many different findings of my research over the years.

Experience in sub-Saharan Africa

Milestone 1: Policy and Administration

Agricultural extension policy

A **policy** is a principle or rule to guide decisions and achieve rational outcomes. It is also a statement of intent, implemented as a procedure or protocol. At this milestone, Oladele and Sakagami (2004) using a Principal Component Analysis to extract agricultural research and extension indices as determinants of agricultural growth in Nigeria from 1981-2002 identified five components which are funds allocated to extension services, share of agriculture in the national budget; agricultural active population; land use area for arable and permanent crops, and expenditure per person of the agricultural population. In another study, Oladele et al (2009) examined the strengths, weaknesses, opportunities and threats to extension systems in selected southern African countries of Malawi, Zambia, Swaziland, Mozambique, Lesotho and Botswana. This is predicated on the need for improved performance and reinvigoration of extension system for better services. Some of the strengths are development works to improve rural areas, extensive grassroots coverage, and use of committees for research and extension linkages, involvement of NGOs and private sector, and effective setting of extension administration units. The threats to the extension systems are attempts to privatize extension services, weak feedback to research, and donor fatigue. The study recommended that extension administrators, and policy makers should make extension services truly more responsive to local concerns and policy. Also in another study, Oladele (2011) reviewed the features of agricultural extension models and policy in selected sub-Saharan Africa countries. This was done with the realization that putting in place a legal and policy framework is one basic new and indispensable way of conducting extension in the developing countries. It was recommended that SSA countries adopt the legislated extension policies option for the improvement of extension service delivery and reduce the contradictions in extension models. Oladele (2012) analyzed the features of agricultural extension models and policy in 27 sub-Saharan Africa (SSA) countries in an attempt to streamline the confusion currently existing in the effort to transfer agricultural knowledge to farmers, particularly in the areas of service provision, programme development and funding. It was found that pluralistic extension system predominate the extension and advisory landscape of many SSA countries and only 2 countries have the legislated extension policy which portends a high propensity for well-organized, financially stable extension systems that have sustained effectiveness and a cumulative impact. Oladele (2013) also identified and proposed the measurement of indicators that would ascertain effectiveness, efficiency and accountability of extension policy. This is based on the unguided approach at which extension services were organised in developing countries, devoid of legal and policy framework.

Administration and Management

Administration and Management is often depicted as the act of directing people towards accomplishing a goal. In the provision of extension services, my researches elucidated the factors affecting job performance and satisfaction bearing in mind Maslows', Herzberg's theories, Henry Fayols' principles and theories X, Y and Z.

Oladele, (2007) found that personal characteristics exert a lot of influence on the job performance of extension agents and researchers in Nigeria. Oladele (2004) examined the effect of World Bank loan withdrawal on the performance of extension services in Nigeria, because agricultural extension activities were tri-partitely funded by World Bank, State and Federal governments in Nigeria. The result indicates that there were sharp decline in the performance of extension activities after the loan withdrawal and thus the question of sustainability of the Agricultural Development Programme. Akinsorotan Oladele, Ajadi (2009) determined knowledge and utilization of job enrichment techniques among extension managers in South Western Nigeria and found that extension managers are more knowledgeable on techniques such as implementing participative management, increasing direct feedback and rotating assignments among subordinates. The most used job enrichment techniques by extension managers are: increased use of initiatives, increasing the amount of job recognition for job well done and involvement of subordinates in identification and solution of problems. Akinsorotan and Oladele (2009) determined the organizational values perceived as evident among extension personnel in Oyo and Ogun States in Nigeria and found that the top five values perceived as “extremely evident” were: research extension linkage, their role in bringing about change in people’s lives, loyalty to the organization, and extension programmes that help solve problems, and honesty/integrity in their work. Ogunlade Oladele and Agboga (2011) stated that the effectiveness of extension is dependent upon the motivation of its employees. Therefore knowing what motivates employees and the incorporation of this knowledge into the reward system will help extension managers to identify, recruit, employ, train and retain a productive workforce. The highest human resource management competencies perceived by the Zonal Extension Manager (ZEM) were knowledge of organization, interpersonal relations and engagement. The human resource management activities for which the ZEM indicated highest means were ability to understand the history, philosophy and contemporary nature of extension and technical proficiency that enhances individual and organizational effectiveness. Oladele and Mabe (2012) analysed the component structure of a 34-item scale measuring different aspects of job satisfaction among extension officers in North West Province, South Africa. Nine components were extracted by Principal component analysis to show areas for job satisfaction among extension officers. These were in-service training, research policies, communicating recommended practices, financial support for self and family, quality of technical help, opportunity to advance education, management and control of operations, rewarding system and sanctions. The results have several implications for motivating extension officers for high job performance especially with large number of clients and small number of extension agents. Kolawole and Oladele (2013) stated that the prevailing situation of low ratio of extension agents to farmers would result in work overload and consequently job burnout. However despite all the stress and frustrations, a large number of extension agents still continue at the workplace. This indicates that such extension agents employ some means of coping with life and work. The results shows that agents used coping strategies such as setting realistic goals for myself followed by taking time to rest when necessary, recognizing the symptoms of stress and burnout, maintaining a healthy relationship with co-workers, developing a structural and support system and retaining hope were coping strategies employed.

Milestone 2 : Technology transfer

Technology transfer is the application of information to use (Rogers 2003). The elements are adoption and disadoption of technology, perception of the technology and stakeholders collaboration.

Adoption and dis adoption

In terms of adoption and dis adoption, Oladele, (2005) stated that while much work has been done on the factors determining the adoption of agricultural technologies, little research has been conducted on the factors that predispose farmers to discontinue the adoption of innovation. The variables identified in the study are attitude, extension visit, feedback provision, marketability and input availability. Oladele and Adekoya (2005) examined the implications of farmers' propensity to discontinue the adoption of agricultural technologies and found that factors influencing farmers' discontinuance behaviour are: attitude, extension visit, feedback provision, marketability and input availability. From the Tobit analysis extension visit is the most prominent factor. Oladele (2008) investigated factors determining farmers' willingness to pay for extension services. The mean values of amount to be paid for each of the services shows a minimum of 12USD to 76USD for organizing group. Factors influencing willingness are farmers' age, gender, educational level, farm size, farming experience, land tenure, income, and proportion of crops sold. Oladele, Oladipo and Ogunlade (2008) reported the incidences of unintended consequences of arable crop technology within farming systems. It was highlighted that in order to improve farmers' production, researchers have developed some agricultural technology, which however produces several consequences, in the usage by farmers.

Ademiluyi Oladele and Wakatsuki (2008) examined socio-economic factors influencing power tiller use among sawah farmers in Bida, Nigeria and found that important socio-economic characteristics that are of crucial concern in the introduction of power tiller to sawah adopting farmers are age, educational level, membership of farmer group, farm size, land tenure, practice sawah, location/distance of sawah plot and cost of power tiller use. Oladele and Obuh (2008) examined the perceived effect of the privatization of extension services and farmers willingness to pay for extension services. Prominent services indicated by the researchers are establishment of Small Plot Adoption Technique (SPAT), providing information to women farm, processing loans, securing market. While, extension agents responded that establishment of SPAT, organizing Fortnight Training (FNT) and food and drinks for EA at every visit should be paid for. Similarly, farmers indicated that the services that should be paid for are providing information to women farmers, identifying rural problems, Training Village Extension Agent and supervising women activities. The mean values of amount to be paid for each of the services shows a minimum of 1800 and a maximum of 11400. A significant difference exists in their perception about the privatization of extension services with the extension agents having the highest mean score. Oladele and Wakatsuki (2008) stated that social factors affecting wetlands utilization for agriculture included crop preferences, farming system, culture, taste, and land tenure, knowledge of wetland cultivation, perceived suitability, farmers' tribe, location of wetland, and farmers' age. It was concluded with suggestions for the right combination of policies, public awareness, and appropriate farming methods in order to improve wetland utilization in Nigeria.

Fu et al (2009) stated that farmers' adoption and propensity to abandoned adoption of rice production technology were influenced by difficulty in water control for plot with sandy soil in flood-prone area, limited plot size due to land tenure system and high labour requirement. Oladele and Jood (2010) identified factors affecting adoption of livestock identification and trace-back system among cattle farmers in Kgalagadi district, Botswana as age, income and distance to crushes. Oladele and Rantseo (2010) examined the determinants of cattle

farmers' perceived relevance of livestock technologies in Botswana and found that significant determinants were educational level, herd size, income and distance to crushes; which implies that the higher the educational level of farmers the higher the perceived relevance of livestock technologies. It is therefore important that these significant variables are factored into the technology development and dissemination process among cattle farmers in Botswana. Kolawole, Oladele and Wakatsuki (2011) investigated the profitability of different sawah rice production models within lowlands in Nigeria and found through the use of gross margin analysis that spring based sawah typology is the most profitable either with farmers renting power tiller or those owning power tillers. Babalola and Oladele (2011) stated that in response to modern trends, agricultural extension and advisory services need to explore the features of biotechnology if farmers in developing countries want to maximize benefits. This is based on the premise that agricultural extension services are the most important source of information and affect farmers' behaviour in adoption.

Oladele and Wakatsuki (2012) investigated the socio economic features, dynamics of farmers associations and adoption of Sawah rice production technology in Nigeria and Ghana and concluded that the externalities which play important role in technology-adoption decisions are network, market power and learning externalities. The study recommended investments, especially by development organizations, in strengthening these different forms of social dynamics by supporting local kinship or community groups that generate social dynamics, promoting farmer access and links with external organizations that can act as sources of information and technologies for farmers, as well as links with other farmer associations and groupings from whom they can learn. Oyekale and Oladele (2012) analysed the factors influencing different climate change adaptation choices by cocoa farmers in southwest Nigeria. Years of education, age of farmers and cocoa land areas significantly reduces the probability of engaging in crop diversification. It however increases with male headship, household size, member sick, age of cocoa, ownership of radio and bicycle. Also, years of education, number of cocoa farms and cocoa farm distance reduces the chance of noting weather. Oladele and Wakatsuki (2012) examined the incidence of replacement adoption through varietal substitution among farmers on yield, participation in on farm demonstration contact with extension agent, varietal adaptability, market price, lodging proneness, age and farming experience in Nigeria and Ghana. It therefore implies that the issues of varietal substitution must be viewed within the prevailing socio-economic and farming system milieu of farmers in order to enhance continuous adoption and sustained profit from Sawah technology.

Stakeholders Collaboration

In terms of stakeholders collaboration Oladele, Sakagami and Toriyama (2005) examined the research–extension–farmer linkage system in South western Nigeria due to the fact that many farmers have not been properly reached by agricultural extension services and the problem of poor food production has been attributed to the weak linkages existing between research, extension and farmers. The result showed that there is a significant difference in the involvement of researchers, extension agents and farmers in linkage activities. The mean involvement score revealed that extension agents are mostly involved in linkage activities followed by researchers and then farmers. Oladele and Somorin (2008) determined the degree of technology and extension gaps among rice farmers and found that the most critical proportion are those whose yield are lower than the expected yield by more than 1t/ha). The technology gap, shows that the differential was mainly less than 0.5t/ha.

Ogunlade, Oladele Babatunde (2009) indicated that beneficiary funding for agricultural extension services in many developing countries is not only a reality, but also a necessity due to several factors. Farm size and education make a statistically significant contribution in explaining sustainable funding among farmers. Oladele (2009) stated that the process of introduction and diffusion of innovations in Nigeria is depicted in the research-extension-farmers linkage system. Major innovations in the last two decades have brought dynamic changes in this system. The results show that researchers are involved in prominent linkage activities, such as evaluation meetings and joint problem identification, while extension agents are highly involved in joint problem identification and evaluation reports. For the farmers, highest involvement was recorded for joint problem identification and dissemination of knowledge. A significant difference exists in the level of involvement of researchers, extension agents and farmers in linkage activities, with the extension agents having the highest mean score.

Sebolai, Oladele, Senyane and Nsoso (2011) reviewed the process of agricultural research management and the attendant consequences of the methodologies that have been adopted for agricultural research management in Botswana. The prevailing scenarios necessitated the need for improved performance of the agricultural research system in generating appropriate technologies. The agricultural innovation system approach has potential to build strong linkages among stakeholders contributing to an effective research and development system. Its adoption and implementation requires a change in the mind sets of scientists and policy makers to consider new and unconventional actors and relationships in the research and development system. Ogunremi and Olaniran and Oladele (2012) stated that research and extension should not be seen as separate institutions but must have some measure of linkage. Scientist involved in basic, applied and adaptive research together with extension agents and farmers should be seen as participants in a single agricultural knowledge and information system and that there is a significant difference in the involvement of researchers, extension agents and fish farmers in linkage. Kolawole and Oladele (2013) found that increasing responsibility and responsiveness to rural needs has given extension services a broader concept and that rural non-farm income account for considerable share of rural household income, extension officers provide non -agricultural information services in Oyo state, Nigeria. These areas include non-farm income generating activities, governance, legal, health and education.

Perception of technology

With respect to perception of technology, Adu, Oladele, Adejoba, Agunbiade (2001) analysed farmers demographic characteristics, awareness and perception of the relevance of livestock technologies in Oyo State and study concludes that livestock technologies would be more result-oriented if adequate consideration is given to the demographic characteristics and perception of farmers among others which will in turn help the farmer in making decision to adopt.. Oladele and Akinsorotan (2007) found that the perception of scientists at universities and research institutes on the effect of GMO's on health and environment was influenced by awareness, age, religion, sources of information (radio, newspaper, scientific periodicals) and their perception toward GMOs. Oladele and Fawole (2007) examined farmers' perception of the relevance of technologies generated by research institutes in south-western Nigeria in the area of agroforestry, land evaluation, improved varieties and machinery and equipment and found that farmers are aware of technologies and perceived technologies such as machinery equipment fabrication, improved varieties of arable crops and agroforestry technologies as relevant. Oladele (2012) stated that among extension officers, a wide range of knowledge levels exists on ecosystem services and valuation

issues and that extension services should change from a generalist approach to a specialist approach; “extension messages should incorporate ecosystems service information”; extension agents would benefit from “increase[s] in extension research skill” and “use of multimedia strategy”; users require new skills; “extension officers need...new training” and “extension messages should address vulnerability of ecosystem services” in response to ecosystem services and valuation issues. The results have several implications for training and educating extension officers in the areas of ecosystem services used for tourism, hedonic pricing, and governance of ecosystem services.

Milestone 3: Communication

Communication (from Latin "communis", meaning to share) is the activity of conveying information through the exchange of thoughts, messages, or information, as by speech, visuals, signals, writing, or behavior. The elements of communication covered by research include Information Communication Technology (ICT), feedback and information seeking and use which are firmly rooted in the transactional model of communication which combines linear, helical, dance and hypodermic needle theories.

Information Communication Technology (ICT)

The advent of ICT has changed the world into a knowledge based economy and as an agent of linkage some of my researches revolved around the use of ICT in extension services. Oladele (2006) examined the effect of the multilingual farm broadcast on the access to agricultural information. Farm broadcast programmes on radio and television were compiled and the language of presentation examined for each of the programme. The diversity of the languages in Nigeria presupposes that for farmers to have access to agricultural information through the radio and television, the language of presentation has to be that of the listeners. The study recommends that information sources to farmers should explore multilingual sources to ensure farmers' access to agricultural information. Oladele, et al (2006) analysed the trend of Information development and application in Japanese agriculture such that lessons and challenges in the development of the information technology for agricultural development are harnessed. Information technologies have the potential to support the agri-food sector in coping with the challenges but they are also key enablers for some of the developments to take place as the drive towards globalization builds on modern communication technology.

Oladele and Boago (2011) analyzed the content of agricultural news coverage in Mmegi The Reporter and The Botswana Daily News newspapers by determining the frequency and space allocation to agricultural education news in the newspapers from January 2006 to June 2008. The results show that in privately owned newspaper, most agriculture news is in advertisement category. The study has also shown that privately owned newspaper has more agriculture news on the front page. There is a significant difference between spaces allocated to agriculture news in privately owned newspaper. It is recommended that government owned newspaper must increase coverage of agriculture news in Setswana. Oladele (2011) compared researchers, extension agents, and farmers' perceptions of the effect of Information Communication Technology (ICT) on agricultural information access and state that researchers, extension agents, and farmers agreed with and were positively disposed to effect of ICT on agricultural access, however, a significant difference in the effect of ICT on agricultural information access among researchers, extension agents, and farmers was observed. Access to agricultural information through ICT will continue to improve, since perceptions are overtly positive among researchers, extension agents, and farmers. Mabe and Oladele (2012) examined the level of awareness of information communication technologies in North West Province, South Africa and found that extension

officers indicated high level of awareness on include mobile phones, computer, internet, overhead projector, fax machines, organization e mail, fixed telephone, personal email and organization website. The study recommends that more information communication technologies should be made available to extension officers, so that they will become more aware of the use of ICT in extension work as tools that can gather and disseminate agricultural information. Oladele (2012) examined the applications of information communication technologies in agro-based livelihoods and found that ICT provided timely solutions to the basic problems of farmers' lack of information on agriculture, lack of access to inputs and output markets, and lack of access to some basic but relatively expensive equipment. It was highlighted the synergistic use and challenges for each of these projects and proffers suggestions for the adoption and adaptation in different parts of the world.

Feedback

Oladele, and Adu (2003) submitted that factors affecting feedback provision on forestry related technologies include illiteracy, unstable government policy, busy schedule of extension agents, busy schedule of researchers, low ratio of extension agents to farmers, poor infrastructure. Oladele (2008) stated that there has not been any coordinated effort on the part of the extension and research agencies to promote farmer's feedback, such that it becomes difficult to get feedback to the decision makers. Studies on the dissemination process are limited to the adoption of technologies, reason for abandon or adoption and the strength of linkage between research, extension and farmers (Ogunfeditimi 1989). It is therefore important to examine the missing link in the dissemination process. Oladele (2008) examined the provision of feedback on pig production technology by farmers in Kwara State and found that through feedback provision, research-extension-farmer linkage would be strengthened.

Information seeking and use

Osikabor, Oladele, Ogunlade (2011) investigated the access, worth assessment and use of information by small-scale farmers in Oyo State. The study described socio-economic characteristics of small-scale farmers; ascertained information access point preferences and analyzed information worth assessment. The study recommends that local farmers' groups identified as information providers should be recognized and used in complementing conventional extension efforts. This will improve access, worth assessment and consequently use of information by small-scale cassava farmers in Oyo State. Oladele (2011) stated that the consequences of the unimpeded growth of greenhouse gas emissions include the raising of the earth's temperature, more precipitation, extreme weather events, and shifting seasons has stressed the need for more use of meteorological information among end users especially those whose livelihood depend on climate variability. Thus cattle farmers' awareness and use of meteorological information in Botswana was examined and found that majority of farmers were aware and attached high importance to meteorological information, use meteorological information, reported that meteorological information is timely and reported that meteorological information is not accurate. Significant determinant of the use of meteorological information are age, farming experience, and information accuracy. It therefore implies that the meteorological information dissemination should take into considerations the implications posed by these significant variables. Adebayo and Oladele (2012) discussed the application of selected theories to explain information seeking behaviour and adoption of organic agricultural practices by farmers. The paper recommended that in order to ensure adequate dissemination and the adoption of organic agricultural practices, extension officers, change agents, NGOs and the policy makers should adopt the principles in planned behaviour, diffusion and innovation

theory to enhance farmers acceptance and implementation on the innovation. Balarane, and Oladele, (2012) determined awareness and use of agricultural market information among small scale farmers in the Ngaka Modiri Molema District in the North West Province and found that agricultural market information provides farmers with knowledge of the prices of the produce, provides knowledge of who to buy the produce, the quantity to be produce and knowledge of different outlets such as fruit and vegetables, Farmers indicated that they are aware of agricultural market information and they use radio and newspaper. Ogunremi, Faturoti, and Oladele, (2012) found that awareness was significantly related to participation and recommended that extension agents should effectively make use of all available means of communication to fish farmers for increase in productivity. Mazibuko, and Oladele (2012) used a descriptive research design to analyse use of storage facilities by small scale farmers in Lejweleputswa district of Free State and found that many farmers do not have both metal and cement silos. The main purposes for storing their produce was food security; the increase for the prices of their produce; house-hold consumption throughout the year; and lack of market accesses for their produce. Significant determinants of use of storage facilities were anticipated price increase, household consumption, preservation of planting materials, primary occupation and farming experience. Oladele and Wakatsuki (2012) described learning alliances in technology development and dissemination in Nigeria and Ghana as involving social learning and innovation systems and brought stakeholders in Nigeria and Ghana together on a platform with clear objectives, shared responsibilities, cost and benefits, output as inputs, differentiated learning mechanisms, long term and trust-based relationships. The process is increasingly leading to increased learning and effectiveness in rural entrepreneurial development and improved livelihoods.

Milestone 4: Rural sociology

Rural sociology is a field of sociology associated with the study of social life in rural areas. The sociology of food and agriculture is one focus of rural sociology and much of the field is dedicated to the economics of farm production. Other areas of study include rural migration and other demographic patterns, public lands policies, the sociology of natural resources rural educational policies. Many rural sociologists work in the areas of development studies, community studies, community development and in environmental studies. My research in this respect covers rural livelihoods, dynamics of interventions and gender dimensions

Rural livelihoods

A livelihood is made up of the capabilities, assets (stores, resources, claims, and access) and activities necessary for a means of living. Livelihood is, therefore, broader than income; it includes everything done to obtain a living. Rural dwellers of developing countries have hitherto been thought to engage only in small-scale agriculture, but this is a misnomer that is continually being disproved with emerging studies of peasant livelihoods showing highly diversified livelihoods. Livelihoods of many rural dwellers depend on agricultural and/or non-agricultural activities, with agricultural activities accounting for a certain percentage share of households' income (Rahman et al., 2007). The livelihoods framework is a tool to improve our understanding of livelihoods, particularly the livelihoods of the poor.

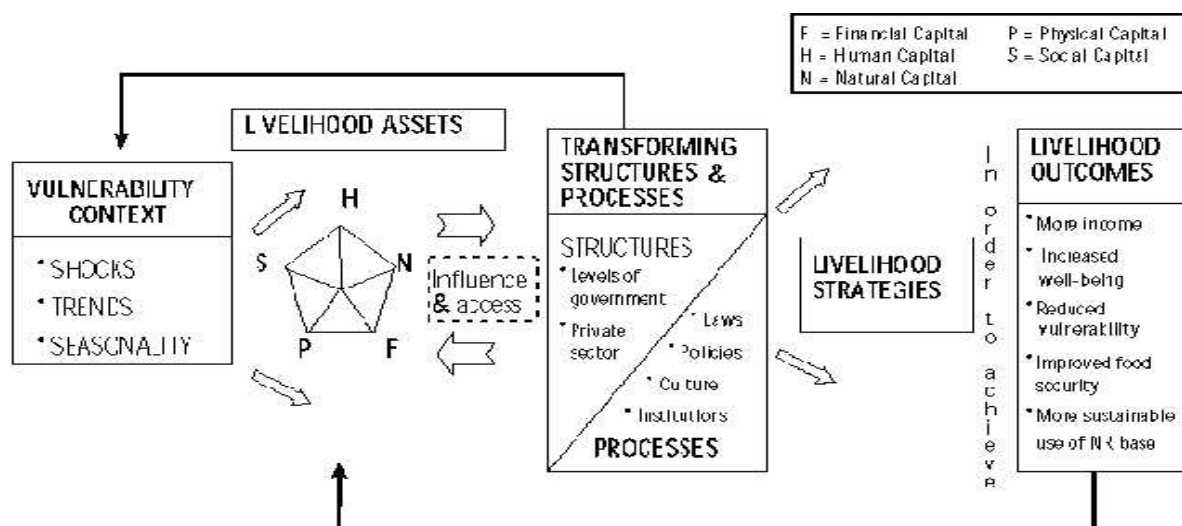


Figure 8: The Sustainable Livelihood Framework. Source: Farrington *et al* (1999)

Luthans, *et al* (2004) noted that with the rising recognition of human resources as a competitive advantage in today's global economy, human capital and, more recently, social capital are being touted in both theory, research, and practice. To date, however, positive psychological capital has been virtually ignored by both business academics and practitioners.

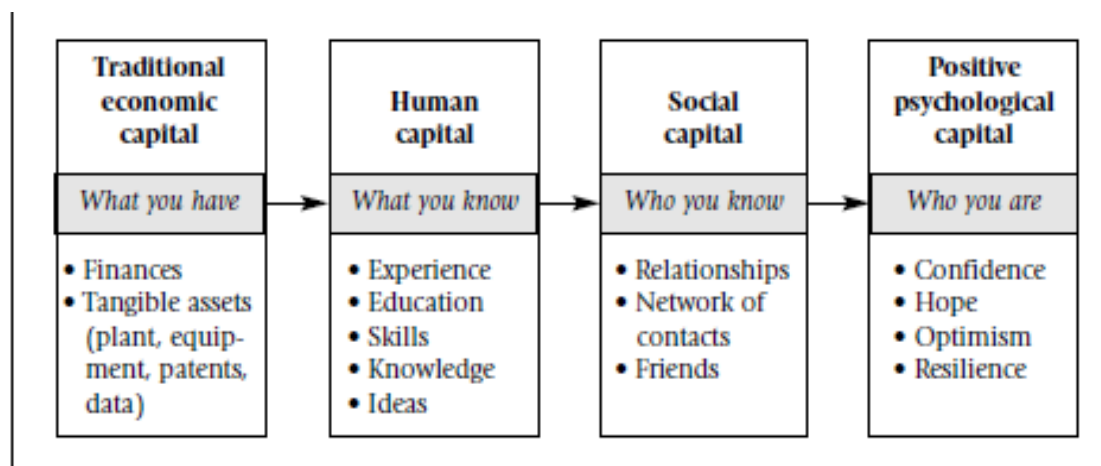


Figure 9 : Expanding capital for competitive advantage

Adekunle, Oladele and Olukaiyeja (2002) examined the use of indigenous control methods for pests and diseases of cattle among herdsmen in northern Nigeria, concluded that indigenous knowledge should be incorporated in the preventive and curative medicine. Oladele, and Olugbodi (2003) examined the differences in the veterinary services provided by university and ministry based officers to livestock farmers in Oyo State. The results showed that regular veterinary services received include advisory services and control of livestock diseases. Significant difference between university-based services and ministry-based services was recorded only in the effectiveness of veterinary services which implies that the functions of teaching, research and service should be well integrated for meaningful development of the livestock sector.

Adesehinwa, Makinde and Oladele (2003) indicated that pig farmer's socio-economic characteristics determined the type of feeding pattern used for the animals. This implies that farmer's socio-economic characteristics such as age, gender, family size and educational status should be considered as important livestock production variables in the development of improved technologies and policy formulation. Oladele (2004) examined the awareness, access, and benefits of livestock farmers on the veterinary extension services provided by the Ministry of Agriculture and the University of Ibadan veterinary clinics in south-western Nigeria and found that benefit from veterinary services was significantly related to awareness and access variables. Records of veterinary clinic visited showed a significantly relationship with benefit derived, while non-significant relationships were recorded for source of information, veterinary services received, and awareness of veterinary services. Oni Oladele, and Oyewole, (2005) stated that factors influencing default in loan repayment among poultry farmers include age, educational level and income of the farmers. Oladele and Monkhei (2009) reported the structural changes in livestock marketing cooperatives in Botswana over two decades. Marketing Cooperatives in Botswana evolved from cattle marketing because the cattle industry is the principal sector with a major contribution to beef export to the European Union market and the difficulty in the arrangement for individual farmers to market their livestock to the Botswana Meat Commission. Despite the realization of the importance of cooperative societies there has been a declining trend in the number, membership and turnover. Secondary data used for this study were compiled from the Department of Cooperatives, Ministry of Agriculture and Ministry of Trade and Industry generated over time. Oladele and Lesotho (2010) stated that the cattle farmers' awareness and attitude towards prevention and control of *Cysticercus bovis* in Botswana were influenced by age, educational level, number of dependents, sources of information, visit to veterinary office, and attendance of health workshop.

Oladele (2011) examined the contribution of indigenous vegetables and fruits to poverty alleviation. The most available crops are mushroom, *ocimum gratissium* and Bush mango. Mushroom is the most used plant for food, *Momordica charantia* for medicinal use and *Calotropis procera* was widely used for animal feed. Also, the most notable crops that generate income to farmers are *Vitex doniana*; *Calotropis procera* and *Phaseolus lunatus*. Ladapo and Oladele (2011) stated that postharvest losses have been a constraining factor in plantain production such that increase in yield brought about by advances in technologies through research did not make any significant impact on the economy of small scale farmers. Significant relationship was recorded between knowledge and constraints to postharvest activities and postharvest losses among farmers and wholesalers. Lekunze, Antwi, and Oladele (2011) examined the socio-economic constraints to sunflower production in Bojanala farming community of the North-West province, South Africa and found that significant determinants of the socio-economic constraints include number of plantings per year, storage costs, price, income, access to market and farm size. Oladele and Oladele (2011) using a snowball sampling technique found that in the incidence of pastoralist-farmers conflict, agro-pastoralists suffered in numerous forms and ways. The aggressiveness of the nomadic pastoralists and uncontrolled grazing was the prominent assumed cause of the conflict. The competitive use of various natural resources such as land, water, shelter and air by various rural dwellers is inevitable. Antwi and Oladele (2011) found that the socio-economic needs for community development in selected villages of Molopo local municipality of North-west Province South Africa include training in agricultural related ventures (vegetable production), livestock production and poultry production in order to improve their income and livelihood. There is need to implement appropriate community development and empowerment programmes that can create an environment where the people can meet their basic needs and improve quality of their life. It is recommended that emphasis should not only be on the development of basic infrastructure, but also on income generating activities and education services aimed at breaking the cycle of poverty in the study area.

Tekana and Oladele (2011) using a qualitative approach proposes that for maximizing the utilization of Taung irrigation scheme, South Africa by farmers there should be strategies that include the introduction of the scheme to emerging farmers, formation of farmers groups and cooperatives, the creation of an extension area for the scheme as well as the allocation of extension officer to cover the scheme. Others include diversification of crop production, creation of marketing outlet and micro-financing of farmers on the scheme. These strategies were introduced in order to provide additional support services to farmers on the scheme in order to maximize the utilization of the scheme. This paper concluded on how each of these strategies had helped maximize the utilization of the irrigation scheme. Olujide and Oladele (2011) determined farmers' knowledge of pictorial information on agroforestry practices and found that majority of the farmers could identify and interpret pictures on silvopasture, agrisilvopasture, silvoaquaculture, and home garden. It is therefore important that farmers' characteristics are considered in the preparation of audio-visual aids in order to improve their effectiveness in transferring information to farmers.

Adebayo and Oladele (2012) reviewed the potentials of organic agriculture as means of enhancing sustainable development. Some of the potentials are soil fertility and system stability, ecosystem service, food safety and quality, mitigating climate change, ecological health, value addition, market niche, return on investment and consumer preferences. The paper recommends that extension agencies and policy makers should ensure adequate dissemination and advocacy for the adoption of organic agricultural practices in Africa. Mumuni, Al-hassan and Oladele (2012) assessed the socio economic effects of mining on agriculture in the Asutifi district of the Brong Ahafo region and found that the socio-economic effect of mining on smallholder agriculture in the area include displacement of people and land, increased migration into mining areas, environmental damages related to water quality water quantity, tailing management, noise and dust pollution as well as ecosystem disturbances, shortage of labour availability to agriculture, and contamination of crops as well as reduction in crops' yield. Adebayo, and Oladele (2012) evaluated knowledge of value chain among vegetable farmers in south western Nigeria and found low knowledge and that the significant determinants of knowledge of value chain variables were age, farm size, household size, dependants, distance to farm center, subsidy received and information. Therefore, to ensure that small-scale and resource-poor farmers stand a chance to participate in these expanding markets, policy makers and researchers must place greater attention towards the needs of poor small landholders and tenant farmers. Mumuni and Oladele (2012) examined farmers' assessment of donor support for rain-fed lowland rice production in Ashanti and Northern Regions in Ghana and found that prominent challenges indicated by the respondents about the projects are funding, weather dependent, land tenure system, credit implementation challenge, farmer group, work system cohesion and project staff strength. Adoption rate for project interventions was high for rice cultivation activities including land development activities though farmers complained of its due to its drudgery. The study recommended increase in project fund and also, farmer group strengthening, improving on the activities of farming support systems to bring processors and marketers and further collaboration with other relevant stakeholders to complete the rice value chain.

Oladele (2012) stated that the socio economic determinants of use of indigenous fallow system for enhancing soil fertility among farmers in Oyo State Nigeria are age, gender, household size, marital status, social participation, farm size, farming experience and income. Moobi and Oladele (2012) analysed the participation of small scale farmers in formal financial market in Mafikeng Municipality, South Africa and found that most prominent formal markets among small scale are commercial banks and insurance institutions were most popular among farmers. Household size, farming experience and membership of farmers group significantly influence participation in formal financial markets. Educational level, farming experience and extension contact were the determinants of farmer's attitude towards formal financial markets.

Moobi and Oladele (2012) examined the participation of small-scale farmers in informal financial market by investigating socio-economic characteristics, constraints and attitudes of small-scale farmers towards participation in informal financial markets. It was found that friends, relatives and burial stockpiles were the most popular informal financial markets among farmers. Household size, years in farming and membership with a farmers group significantly influence participation in informal financial markets, whereas gender and sources of labour influence attitude of farmers towards informal financial markets. Oladele, Olujide, Oladele (2012 a b) examined semi-settled pastoralists' sources of information and utilisation of HIV/AIDS prevention techniques in South West Nigeria and found that prominent sources of information on HIV/AIDS prevention techniques are radio, mosque and friends. Semi-settled pastoralists had high knowledge on HIV/AIDS prevention techniques. Silolo and Oladele (2012) examined personal and job characteristics and the socio-economic status of farm workers in the Mafikeng area, North West province, South Africa. The results showed that the majority had through primary education with a mean salary of most of the farm workers per month was R1 250.00. Medical aids, sectoral determination and labour unions were non-existent in different farms. In terms of socio-economic status which was measured as the position an individual occupies in a society with respect to the amount of cultural possession, effective income, material possession, prestige and social participation; with implication for social and economic inequality, majority of farm workers are on the low level. Ward and Oladele (2013) investigated factors influencing farmers' attitude towards formal and informal Financial Markets in the Northern Cape, South Africa and found that prominent constraints are stringent collateral requirements, distant financial markets from farmers, and high transaction costs. Qas, Antwi and Oladele (2013) stated that in terms of participation in main stream beef markets by emerging farmers in Dr Kenneth Kaunda District, North West Province, South Africa majority of the cattle farmers in the study area participate more in the informal cattle markets and that the informal marketing channels are better when selling one or two cows at a time; coupled with low transactional costs (no transport cost, no statutory levies and commission) hence receiving maximum returns. It was also stated that few respondents who used the mainstream markets enjoyed the highest percentage of cattle sold since the herd sizes of those participants were comparatively larger than those participating in the other markets. Oladele Antwi, Kolawole (2013) stated that knowledge of biosecurity among livestock farmers along border villages of South Africa and Namibia, is low knowledge and their personal and farm characteristics were significantly related to the knowledge of livestock biosecurity practices.

Dynamics of interventions

Knowledge flow in linkage activities aims at empowerment. Empowerment is measured in terms of production (Sole or joint decision making over food and cash-crop farming, livestock, and fisheries as well as autonomy in agricultural production); resources (ownership, access to, and decision making power over productive resources such as land, livestock, agricultural equipment, consumer durables, and credit); income (sole or joint control over income and expenditures); leadership (membership in economic or social groups and comfort in speaking in public), and time (allocation of time to productive and domestic tasks and satisfaction with the available time for leisure activities).

Ogunlade, Oladele and Ogunsola (2009) examined the impact of Green River Project (GRP) on farmers' livelihood and found that there exists a significant difference in the livelihood before and after GRP intervention. Olujide, Oladele and Akinbobola (2011) indicated that human trafficking depletes labour available for agricultural purposes, however rural dwellers have negative perception about human trafficking but their knowledge on human trafficking is low. The policy implications therefore are to introduce measures to counter human trafficking and related awareness campaigns should mainly be targeted to those areas

where migration rates are high or on the rise. Cwaile, Antwi, and Oladele, (2012) stated that participants in Ngunni cattle project were generally favourably disposed to the project and many indicated that constraints in meeting their livelihoods have reduced greatly due to capital acquisition by the project beneficiaries. Significant determinants of total livelihood after project were total hectares, number of employees, income, contact with extension and attitude. Sekoto and Oladele (2012) analysed support service needs and constraints facing farmers under land reform agricultural projects (LRAD) in the Central district (Ngaka Modiri Molema) of the North West Province and stated that prominent constraints such as; lack of finance, poor building infrastructure, lack of fencing and poor input supply and these constraints have negative impact on the projects. Prominent support services needed by LRAD farmers are funding, building infrastructure, capital funds, farming infrastructure and inputs. The impact analysis of Taung irrigation scheme on household welfare among farmers in North-west Province, South Africa was examined by Tekana and Oladele (2012). Per capita expenditure is used as a proxy for per capita income and employed as a measure of welfare. Significant determinants of household welfare amongst farmers were age, gender, educational level, household head type, access to natural capital and socio-economic status. Kgosiemang and Oladele (2012) stated that factors affecting farmer participation in agricultural projects in Mpumalanga are effectiveness of comprehensive agricultural support programme, effectiveness of comprehensive rural development, attitude, household headship, livestock enterprise, and income. Vusi and Oladele (2013) stated that prominent constraints affecting small scale broiler farmers in Capricorn district in Limpopo province include lack of access to credit, high interests rates, short repayment period, small stock size, , inadequate infrastructure and high feed costs, difficulty to access veterinary, service, lack of biosecurity knowledge, long distance to the market, lack of storage facilities limited markets, unorganized market outlets and inability to participate in the high value markets.

Nxumalo and Oladele (2013) indicated that in terms of factors affecting farmers' participation in agricultural programme in Zululand District, Kwazulu Natal Province, South Africa farmers were favourably disposed to participation, while unavailability of land, lack of funds and limited resources were major constraints against participation. Significant determinants of participation are attitude, effectiveness of Land Care, age, gender, livestock enterprise, crop enterprise and income. Bothhoko and Oladele (2013) stated that factors affecting farmer participation in agricultural projects in Ngaka Modiri Molema district in North West province are the effectiveness of the programme introduced by government. Moagi and Oladele (2013) analysed information needs of Land Redistribution for Agricultural Development (LRAD) beneficiaries in Waterberg district, Limpopo and found that there is high information need in the areas of pesticides, agricultural equipment, disease management, market prices and collaterals. Extension agents were the main information source. Farming experience, farmers' group membership, farm income, extension contacts, farm size, labour sources and information sources showed significant relationships with information needs of farmers. Antwi and Oladele (2013) evaluated the impact of the Land Redistribution for Agricultural Development (LRAD) projects on livelihoods of beneficiaries in the Ngaka Modiri Molema district of the North-West Province and stated that an integrated agrarian reform support programme will go a long way in improving productivity of the projects if it consists of a package in support services, rural infrastructure and co-operatives. The main function of such unit should be training, acquisition and distribution of agricultural inputs/equipment to agrarian project beneficiaries and there should also be extension of special grant to support government's efforts. Antwi and Oladele (2013) analysed the effects of socio-economic factors on the performance of Land Redistribution for Agricultural Development (LRAD) projects in the Ngaka Modiri Molema district of the North-West Province and concluded that policy decisions to improve the performance of the LRAD projects in the study area should focus on: improvement of education and skills training of the beneficiaries; introduction of

new production technologies; encouragement of savings culture among the beneficiaries; and establishment of relevant linkages for the projects in the study area.

Gender dimensions

Gender analysis focuses on understanding and documenting the differences in gender roles, activities, needs, and opportunities in a given context. It highlights the different roles and learned behaviour of men and women based on gender attributes. These vary across cultures, class, ethnicity, income, education, and time; thus, gender analysis does not treat women as a homogeneous group or gender attributes as immutable. Gender analysis is important in the formulation of country economic memoranda, country sector strategies, structural adjustment, country portfolio management, poverty assessments, environmental assessment, and in sector-specific project planning, monitoring, and evaluation; thus, many variants of policy and sector-specific gender analysis tools are available (Feldstein and Jiggins 1994).

Adeoti, Cofie, and Oladele (2012) stated that the gender dimension of the contribution of urban agriculture to sustainable livelihoods in Accra, Ghana shows that male and female farmers indicated that high benefits of urban agriculture to their livelihoods which is influenced by Farm size and access to credit. Oladele, Cofie and Adeoti (2012) examined the gender analysis of land use for urban agriculture and sustainability of Livelihoods in Freetown, Sierra Leone and found that the majority of producers were female with the gross margin on male and female managed farms were 15130 and 23895 Leones per farm/season respectively. Also, female managed farm had a higher return than male managed farms. Significant determinants of contribution of the urban agriculture (UA) income to household income are household size, access to credit, membership of farmers' association, gender, age and farm size. Modirwa and Oladele (2012) examined food security status among male and female-headed farming households in Eden District Municipality, Western Cape, South Africa. Using Mann-Whitney U and Wilcoxon tests, a significant difference exists in food security status, with higher mean rank for males than females. Both household heads indicated that poor storage, poor market, lack of credit, and land tenure highly affects their household food security.

Milestone 5: Education

Educationists have identified three sources of knowledge as found analytically useful, and generally in accord with current realities, to distinguish between the three modes of education (recognizing that there is considerable overlap and interacting between them). Informal education is the lifelong process by which every person experiences and exposure to the environment at home, at work, at play, from the example and attitudes of family and friends, from travel, reading newspapers and books, or by listening to the radio or viewing films or television. Formal education is the highly institutionalised chronologically graded and hierarchically structured "education system, spanning lower primary school and the upper reaches of the university. Non-formal education is any organized, systematic, educational activity carried on outside the framework of the formal system to provide selected types of learning to particular subgroups in the population, adult as well as children. Thus defined, non-formal education includes, for example, agricultural extension and farmer training programs. Adult literacy program, youth clubs with substantial educational purposes, and various community programs of instruction in health, nutrition, family

planning, co-operatives and the like. My research covered the formal and the non-formal education.

Non-formal education

Oladele (2005) stated that the education of farmers would be result oriented if among other things the learning enhancement situations are created. Farmers' receptivity to training largely depends on the use of several educational methods by extension agents to reach farmers in Mezam division of Northwest province of Cameroon. The factor that was rated as the most important in enhancing learning of the farmers was that extension agents should be knowledgeable in farming. The agent being a farmer and educated follows this, language came fourth on the importance list. Oladele, (2006) indicated that vocational education services provided by non-government organizations (NGOs) to adult farmers in the states of Oyo and Ogun, in Nigeria. Two agro-based NGOs, the Diocesan Agricultural Development Project (DADP) and the Farmers Development Union (FADU), were purposively selected because of their relevance to the study. While a broad range of extension activities were provided by the agro-based NGOs to their members, those most frequently accessed by farmers were mainly advisory. Oladele (2008) stated that a significant difference existed in the knowledge gained by farmers after training between video and agent-taught groups and differences in the knowledge gained after the three exposures to video training. It was recommended that video be used to disseminate agricultural information as a supplement to agent contact, in order to alleviate the problems of low extension agent-farmers' ratios and to promote beneficiary funding of extension services as farmers buy the videotapes.

Formal education

Oladele and Baiphethi (2009) using a descriptive survey, which ascertained supervisors and subordinates perception of the impact of Botswana College of Agriculture training programme on graduates' job behaviour and found that mean scores showed that graduates had the highest mean while subordinates had the lowest mean. It therefore implies that the rating of graduates by their supervisors and subordinates is lower than that of the graduates and the graduate ratings can also not be considered as valid because of the shortcomings associated with self-rating. There is need to improve the training programme such that graduates can be rated independently as competent individuals. Thobega, Subair, and Oladele (2012) using a descriptive research design analysed the supervisors' perceptions of student competencies after a Field Practical Training (FPT) class. While students were perceived to be competent in most of the 16 practical skills taught at Botswana College of Agriculture (BCA), supervisors highlighted constraints 17 that nullify the perceived effectiveness. Supervisors should spend more time with the students so that they observe students on task. Oladele (2012) found that there is high competence in most of the agricultural tasks covered in the study on self-perceived competency among graduating students in the school of agriculture, North-West University, Mafikeng, South Africa. The study concluded that competency-based curricula that reflect inter-program modules for all academic programs should be sustained.

Hulela and Oladele (2012) stated that in the features of an education system in combination with proactive policies of education, and agriculture set the periphery for appropriate curriculum in agricultural education that could encourage the development of psycho-social, entrepreneurship and accountability in learners. Molefhe and Oladele (2012) examined the effect of supervisors' specialization on job performance of agriculture science teachers in Junior Secondary Schools and found that majority of ATAS (Agriculture teacher supervised by agriculture supervisor) and ATNAS (Agriculture teacher supervised by non -agriculture

supervisor) indicated that a higher proportion of the supervisors who have the same subject specialization perform their supervisory roles than supervisors who do not specialize in the same subjects. Significant differences existed in the perceived effect of supervision and between ATAS and ATNAS, on supervisors' specialization and job performance. Oladele (2012) stated that a wide range of knowledge levels exists on climate change issues related to causes, effect, vulnerability, and mitigation and that extension officer will have to address new skill requirements for farmers, the need for specialized extension services, and changing and diversified livelihoods. The results have several implications for training and educating extension officers on climate change issues.

Oladele and Wakatsuki (2012) described a model of manpower development in the sawah technology development and dissemination. The development of human capital as a critical driver of food security has led to the development and dissemination of the sawah technology in the two countries which consequently has led to the improvement of rice yield from an average of 1.1 to 5.5 t ha⁻¹ in Ghana and an average of 1.47 to 6.0 t ha⁻¹ in Nigeria. The manpower development has impacted on the farmers adopting the technology such that they have achieved improved food security through yield increase and better incomes. Oladele, Nyambi, Mabe, (2013) studied competencies in livestock tasks among Diploma students in a South African University and found that overall, students' lacked competence in most of the tasks and the male students had competence than female students. It is suggested that faculty revisit the animal science program content and delivery strategies in order to meet students' and employers' needs. Oladele and Babalola (2013) used a descriptive design to determine supervisors and students attitude towards research project supervision in two different tertiary institutions in Southern Africa and found that matching academic interest, expertise, resources, matching expectations, mutual understanding, and stimulated and maintained student interest and motivation play vital role in successful supervision.

Agricultural Extension in South Africa

The history of agricultural extension in South Africa started with the introduction of a variety of measures such as the monopoly of powers, direct controls over imports and exports, and guaranteed prices and guaranteed markets via the Marketing Acts of 1937 and 1968; the 1939 Agricultural Co-operatives Act; the provision of infrastructure such as electricity, roads, railways, telecommunications and irrigation water through other state departments and agencies; financial assistance through the Agricultural Credit Board and the Land Bank, with credit provided at subsidised interest rates and on preferential terms to farmers who could not access credit from the commercial banks (Sustainable Development Consortium, 2007). Given this favourable environment agricultural production in South Africa exceeded both population increase and consumption requirements. It is however unfortunate that in the midst of this plenty a large numbers of black South Africans remained too poor to buy adequate food for their families (Singini & van Rooyen, 1995). In 1945 Department of Native Affairs published *A New Era for Reclamation* which set out the vision for betterment land use planning and villagisation, this was followed by Tomlinson Commission which was rejected by the nationalist recommendations for depopulating the reserves and investing in agricultural development.

The homeland era in 1976 opened the way for homeland extension services and the development of agricultural development parastatals. Although it was a ray of hope for the rural areas nevertheless the ratio of extension personnel to black farmers was 1: 600 compared to 1: 30 for white farmers. The parastatal homeland development approach during the 1970s and early 1980's revolved around centrally managed showcase capital intensive projects. The Development Bank of Southern Africa which was established in 1983 introduced the Farmer Support Programme (FSP) as an alternative to the large capital

intensive schemes. The FSP focused on small farmers in the homeland areas. It set out to integrate the promotion of agricultural activities with other non-farm related rural development activities (Van Rooyen, 1995). This was followed by a transition which was an agricultural development programme heralded by the Government of National Unity with focus on Rural Development Strategy which lead to the creation of a national network of local service centres (LSCs) where a variety of agricultural services can be accessed. In 1995 after the eclipse of the rural development strategy, a white paper on agriculture was introduced. This led to a re-engineering of research and extension with a shift from commercial agriculture, to a new focus on “basic research in the context of resource-poor farmers” (Department of Agriculture, 1995). This was to enhance the capacity of small-scale farmers through appropriate support services with the extension agent acting as a facilitator.

The post 1994 period the Department of Agriculture was restructured where provincial Departments of Agriculture were established and due to inability to maintain support services to farmers, most commercial farmers have switched to privately provided services (Vink & Kirsten, 2003). Duvel, (2003) reported that given the low qualification and competence of extension workers, an extensive and structured support programme should be developed and implemented. The Participatory Programmed Extension Approach (PPEA) was recommended for South Africa consisting of five linked programmes: extension planning and projects, extension linkage and coordination, knowledge and support, education and training, monitoring and evaluation. In 2005 the Department of Agriculture published norms and standards in a bid to: improve access to agriculture support services (information, finance, inputs, regulatory services, technical expertise, markets,) endow farmers with skills and knowledge for ensuring sustainable resource management; facilitate their access to new technologies; enhance communication with farmers and farmer organizations, mentors and advisors (Department of Agriculture, 2005). In 2008 the extension recovery plan was launched in order to ensure accountability and visibility of extension, promote professionalism and improve the image, re-skilling and re orientation of extension, provision of ICT infrastructure and other resources as well as recruitment of personnel. The on-going process of agricultural extension policy formulation will iron out some of the existing deficiencies.

The South Africa extension situations is similar to that of most developing countries as there is a general trend of male dominated services, low educational qualification, high farmer extension ratio, wide rural coverage, poor public agricultural research system, bureaucratic management link and poor linkages with research. However, the strength of the South Africa extension system is that of its low reliance on donor funds and the extensive use of ICT. The will to improve agriculture by the government has been faced with several problems. For extension services to be proactive to small scale farmers, public research should focus on the general needs of small scale and emerging farmers, privatisation of extension should not be adopted yet, continuous training and re-training programme for extension officers, creation of functional provincial and national platforms for agricultural innovation systems and improvement of marketing channels for the small scale farmers as supported by Oladele and Mabe (2010); Mabe and Oladele (2012); Moagi and Oladele, (2012); Balarane and Oladele (2012); Bothoko and Oladele, (2013); Antwi and Oladele, (2013); and Nxumalo and Oladele, (2013).

Concluding Remarks

The above descriptions and analysis of the extension services in South East Asia and sub-Saharan Africa has highlighted a lot of issues that can challenge the thinking and practice of extension services. Specific issues that are applicable to the re-engineering of extension services in order to fulfil its linking roles and services to rural dwellers as gleaned from the preceding sections are:

- a) There should be an enabling law for the practice and funding of extension services. This will eliminate policy instability for the practice and funding of extension services and ensure the sustainability of the extension services.
- b) Agricultural extension is heavily dependent on the use of ICT, therefore, capacity and competencies should be developed as the exploration of ICT tools will reduce overhead cost, ensure timeliness of information as well as reduce distortion of communication.
- c) The practice of calendar based visits will ensure accuracy of implementing farm practices and also facilitate timeliness in report and responsiveness to feedback on agricultural technology.
- d) There should strong collaboration and linkage between organizations charged with extension services. The role conflict and competition for scarce resources will be eliminated such that duplication of efforts would not occur and wastages would be eliminated.- a structural reorganisation is necessary
- e) Extension services should be holistic touching every aspect of the famer and farming communities.
- f) Acquisition of necessary skills and competences should be the focus of formal and non-formal educational interventions.
- g) Extension service delivery should be built around well motivated energetic workforce with satisfaction but without burnout

From the above discussion and comparison of extension methodologies in different parts of Asia, especially Japan, there is need for the integration of the critical factors of successful extension operation into the extension system in sub-Saharan Africa. Above all an extension system that is peculiar and responsive to the prevalent socio-economic and socio-cultural conditions in sub-Saharan Africa should be evolved such that extension organization, funding and management should not be donor responsive.

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ABOUT PROFESSOR OLADIMEJI IDOWU OLADELE

Professor Oladimeji Idowu Oladele was born on 14th July 1968 on Sunday morning to Late Mr Samuel Olawale Oladele (A teacher) and Mrs Ruth Olufunmilayo Oladele (A Business tycoon). Prof Oladele is the second child of the five children. After graduating as the second best at the BSc (Hons) level (Second Class Upper Division) and as the best MSc student, the Department of Agricultural Extension and Rural Development University of Ibadan offered him an Assistant Lecturer position in 1997. After the completion of his PhD in 1999 he was promoted to Lecturer II position. Following the stipulated three year promotion cycle in University system in Nigeria, he became Lecturer I in 2002, Senior Lecturer in 2005. He resumed in Botswana College of Agriculture as Senior lecturer in 2008 and was appointed as Associate Professor with North West University Mafikeng Campus in 2010. He was promoted to the Full Professor position in 2011.

Prof Oladele research interest covers the socio-economic factors affecting farming households' productivity mainly in the areas of support services and the use of such services. He has examined the broad impact of extension services on farmers' productivity and how household food security can be improved through extension services. He was a Visiting Scientist to JIRCAS from 2003 to 2004. Post –doc at Ibaraki, Hokkaido and Kinki Universities of Japan. He was a consultant to World Bank, International Water Management Institute, ETC-RUAF, Netherlands, Project Coordinating Unit; Agricultural Development Programmes, Nigeria. He is a recipient of several awards and grants such as CV Raman International Fellowship for African Researchers under the Senior Fellowship India, Japan Society for the Promotion of Science Fellow, Botswana Tertiary Education Council research grant, ETC – RUAF Netherlands, University Senate Research Grant, Japan Capacity Building for African Researchers -Nagoya University, European Union & European Forest Institute, CTA, Netherlands, Bashorun MKO Abiola Fellowship for Postgraduate Teachers, UNESCO (Nigeria), ZARD award for Outstanding Ph.D. Student 1998.

He had made impact in the agricultural extension profession and through many of his publications which have been cited severally by other authors (SCOPUS search engine) and translated in to other languages such as French, Japanese, Chinese and Belarusian. He has ingeniously transformed theoretical concepts into empirical issues which had opened up more understanding and analysis of the issues concerned in agricultural extension. Professor Oladimeji Idowu Oladele is keeping the firing line of research and his current research activities revolve round the issues of agricultural extension and the achievement of food security, which focus and x-ray factors that affect the effectiveness of the extension service delivery in the days of new tools and technology as well the conditions of the end-users (farmers and rural dwellers) for the uptake of the new technologies and forging a close collaborations among the stakeholders. The analysis would cover institutional, social and economic conditions that would enhance the new paradigm in development of farmers. It is important to note that central to these future research activities is the involvement of M and D students who are currently working on empowerment of woman in rural areas through water use security and agricultural skills training for gender equity and poverty reduction in North West Province, water use productivity associated with appropriate entrepreneurial development paths in the transition from homestead food gardening to smallholder irrigation crop farming also in the North West Province.

He has travelled to more than 30 countries in the world addressing different fora on different issues of agricultural extension through several travel and support grants. He is a reviewer to many journals namely: Journal of Agriculture and Social science Research (JASR), African Journal of Agricultural Research, Botswana Journal of Agriculture and Applied Sciences, Journal of Human Ecology, International Journal of Agriculture and Rural Development,

Journal of International Agricultural and Extension Education, Sustainability Science (Springer Publishers), Development in Practice and Journal of Biodiversity, India. He is a member of the following professional associations and societies: Agricultural Extension Society of Nigeria, National Association of Educational and Media Technology, Nigerian Rural Sociological Association, Agricultural Research and Extension Network O.D.I. UK, Farm Management Association of Nigeria, Agricultural Extension Research Society of Japan, Japanese Society of Tropical Agriculture, Working Group on Ecosystem Services Management and Valuation, Hokkaido University Japan, South African Society for Agricultural Extension, North American Colleges and Teachers of Agriculture Association, Association of International Agricultural and Extension Education and International Society for Horticultural Science. He is currently a Full Professor of Agricultural Extension and Director of School of Agricultural Sciences, North West University Mafikeng Campus. He is a devout Christian, with a fervent love for classical music. He plays the piano, Double Bass and Trombone. He is married to Mrs Folasade Oladele blessed with four children.