

TACKLING POVERTY, FOOD AND NUTRITION CHALLENGES IN NIGERIA: PARTICIPATORY RESEARCH AND EXTENSION APPROACHES

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Courtesies

The Vice- Chancellor,
Deputy Vice-Chancellor,
Registrar,
Deans of Colleges,
Professors,
Directors of Various Units,
Heads of Departments,
All Academic Colleagues,
All members of Administrative and Technical Staff,
The Royal Highnesses,
My Lords Spiritual and Temporal,
Distinguished Invited Guests,
Gentlemen of the Print and Electronic Media,
Great Kings and Queens,
Ladies and Gentlemen.

Preamble

I give glory to God Almighty for sparing my life till today and giving me a profession, “The First and Foremost God-Given Profession” – A-G-R-I-C-U-L-T-U-R-E. More importantly I give Him all adoration for giving me a specialization in agriculture which is the custodian of other disciplines namely, A-G-R-I-C-U-L-T-U-R-A-L E-C-O-N-O-M-I-C-S. It is the discipline that provides the litmus test for economic feasibility, socio acceptability, long sustainability, environmental manageability, location adaptability, cost-wise affordability,

timely availability constraint- removability of technologies developed by technical scientists in agriculture.

This public Lecture is the FOURTH in the series at Landmark University, the second from the College of Agricultural Sciences but the FIRST in the Department of Agricultural Economics and Extension.

Table 1 shows the list of the Public Lectures so far presented.

Table 1: Public Lectures at landmark University

Serial Number	College	Department	Date	Name	Title
1 st	Agricultural Sciences	Crop and Soil Science		Prof. Olusola Agbede	Assessment, Development and Conservation of Soil Fertility : Key to National Food Security
2 nd	Science and Engineering	Biological Sciences		Prof. Olugbenga Owa	God, Food, Earthworm and Your Health
3 rd	Science and Engineering	Physical Sciences		Prof. Raphael D. Olarinoye	Science and Technology Education in Agricultural Revolution
4 th	Agricultural Sciences	Agricultural Economics and Extension	19 th May 2015	Prof. James O. Olukosi	Tackling Poverty, Food and Nutrition Security in Nigeria: Participatory Research Approaches

Vice- Chancellor sir, I count it a great honour and privilege to be called upon to deliver this public lecture. It is a testimony of God's faithfulness in my life.

It could not be by chance that when I finished my first degree in 1968 at Ahmadu Bello

University Zaria that my first assignment was to come and conduct a socio- economic survey of two villages in Omu Aran Area. How come that 43 years later the Lord brought me back to Omu Aran to continue my academic life at Landmark University? Who could have thought it possible 43 years ago that a university of this magnitude will be located at Omu Aran. It can only be God!

Vice- Chancellor sir, I do not take my appointment at Landmark University for granted. It is divine arrangement and I am determined to put in my best to see to the growth of this citadel of learning.

The title of this lecture is predicated on four verses from the Holy Book.

1. Deuteronomy 32:30 reads, “How should one chase a thousand, and two put ten thousand to flight.....”
2. Ecclesiastes 4: 9 reads, “Two are better than one, because they have a good reward for their labour.....”
3. Matthew 26!! Reads, “For ye have the poor always with you.....”
4. Galatians 2:10 reads, “Only they would that we should remember the poor,.....”

I therefore titled this lecture, “ TACKLING POVERTY, FOOD AND NUTRITION CHALLENGES IN NIGERIA: PARTICIPATORY RESEARCH AND EXTENSION APPROACHES”

I will like to discuss my Lecture in the following order:

- What Is Poverty, Food And Nutrition Security?
- The State of Poverty, Food and Nutrition Security In Nigeria
- What Are The Agricultural Challenges For Poverty, Food And Nutrition Security?
- Scientific Options For Tackling Agricultural Challenges Facing Food And Nutrition Security Attainment
- Brief History of Agricultural Programmes and Research Development in Nigeria for Tackling Poverty, Food and Nutrition Insecurity

- Impact of Agricultural Programmes on Poverty, Food and Nutrition Security
- General Lessons Learnt From Previous Efforts
- Participatory Approaches: A Way Forward
- Some of My Contributions In Participatory Research and Extension
- Summary and Conclusion
- Recommendations for Landmark University Agrarian Revolution Mandate
- Acknowledgement
- References

I. INTRODUCTION

Poverty is a phenomenon found not only in Nigeria but all over the world. The poor will always be with us says the Holy Book in Matthew 26:11. The same Holy Book in Galatians 2:10 says that we should remember the poor. Therefore we must try our best to face the challenges of poverty. In order to address the issues correctly in this lecture it is necessary to hear from the poor the various ways they perceive poverty and food security since they are ones who know where the shoe is pinching most,

II. WHAT IS POVERTY, FOOD AND NUTRITION SECURITY?

A poor woman from Moldova (1997) said:

“Poverty is pain; it feels like a disease. It attacks a person not only materially but also morally. It eats away one’s dignity and drives one into total despair.”

Food insecurity means that the person or his household does not have access to adequate food, at all times, for the maintenance of a healthy and active life. This definition has different aspects:

- (i) *Access to food* refers to the ability of the person or his household members to procure

food not by begging but through their own production, purchases, bartering or gathering and hunting from the forest and the wild.

- (ii) *Adequate* food means quality of food in terms of variety and diversity of food items used in meal preparation and the nutrient composition of accessible food items.
- (iii) Adequate quantities imply having enough to satisfy food and nutritional needs of different members of the household.
- (iv) *At all times* implies the accessibility throughout the year without fluctuations in the daily meal frequency and in quality of the diet served as the year progresses.
- (v) *Maintenance of health and active life* implies that there is no sign and indication of ill or poor health because of inadequate food intake in any member of the household concerned. There should be continuation of an active and productive life by adult members of the household in particular.

It can be deduced from the above points that POVERTY CAUSES FOOD INSECURITY.

These points indicate that the food unsecured person and his household may not have the ability to produce enough food to eat. He may not be able to buy if he does not produce. If he resorts to gathering from the forest and the wild, it is a sign of food insecurity due to poverty.

The poor person may be eating food of poor quality which is nutritionally deficient. Therefore food security cannot be separated from nutrition. This is because the person may not be eating enough varieties of food to meet body nutritional requirements. Actual quantities eaten may not be enough to satisfy his needs. The food may not be available at all times throughout the year. This may result in eating only once or twice a day as rightly put by a 10-year old girl from Gabon (1997):

"When I leave for school in the morning, I don't have any breakfast. At noon there is no lunch, in the evening I get a little super, and that is not enough, so when I see another child eating, I watch him, and if he doesn't give me something I think I'm going to die of hunger".

Another poor, food insecure man from Vietnam (1999) said:

"In the mornings, eat sweet potatoes, work. At lunch, go without. In the evenings, eat sweet potatoes, sleep".

From Ukraine (1996) a poor, food insecure man said concerning his wife:

“Often she has to decide who will eat, she or her son”.

You are poor and food insecure:

If you are not eating to your satisfaction.

If you are eating the same type of food day after day;

If you are not eating at least two or three meals a day;

If you are going 0-0-1 or 0-1-0 or 1-0-0;

If you are foregoing food for your children, wife or husband;

If there is no fish or meat or egg in your soup;

If you are cutting down on the quantity of food today because of tomorrow.

Nigeria must fight food insecurity because lack of adequate food for a long time can cause malnutrition, underweight, stunting, marasmus, kwashiorkor in children and faster rate of ageing in adults. Disease resistance in the body goes down fast and one is prone to attack by disease pathogens. If the above situations are not arrested, death can occur.

Secondly, poverty and food insecurity can lead to low self-esteem and the will to self-actualization. The person affected may no longer be able to lead a life worthy of human dignity.

Thirdly, whoever is poor may not have access to the material things of life such as good drinking water, good sanitation, good educational opportunities, health care, productive assets, economic infrastructure and ability to participate in decision making process. Poor people find themselves behaving in certain ways they themselves cannot understand. They tend to blame everything going wrong with them on other people who they consider are better-off. They tend to feel unloved and uncared for by those that they feel can help them. They feel despised, humiliated, depressed, dejected, unseen by the rich and can become deviant.

Listen to these voices of the poor:

"The authorities don't seem to see poor people. Everything about the poor is despised, and

Above all poverty is despised"

A poor woman, Moldova 1997.

"Poverty is humiliation, the sense of being dependent, and of being forced to accept rudeness, insults, and indifference when we seek help" - Lavita, 1998.

"We poor people are invisible to others. Just as blind people cannot see, they cannot see us - Pakistan 1993.

Fourthly, the lack of these resources and rights can lead to a state of powerlessness, helplessness and despair. Hear what this poor man from Kenya said:

"Don't ask me what poverty is because you have met it outside my house.

Look at the house and count the number of holes in the roof

Look at my utensils and the clothes that I am wearing

Look at everything and write what you see.

What you see is poverty".

The person or group of persons living in poverty and food insecure situation can lose the ability to protect themselves against economic, social, cultural and political discrimination and marginalization. Listen to a poor man in Niger (1996):

"The rich are those who are able to save and sell part of their harvest when prices rise",

Another poor man from Ghana (1990) said:

"For many of the poorest villagers, there are no alternative

Sources of loans and in certain circumstances we have

No choice but to accept the exploitative terms of the

local money lenders".

A poor man from Kenya (1997) said:

"Water is life, and because we have no water,

Life is miserable".

A poor man from Brazil (1995) said:

"The poor person has to exist so he can serve the great one, the rich. God made things like that",

A poor man from Georgia (1997) said:

"Poverty is lack of freedom, enslaved by crushing daily burden, by depression and fear of what the future will bring"

This predicament can lead to desperation and helplessness and in turn produce violence, high rate of robbery, theft, thuggery and other deviant behaviour. Poverty can go beyond want to include defenselessness and insecurity, vulnerability and exposure to risks, shocks and stress.

The final outcome of poverty and food insecurity in the economy is scaring and therefore calls for urgent attention. Poverty affects an individual psychologically and certainly cannot allow an individual perform at his best. A poor person is a hungry person. "A hungry person", they say, "is an angry person".

III. THE STATE OF FOOD AND NUTRITION SECURITY IN NIGERIA.

Even though Nigeria has the potential for surplus, it has instead become one of the world's largest importers of food, especially of wheat and rice. In 2010, the import bill for rice alone was \$1 billion. The author participated in an FAO Food Security and Nutrition Survey of 1,718 households in Kano State in 1994. About 80% of this sample was found to be food insecure. Forty-six percent of these households were temporarily food insecure, while 34% suffered from chronic food insecurity. Among the 918 children aged 1 – 5 years from the 1,718 households appraised, 13% of these children were severely malnourished, 23% were at risk of being malnourished. About 70% of the malnourished and at risk of being malnourished came from the poor, food insecure households.

This is just an example of the severity of the food insecurity in Nigeria which is particularly more severe in the northern savannah zone of the country. The situation is not much different today because in spite of government efforts to tackle this problem the recent world economic crisis has set in to counter previous achievements of past interventions.

The situation may worsen if further serious policies are not put in place.

IV. WHAT ARE THE AGRICULTURAL CHALLENGES FOR FOOD AND NUTRITION SECURITY?

Needless to say, there are numerous challenges facing the attainment of food and nutrition security in Nigeria. These can be classified into production, processing, marketing, distribution and consumption aspects.

A. Production Challenges

i. Input supply challenges

- Lack/insufficient /inadequate supply of improved farm inputs e.g., seeds, fertilizers, chemicals, etc. is a major problem.
- Adulteration of available farm inputs e.g. chemicals, herbicides, fungicides, insecticides.etc How do we ensure that these inputs are pure and unadulterated?
- High cost of inputs is also a biting issue. How do we bring down the prices to manageable levels for the producers and other stake holders?

ii. Low productivity

- unavailability of improved technologies leading to low yield per hectare
- low soil fertility

iii. Land ownership and tenure

- land is communally owned
- land fragmentation not amenable for large scale farming
- family land not usable as collateral

iv. Credit challenges

- Production Risks
- Market and Price Risks
- Inadequate insurance coverage
- Collateral limitation

- Cumbersome procedures
- High interest rate

B. Processing Challenges

i. Improved processing technologies

- unavailable
- unaffordable (high cost)
- sometimes inappropriate
- Non-suitability to environment
- Lack of technical know how
- Lack of infrastructural facilities
-

ii. Credit challenges

(As mentioned above under production)

iii. Non-availability of year round raw materials

C. Marketing and Distribution Challenges

- Poor pricing of farm produce as a result of small production by individuals
- Remoteness of farms to markets and processors
- Absence of organized marketing groups at both local and national levels
- Farmers are not organized to take advantage of economies of scale. High cost of production and transportation because farmers act as individuals
- Processors have no out grower schemes ie. No linkages between producer and processors
- Low advocacy
- Short shelf life of some raw produce
- Lack of / poor standard and quality control
- Absence of reliable and guaranteed price (high price fluctuations)
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- Poor market intelligence
- Non-availability of supply and demand information about raw and processed

products

- General poor market information
- Poor linkages between producers, processors, marketers and consumers

D. Consumers' Challenges

- inadequate information about products being purchased
- product adulteration
- lack of standard weights and measures
- No consumer protection against fake products
- Inadequate storage facilities lead to spoilage of products so that little purchases can only be at a time.

E. Public Sector Challenges

- inadequate funding (sector, research, training and extension)
- Weak/poorly implemented policies

F. Infrastructural Challenges

There are infrastructural needs for agricultural transformation that can lead to reduction in food insecurity. These can be considered from the physical, social, institutional, and farm structures points of view.

- Physical infrastructures are defined here to include
 - i) Transportation systems such as feeder roads, access roads, railroads, bridges, ferry services, boats, ports, footpaths.
 - ii) Processing facilities such as public processing facilities, machinery, equipment, buildings etc.
 - ii) Communication systems such as rural telephone services, postal agencies etc.
- Social rural infrastructures include
 - i) Health facilities such as hospitals, dispensaries, maternity/ health centres etc.

- ii) Education facilities such as primary schools, secondary schools, technical schools, vocational schools, adult education facilities etc.
- iii) Rural utilities such as rural electrification/power supplies and water supplies. The adequate provision of these services will tend to raise productivity and stem the rising rural urban drift.

- Institutional Rural Infrastructure

We define these to include:

- i) rural organizations such as cooperatives, farmers' unions
- ii) Rural based projects such as community projects etc.
- iii) Financial institutions such as credit societies, banks, government credit institutions
- iv) Agricultural research facilities such as research substation, experimental-outlying farms, schools of agriculture, demonstration plots
- v) Agricultural Extension Services
- vi) Crop-animal production-control-grading services
- vii) Soil conservation services
- viii) Crop and livestock insurance coverage

- Rural Farm Infrastructures

These we define to include:

- i) Storage facilities such as silos, warehouses, go-downs, farm bins, open-air storage facilities
- ii) Irrigation water facilities such as dams, irrigation canals and tributaries, bore-holes, drainage systems etc.
- iii) Land clearing and preparation systems
- iv) Farm inputs supply systems such as seeds, fertilizers, pesticides
- v) Farm roads improvement facilities

V. SCIENTIFIC OPTIONS FOR TACKLING AGRICULTURAL CHALLENGES FACING FOOD AND NUTRITION SECURITY ATTAINMENT

From the enumerable challenges stated above it is paramount that different stakeholders play their roles in order to tackle them. It is very evident that the governments at various levels have done and are still doing a lot to combat the menace of food and nutrition insecurity. However, a Yoruba adage says, “If lice are not completely eradicated from the cloth blood will not stop staining the nails”.

The food security challenges require a multi-dimensional approach. The following suggestions are therefore meant to complement and improve on the strategies so far in place by soliciting collaboration between the various stakeholders and others not here mentioned. The roles of the various stakeholders are hereby identified and discussed.

A. Role of The Public Sector

The public sector is responsible for creating an enabling environment for agricultural business from production to consumption to thrive. This task rests on the shoulders of the Federal, State and Local Governments who must work together in a participatory manner.

The three tiers of government need to invest heavily in addressing the key issues enumerated above that are currently hindering the sector.

They are expected to perform among others the following roles:

1. Public Research

It is now glaring that for Nigerian government to provide enough food for our growing population, enough funds must be channeled to our research institutes and universities engaged in biological research, namely in areas that will provide our researchers with adequate technological tools to meet the challenges of food security. Emphasis must be placed on the new opportunities offered by biotechnology in the contextual framework of prevailing agro-ecological constraints; namely drought, deforestation, advent of diseases and pest etc.

- The government should fund more research work on value chains of various crops and invest strongly in agricultural educational and research institutions.
- The government should set up policies that will use the value chain approach in conjunction with the research institutes to identify agricultural products that can be mapped out for promotion. The banks can finance such promising value chains.
- Research effort should be intensified at developing new industrial products from the raw produce and continuously enforcing and encouraging local content utilization in the relevant industries to stimulate demand.

Some cases in the past that have been successfully researched into include

- i. The addition of sorghum flour to wheat flour to produce some recipes including bread by the Institute of Agricultural Research Samaru (Fig.1)
 - ✓ Nigeria is the largest producer of food sorghum and
 - ✓ 95% of the sorghum grown in Nigeria is for human consumption
 - ✓ More than 50% of Nigerians eat or drink foods and beverages made from sorghum daily.
 - ✓ This effort has resulted in production of large quantities of sorghum across the country after the ban on malted barley in 1988 as an alternative malt source.
 - ✓ It resulted in linking Sorghum Farmers Groups to Markets (Guinness supplied foundation seed of ICSV-400, and SK 5912 from IAR and fertilizers to farmers)
 - ✓ It increased production of available varieties of sorghum
 - ✓ It led to the identification of final buyers (11,000mt by NBL in 2006)
 - ✓ It led to the creation of job opportunities - farmers and others
 - ✓ Increased income for small scale farmers
 - ✓ Regional Production Coordination (RPC) were developed

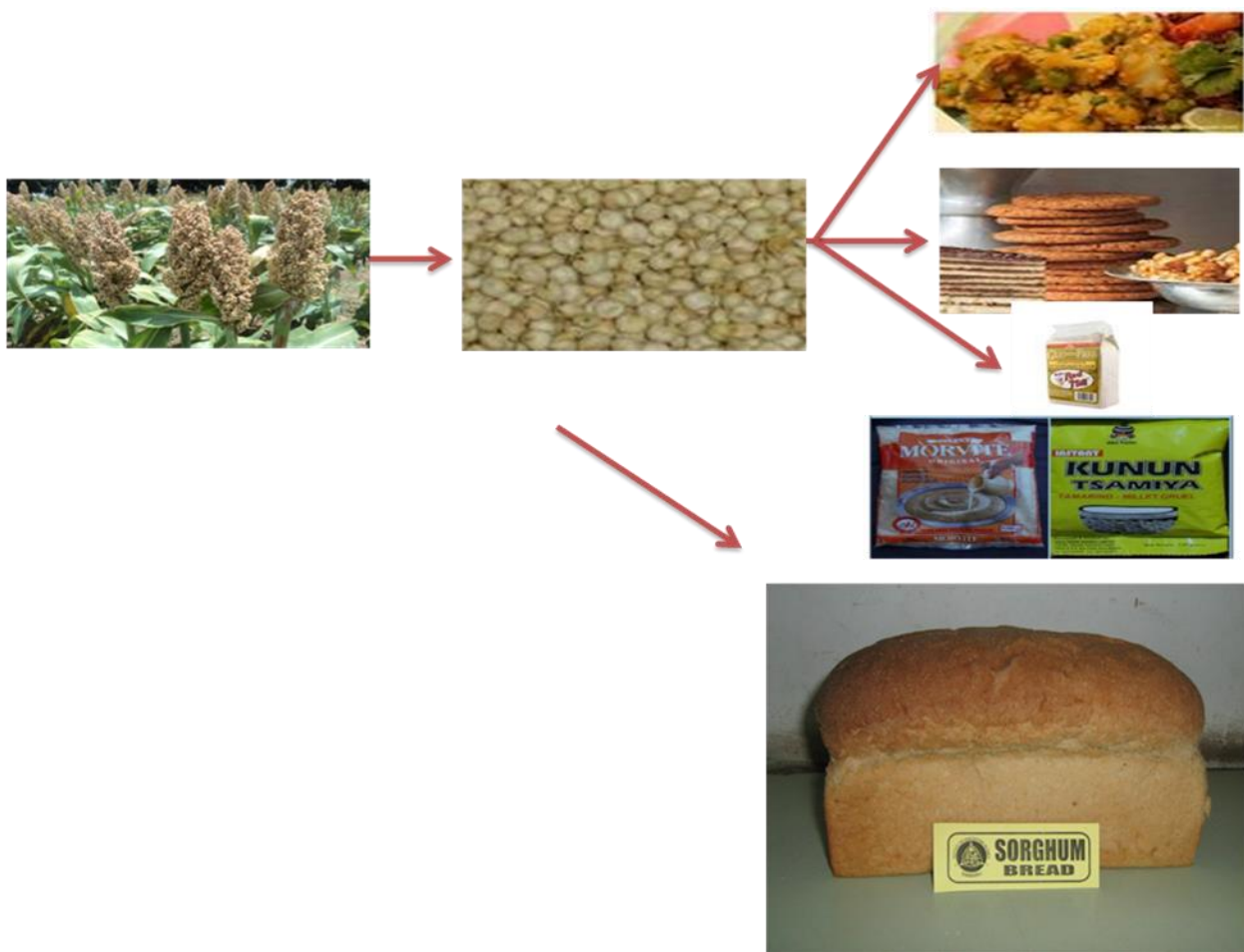


Figure 1: Sorghum recipes including bread

- ii. The present government of President Jonathan is promoting the addition of 20% cassava flour to 80% wheat flour to produce bread.
- iii. Cocoa bread is also developed at Cocoa Research Institute of Nigeria (CRIN) Ibadan
- iv. Cashew bread was also developed by Professors A. O. Aduku and J.O. Olukosi (formerly both at Ahmadu Bello University, Zaria).

The implication for scientific intervention is to pursue this type of initiative in the areas of crop and animal research strategies from three different angles namely: introduction/breeding, protection and biotechnology.

Crop biotechnology is the latest revolution in agriculture and it comprises the following major areas of modern plant biology: Molecular Genetics and Plant cell and tissue culture.

The conventional methods used in Nigeria for disease diagnosis involve visual observation of

disease symptoms and determination of pathogen specialization through inoculation of differential cultivars. Immunoassays (involving the use of polyclonal or monoclonal antibodies as probes) and nucleic acid-based hybridization assays (which use DNA or RNA as probes) are the molecular probes that greatly facilitate disease detection and management process.

In conventional crop breeding, promising lines are identified only by their phenotypes. Apart from being time consuming, conventional breeding is also capital and labor intensive. Innovative breeding techniques, like molecular marker-assisted breeding, are required to break through. Marker-assisted screening is a rapid indirect method of detecting promising lines based on a certain banding patterns of linked molecular markers. Apart from increasing the accuracy and rapidity of screening promising lines for agronomic traits, marker-assisted selection is also of immense importance in the attempt to incorporate desired genes of wild exotic species into food crops that lack them.

Genetic engineering of crops is another tool of molecular genetics which involves, among other things, the exploitation of some species of Agro-bacteria to incorporate desired genes into food crops. Transgenic food crops with resistance to herbicides and insect pests are now in commercial use in most developed countries. Nigeria might benefit from genetic modification of crops by selecting and introducing transgenic crops that fits its demands. However, compulsory biosafety measures must first be in place.

Plant Cell and Tissue Culture

This is another technique of biotechnology that is often exploited for:

- The production of haploid plants through microspore culture
- Recovery of disease-free plant materials
- The rapid development and selection of desired traits by cellular breeding
- Hybrid rescue through Embryo culture
- Somatic hybridization through protoplast culture
- Micro -propagation of elite genotypes and conservation of exotic germplasm

All these opportunities, which plant cell and tissue culture offer, are yet to be fully exploited in Nigeria. Unlike the techniques of molecular genetics, tissue culture technologies could easily be transferred to Nigeria and adapted by conventional breeders.

The immediate major task, therefore, is for the government to invest heavily towards the training of enough specialists in the field of crop biotechnology and creation of well-equipped modern biotechnology laboratories at the various national agricultural research institutes of Nigeria. Available statistics in the USA and Canada show that extremely high social rates of returns of biotechnological research justify public investment. Nigeria cannot be an exception.

2. Land Tenure Policy

There is need for consistent effective land tenure policy that enhances growth in the value chain of products that will promote food security.

3. Support Services

Profitable value chains should be supported by services that allow the chains to grow. The range of services that can add value and strength to a value chain is vast. These include input supply, market information and product development support, business management and consulting, transportation and logistics, quality assurance, skills, extension and training, veterinary services, credit and other financial services.

4. Trade policies and Export Promotion

Trade policies that enhance the growth of value chains must be put in place by the government. Export promotion must be the focus of the government to generate revenue to support the food security initiatives.

5. Incentives to Financial Institutions

Incentives need to be provided for financial institutions, especially banks and insurance companies to support the private sector that get involved in the food security initiatives

6. Ensuring strong and effective extension support

Government should ensure strong and effective extension services and agriculture development programmes at the local levels.

7. Provision of adequate infrastructures

Government should provide adequate infrastructure especially feeder road networks and consistent and affordable electricity.

8. Setting Grades and Standards

9. Linkage Roles

The government should be responsible for initiating linkages between the various stakeholders.

10. Government regulations on domestic trading, regional and international trade policies should be put in place to favour food security initiatives.

11. Market information systems should be initiated by and sustained by the government on major processors and users of farm produce and its products.
12. Payments of premium prices for quality produce in the market. should be paid by government. This could be facilitated with the establishment of Commodity Exchange Market in Abuja.
13. Ban on importation of some key food items like rice, maize etc, should be instituted by government to encourage local production.

B. Role of some Government Agencies

- i. Role of NAFDAC
NAFDAC should ensure food safety along the value chain to make our processed farm products internationally acceptable.
- ii. Role of Standard Organization of Nigeria(SON)
SON should publicize the standards for farm produce and enforce compliance to make our raw materials and manufactured farm products comply with international standard.
- iii. Abuja Commodity and Security Exchange in collaboration with SON should publicize the standards for farm produce and enforce compliance.
- iv. Nigeria Export Promotion Council should be more aggressive in seeking export markets for our farm produce so that efforts can yield more dividends.
- v. Home Management / Home Economics Agencies at all levels should create awareness and train extension agents in the implementation of food-based interventions to improve food security and nutrition.

C. Role of The Private Sector

- If agriculture is recognized as a key business sector in Nigeria and like other sectors, it requires the engagement of the organized private sector across critical value chains.
- The sector presents tremendous opportunities for the emergence of small and medium-sized enterprises which can create value and jobs across critical value

chains.

- The private sector can provide financing, support systems—including equipment, processing, transportation, distribution and marketing support.
- Advocacy for common interest of the sub-sector can also be done by the private sector

i) Role of Farmers

- Farmers should do some processing before selling since processing adds value to farm produce. Their activities should include among others proper cleaning, sorting and use of correct packaging.
- Farmers should form cooperatives and do group marketing
- Farmers should use their cooperative power to seek production, processing and marketing information e.g. where is surplus, where is there demand and what prices prevail at these locations and for which products?
- Establishment of community processing and storage centres as done in NSPFS for some commodities are needed to complement small scale private warehouses and processors to increase shelf life and value.

ii) Role of processors

- Processors should organize out-growers schemes as was done by old NTC and Cotton industries
- Processors should pay special prices to farmers supplying direct to the processing sites to take care of transportation and risk of delivering.
- Ensure compliance with government regulations on percentage of local content and health matters.
- Pay premium prices to farmers for quality produce.

D. Political Will and Commitment

Many of the recommended policies are actually not new. What is needed is the commitment and political will of all the stake holders. Stability in

government policies is essential to achieving food security because constant changes do not bring desired results. Irrespective of the political party in power there must be consistent, continuous and permanent commitment to food security attainment.

E. Promoting Growth of Agribusiness for Attainment of Sustainable Food and Nutrition Security

These are suggested eight strategies:

1. Provision of industrial incentives through tax rebates, depreciation allowances, tariff concessions and financial guarantee system through formal credit markets
2. Provision of industrial facilities and infrastructure.
3. Governmental provision and funding of industrial training and research
4. Re-invigoration of beneficial investment opportunities e.g. Nigerian Bank for Commerce and Industries (NBCI)
5. Promotion of import substitution strategies designed to raise the productivity of specific crops.
6. Adoption of export strategies for the processed products of certain such as palm oil, groundnut oil, soyabean oil, corn oil, coconut oil .
7. Adoption of small farmers' contractual production designed to facilitate adequate supply of agribusiness raw materials
8. Organization of agribusiness on the principle of comparative advantage and ecological specificity.

VI. BRIEF HISTORY OF AGRICULTURAL PROGRAMMES AND RESEARCH DEVELOPMENT IN NIGERIA FOR TACKLING FOOD AND NUTRITION INSECURITY

The agricultural intervention programmes are hereby considered under the following: time periods:

1. The Colonial period (1861 -1951)
 - 1899 - BCGA establishment

- 1912 - Department of Agriculture establishment
- 1914 Nigerian Veterinary Department established
- 1913- 1921 – World War I period (stagnation)
- 1924 – Vom laboratory established
- 1927 – Stock Farm established
- 1920s & 1930s – The Faulkner Strip Layout
- Late 1930s –early 1940s – intensification of
 - research activities and extension and
 - training programmes
- 1941 – Fisheries Development Branch established
- 1939 -1945 –Second World War
- 1947 – West African Institute of Trypanosomiasis (WAITR)was established
- 1950 – Exotic Breed of Cattle introduced

2. The Internal Self Government period (1951-1960)

3. The Post-1960 periods

- The 1962-1968 development plan was Nigeria's first national plan.
This very important exercise was carried out without adequate data.
- Among several objectives, it emphasized the introduction of more modern agricultural methods through farm settlements, co-operative (nucleus) plantations, supply of improved farm implements (e.g. hydraulic hand presses for oil palm processing) and a greatly expanded agricultural extension service.
- Some of the specialized development schemes initiated or implemented during this period included:
 - Farm Settlement Schemes; and
 - National Accelerated Food Production Programme (NAFPP), launched in 1972.
- There were also a number of agricultural development intervention experiments, notably
 - Operation Feed the Nation, launched in 1976;

- River Basin and Rural Development Authorities, established in 1976;
 - Green Revolution Programme, inaugurated in 1980; and
 - The World Bank-funded Agricultural Development Projects.
- While each of the above programmes sought to improve food production, the ADPs represented the first major practical demonstration of the integrated approach to agricultural development in Nigeria.
 - The experiment which started with World Bank funding the enclaved projects at :
 - Funtua (1974),
 - Gusau (1974) and
 - Gombe (1974),
 - blossomed into Ayangba (1977),
 - Lafia (1977),
 - Bida (1979),
 - Ilorin (1980),
 - Ekiti-Akoko (1981) and
 - Oyo-North (1982) Agricultural Development Projects.
 - Fadama I Project (1993 - 1999) .Following successful negotiations for multi-state agricultural development projects with the World Bank, 12 states of the country were covered namely:

Adamawa, Bauchi, Gombe, Federal Capital Territory, Imo, Kaduna
Kebbi, Lagos, Niger, Ogun, Oyo and Taraba.
 - Fadama II Project (2004- 2010). Following the success of Fadama I, it covered the 12 states mentioned above while six additional states benefitted from a different funding arrangement under African Development Bank
 - Fadama III Project (2009 to date). Following the success of Fadama II, it covers all the states of the country including Abuja Federal Capital.
 - In addition to these World Bank sponsored projects there are those sponsored by IFAD. Completed ones include:
 - Roots and Tubers Expansion Programme -1999
 - Sokoto State Agricultural and Community Development Project – 1992
 - Katsina State Agricultural and Community Development Project – 1990

- Artisanal Fisheries Development Project – 1988
- Multi-State Agricultural Development Project - 1985
- The years since the early 1960s have also witnessed the establishment of several agricultural research institutes and their extension research liaison services. Some of the major institutions are:
 - Institute for Agricultural Research, Samaru-Ahmadu Bello University
 - Lake Chad Research Institute, Maiduguri
 - National Cereals Research Institute, Badeggi
 - Institute for Agricultural Research and Training, Ibadan
 - National Root Crops Research Institute, Umudike
 - Cocoa Research Institute of Nigeria, Onigambari
 - Rubber Research Institute of Nigeria, Iyanomo
 - Nigerian Institute for Oil Palm Research, Benin City
 - Forestry Research Institute of Nigeria, Ibadan
 - National Institute of Horticultural Research, Idi-Ishin
 - National Animal Production Research Institute, Shika
 - National Veterinary Research Institute , Vom
 - National Institute of Trypanosomiasis Research, Kaduna
 - Nigerian Institute for Oceanography and Marine Research, Victoria Island, Lagos
 - National Institute for Fresh Water Fisheries Research, New Bussa, Kainji
 - National Agricultural Extension Liaison Services (NAERLS), Ahmadu Bello University, Zaria
 - Nigerian Stored Products Research Institute , Ilorin
 - Federal Institute of Industrial Research, Oshodi
 - Projects Development Institute, Enugu
 - Centre for Genetic Research and Biotechnology, Moor Plantation, Ibadan.
 - National Institute for Chemical Technology, Zaria

International Institutes include:

- ✓ The International Institute of Tropical Agriculture (IITA), Ibadan
- ✓ (iii) International Livestock Centre for Africa (ILCA)

- ✓ International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) Sub-station, Kano.

- The Federal Government Transformation Agenda (2011- 2015)

The objectives are to:

1. ensure food security and meeting the food needs of the nation;
2. enhance the generation of national and social wealth through greater export and import substitution;
3. enhance the capacity of value addition leading to industrialization and creation of employment opportunities;
4. ensure efficient exploitation and utilization of available agricultural resources;
5. enhance the development and dissemination of appropriate technologies for rapid adoption
6. achieve self- sufficiency in rice production;
7. achieve self- sufficiency in fertilizer production.

The agenda's four key measurable goals are:

- i. Fixing the fertilizer and input challenges;
- ii. Fixing marketing institution's challenges;
- iii. Fixing the financial value chains; and
- iv. Fixing the agricultural investment framework.

In essence the current government approach on food security seems laudable and recognizes the need to reach out to the poor at their level. However, we don't know whether the new APC Government will come up with a different agenda or continue in the same line of approach.

VII. IMPACT OF AGRICULTURAL PROGRAMMES ON POVERTY, FOOD AND NUTRITION SECURITY

On closer examination of the objectives of the projects enumerated above, there is none of them that directly addressed the subject of nutrition per se. None of them dealt with issues of nutrition among participants. The objectives were basically on improving productivity, income and provision of rural infrastructure like roads, better water etc. It is assumed, one would suppose, that the nutrition aspect would be automatically addressed if the participants have more to eat, spend and drink. However, experience has shown that adequate nutrition of household members may not necessarily arise from the improvement in the above expected outcomes. A study entitled, “Participatory Rural Appraisal on Household Food Security and Nutrition in Kano State” was sponsored by Food and Agriculture Organization (FAO) in Kano state in 1997. Participatory Rural Appraisal (PRA) of household food security and nutrition in the state was undertaken in three different agro- ecological zones of the state. Out of 1,718 households appraised about 80% were found to be food secure. Forty-six percent of these were temporarily food insecure households while 34% suffered from chronic food insecurity.

Out of the 948 children aged 1-5 years from the 1,718 households appraised, the mid-upper arm circumference (MUAC) measurement of 13% of these children fell in the RED ZONE(i.e. definitely malnourished) 23% of the children were in the YELLOW ZONE (i.e. at risk of being malnourished). Sixty-four percent were in GREEN ZONE (well nourished).

About 70% of the children in RED and YELLOW ZONES came from the poor food insecure households. Two points came out clearly from this finding:

- 1) More malnourished children came from the poor food insecure households
- 2) About 30% of the malnourished children came from the rich food secure households.

This second point is a cause for concern. Some of the household heads among the rich class definitely spend their income on purchasing luxury goods like cars without giving adequate care to their family consumption needs. They provide basic carbohydrate food sources and leave the women to fend for the other condiments containing protein and vitamins. They go outside and settle themselves to good meals in restaurants.

The effect of their wealth is not filtering down to the women and children in terms of

nutritional requirements. The impact on nutrition of women and children therefore cannot be substantial.

Nutrition aspects must be specifically built into these agricultural programmes for desired impact. This is buttressed by what Hillary Clinton, the US Secretary of State said concerning a new approach to nutrition:

“...we’re putting an end to the stove-piping that has long hindered our Government’s nutrition efforts. For years, experts have been saying that [nutrition] is a problem that must be addressed through a comprehensive response that unites experts and programmes from across different fields.

But for too long, the agricultural experts didn’t talk to the neonatal experts who didn’t talk to the early childhood experts.”

In order to maximize nutritional benefits from agricultural interventions the USAID’s Infant and Young Child Nutrition (IYCN) Project team brought together nutrition, agriculture, and other global health colleagues for a lively session at the Global Health Council’s annual conference on June 14, 2010. Within the context of vastly increased public- and private-sector funding for agricultural development, participants discussed the intersection between agriculture and nutrition and explored a nutritional impact assessment tool to help programme planners meet the vision of the many new initiatives addressing nutrition, global hunger, and food security.

According to the IYCN Project Technical Director, Dr. Tom Schaetzel, there is the need to build positive nutritional impact into agriculture and food security interventions. While food security is an important factor influencing nutrition, agriculture projects that focus exclusively on increased production and incomes may have little impact on food security and nutrition. In some cases, these projects can have a negative impact on the nutritional status of vulnerable groups.

Dr. Schaetzel, who presented a review of 35 years of agricultural projects to identify factors associated with improved food security and nutrition, and factors associated with reduced food security and worsened nutritional status, discovered that in order to maximize nutritional benefits and avoid a negative impact on nutrition, the design of agricultural interventions should focus on activities that improve nutrition and food security for the most nutritionally vulnerable groups,

particularly mothers, infants, and young children.

From literature search for Nigeria thus far, there has been little or no documented study that determined the impact of agricultural programmes on nutritional situation of particularly women and young children. There was a study proposed to assess the impact of Oyo North Agricultural Development Project (ONADEP) on the nutritional status of young children in the 0-10 year age group. The study was to generate nutritional data as yet unavailable in Nigeria, and was to provide an indication of the effects of structural adjustment and agricultural change on human wellbeing.

Specifically, the project aimed to compare the health and nutritional status of the target group in ONADEP and a non project area; identify barriers to good health and nutrition among children and mothers in the study area; and devise and promote means to improve nutrition and health of children in rural areas. The results would have served as a guide action and policy to improve nutritional status and maintain nutrition security of groups vulnerable to malnutrition. The project was to be an important component of a network of Centre-supported community nutrition projects in West Africa.

Unfortunately, due to lack of documentation of this project in the IDRC library, the results are not available.

Conclusion And Recommendation

- ❖ Due to little or no information on the impact of these agricultural development programmes in Nigeria on the nutritional status of women and children, one cannot but agree the more with Dr Schaetzel and Hillary Clinton that time has come for
 - Nigerian agriculture experts,
 - Nutrition experts,
 - Neonatal experts,
 - early childhood experts
 - and other relevant experts to come together to develop tools that will ensure that Agricultural Development Programmes make required impact on nutrition of men, women and young children.

VIII. GENERAL LESSONS LEARNT FROM PREVIOUS PROGRAMMES

The conclusion and recommendation highlighted in the concluding part of SECTION V proves a point. It emphasizes the need for collaborative research approach to combat the myriad of challenges of food and nutrition enumerated earlier. One would have expected that with the enumerable government programmes and projects enumerated earlier the food and nutrition issues would have become a thing of the past.

In addition, according to the Report of Technical Committee on the Review of Poverty Alleviation Programmes in Nigeria the following are the factors among many others that cause non-actualization of the programme objectives on poverty and food security:

1. Lack of adequate data for effective programme planning. The First National Development Plan of 1962 – 1968 was described by Stolper as “Planning Without Facts”.
2. Ineffective targeting of the poor. Previous efforts concentrated on the rich who could afford the necessary inputs.
3. Lack of back-up need assessment. Without first diagnosing the clients’ problems solutions would inevitably be at variance with their needs.
4. Absence of a framework for regular monitoring, evaluation and impact assessment.

This then leads us to the advocacy for the use of participatory approaches, the topic for this public lecture.

IX. PARTICIPATORY APPROACHES: A WAY FORWARD

Consider this episode:

The sorghum (guinea corn) breeder developed a variety called SHORT KAURA that gives a very high yield that is by far superior to the farmers’ tall farafara local variety. This is the history of Short Kaura development: Selection Trials took 4 years

Hybridization Trials took 3 years

On-station trials took 3 years

On-farms trials took 3 years

On-farm Adaptive trials took 3 years

Period taken to reach mass adoption stage took 16 years

At the adoption stage the farmers rejected the variety and went back to plant their own old tall farafara variety and commented thus:

"Thank you for the new variety. It gave us good yield but we prefer long stalked sorghum useful for making our thatched houses, homestead fencing, making fire for cooking our food and feeding our animals. More over the new variety is more difficult for our women to thresh."

Imagine all the resources committed to this project over a period of 16 years in terms of time, energy, monetary aspect etc! They have all gone down the drain! Why? This is because the scientist has worked alone tirelessly, devotedly and intellectually but failed to carry along the people for whom the technology was being developed.

Let us consider another interesting case. The case of a solar dryer developed by the agricultural engineer with funds from IDRC Canada with headquarters at Dakar Senegal. The dryer was reported effective at the on-station level by the engineer. We then, as Agricultural Economists, took the dryer out for on-farm testing at Abuja area. The farmers' comments were that the dryer was not fast enough to match the rate at which they bring home their produce from the farm for drying. Even though they would obtain better quality products free of impurities, they would prefer to have a device that will act both as a dryer and as a store. The device will be such that as they bring in their harvests on daily basis they would dump it in the dryer and with the assurance that it will also act as a store.

The engineer had no choice than to go back to the laboratory but the research funds had been exhausted. If the agricultural economists, other scientists and the farmers were involved from the project inception the socio economic factors would have been built into the design.

Take another example here in Omu Aran of a government project- the siting of Latinwo market in its present location. The government of those days observed that Omu Aran

needed a more adequate market place. Till date the place is not used as envisaged because sitting was done either with little or insufficient involvement of the people. The complaints are that i) It is far from the centre of town implying that traders would carry their merchandise by head portage. There were no town taxis, no town bus services and that time there were no okada riders. Market participants would have to convey their heavy farm produce through head loads to distances of two kilometers or more. The market was therefore called Latinwo.s market unused. It remains as government project till today. This is a pointer that any programme that does not involve the end users may remain government project and not the people's project. I believe we see many such unused markets in isolated bushy places throughout country the side

Participatory research approach basically advocates that various scientists from relevant disciplines come together and involve farmers (or the technology end users) right from problem identification to design of possible alternative solutions, developing and testing the various alternatives together and choosing the best workable options suited to the various environmental conditions. The farmers will then have a sense of belonging and can claim ownership of the technology. They can say, "This is our technology, not their technology".

X. SOME OF MY CONTRIBUTIONS IN PARTICIPATORY RESEARCH AND EXTENSION

A. Data Gathering to Stem "Planning Without Facts"

I have become an advocate of participatory research approaches not by choice but as an historic event. On graduation in 1968, I was invited by Professor David Norman, the then Head of Department of Agricultural Economics and Rural Sociology, Institute of Agricultural Research, Ahmadu Bello University, Zaria to join the department. There was general paucity of data concerning farmers' farming activities. At the time, majority of the scientists in agronomy, crop protection, soil science, animal science etc. were expatriates. They were conducting research on sole crops according to their own training in their own countries. When Professor Norman asked them what the yield of the various crops were on the farmers' field they were totally at loss. In other words they were doing research to improve the yield of farmers they did not know. Were the farmers growing crop as sole or in mixtures? The technical scientists did not know.

This issue of lack of data raised by Professor Norman was not unique to the north of Nigeria alone but other parts of the country. Paucity of data was a common problem during the preparation of the First National Development Plan of 1962-1968. The apparent lack of data at the farm level in those days was not only experienced in Nigeria but other African countries as well.

The Ford Foundation saw this need and was ready to sponsor socio- economic surveys into rural areas to amass data. Professor Norman therefore sought and received funding from the Ford Foundation for carrying out socio-economic surveys in the northern provinces of Nigeria.

1. Conventional Cost Route Method

Professor Norman conducted his own survey in Zaria Province. He sent Dr Goddard to conduct similar one in Bauchi Province and J.C. Fine covered Sokoto Province.

When I joined the department in 1968 as the first Nigerian staff he decided to send me to my own province, Ilorin Province, while another colleague Peter Ochalla was sent to cover Kabba Province.

As God would have it, I was sent to carry out the survey of two villages which differed in ease of communication to Omu Aran. Ipetu, which is 7 km south west of Omu Aran, close to Landmark University here, was chosen and another village, Odo Ore, which is about 32 km north west of Omu Aran. Each was chosen to represent two different ecological types, the forest area and the other derived savannah.

After a complete enumeration of the two villages 25 households were selected in Odo Ore and 30 households in Ipetu. The methodology was very tedious and painstaking. Each household member was interviewed twice a week for a whole calendar year finding out what operations they carried out, time taken for each operation, use of family labour, hired labour, tools and equipment, crops harvested, consumed, sold, quantities given as gifts, animals kept, their feeding regimes, number born, sold, consumed, mortality rate etc. Everything was recorded about the household members' off-farm activities and other occupations apart from farming.

The findings relevant to our topic of food security are:

- i. Farmers' management practices were consistent with both profit and food security objectives.
- ii. Farmers practised diversification as a means of combating risk and

uncertainty.

- iii. A total of 21 different crops were grown annually and each farmer on the average grew up to six different crops to ensure a variety of food sources for the family.
- iv. Farmers practiced mixed cropping as a rule rather than an exception devoting up to 70% of their cropped land to crop mixtures.

Reasons given for growing crops in mixtures are:

- a. More efficient use of labour, time and energy
- b. More output, more return, more food per unit of area (food security consciousness)
- c. More certain of some yield i.e. not all crops will fail in one year
- d. Tradition – way the fore fathers were doing things
- e. Best way to make use of fertile land throughout the year
- f. Beneficial effects of the crops on the other.

Returns were greater in crop mixtures than for sole crops upon which the scientists of those days concentrated their effort.

PROVIDE TABLE HERE

Lessons from the Conventional Cost Route Method

1. The research efforts of the technical scientists were not relevant to what the farmers were practising in the villages- sole cropping versus mixed cropping.
2. Food security is of greater importance to the subsistence farmer than profit making though the two are not at variance with farmers' practice.
3. Farmers will continue to diversify due to low level of income and crop rotations, clearing, ridging and weeding bottle-neck problems because of subsistence nature of farming. Therefore research must concentrate on a variety of crops than one or two
4. Research should concentrate more on mixed cropping, crop rotations and weeding bottle-neck problems.
5. From methodology point of view this type of socio-economic survey is very expensive, time and labour consuming.
6. Too much data were collected, some of which were never analyzed till today
7. This leads to delay in bringing solutions back to the farmers

8. A more cost effective method needed to be developed over time.

2. Sundeo Approach for Farm- Problems' Diagnosis

By the time I finished collecting data at Omu Aran early 1970, I had not finished the coding and analysis when my Ford Foundation scholarship came through for me to go for my M.Sc. degree at Kansas State University, U.S.A. I had to carry the data along with the aim of using the data for my thesis. When I finished my course work and took my data to the central computer centre at KSU the computer could not accommodate the data. It was too massive! I had to use other data for my thesis.

On returning to Nigeria in December 1972, I resumed the analysis of the Omu Aran data but my Head of Department (HOD) called me one day and said “James, the type of socio-economic study of Omu Aran area you conducted is being acclaimed the world over. It has earned me a lot of respect and I receive invitations from many countries and institutions for me to come and share my experiences. Since no one has ever repeated that type of study after a couple of years in the same location, I want you to go back to Omu Aran to repeat the study interviewing the same households.”

I came back to Omu Aran and repeated the study in Ipetu and Odo Ore in 1973 and 1974. On returning to Zaria fully I continued the analysis of the two surveys. Then the Ford Foundation scholarship came through for my Ph.D. at Michigan State University (MSU) U.S.A. so that I could use the two years' data for the Ph. D. dissertation. Low and behold, the data was too large for the then central computer centre at MSU. I could only use a part of the data for the dissertation.

On my return to Nigeria, my HOD said, “You know researchers are no more using this conventional, tedious, long period of data collection method? They now use shorter periods of 3 to 5 days in the field to diagnose problems on the farm, get what they need and come out of the field! They call it the Sundeo Approach
So you will go for training in this Sundeo Approach as soon as opportunity arises.”

The Sundeo approach required that a team of scientists comprising of an agronomist, animal scientist, agricultural economist, extension specialist etc visit the farms in a particular locality and diagnose the problems within a period of 3- 5days. Each scientist records data according to his/her

own field of interest. Within a period of ten days they compile their report and make necessary recommendations. These surveys are carried out three times a year, at the beginning, middle and end of the cropping season.

Having learnt the Sundeo approach we used it in conducting Diagnostic Surveys for many Agricultural Development Projects (ADPs) in the country like Kogi ADP, Imo ADP, Kaduna ADP, Benue ADP etc.

The diagnostic surveys formed the basis for the scientists' interaction with the ADPs. The problems identified are categorized into urgent, most urgent, pending etc. There are problems for which technologies already exist on the shelf. Those are given prompt recommendations. For those that need to be taken to the laboratory for on –station experimentation the scientists start to work on them. Such recommendation will take time to address.

Lessons Learnt from the Sundeo Approach

- a. It is cheap and less time consuming
- b. ADP staff get opportunity to learn with the researchers
- c. It foresters prompt attention while other actions will wait for the solution to be generated
- d. It is however extractive in that the farmers don't have opportunity to interact much with the outsiders
- e. It is extractive

3. Rapid Rural Appraisal (RRA) and Lessons Learnt

The Farming Systems Research normally goes through four phases, namely Diagnostic Survey Phase, On-Station Experimentation, On-Farm Research and Mass Adoption. The Diagnostic Surveys are conducted to identify constraints faced by farmers in a particular study area for the purpose of designing on-station and on-farm research to remove identified problems. A typical Diagnostic Survey could last anywhere between 5 and 10 days with farmers involvement and a multi-disciplinary team of research scientists.

Of recent, however, the Rapid Rural Appraisal (RRA) techniques seems to be gaining grounds. The first set of questions that come to mind are "What is RRA?" How does it differ from conventional Diagnostic Survey?" Some people claim that RRA is actually a new name for an old wine. Just as the Diagnostic Survey, RRA is used to avoid the problem of long and costly formal

surveys which most of the time result in collection of too much and/or irrelevant data, production of late and inappropriate results with too little/no participation by the local people. RRA is also used to help overcome the biases of meeting only the more accessible and well-to-do individuals and groups; looking for only quantitative apparent data while missing the more qualitative in-depth information and insights and also avoid dealing with the local population in a “top-down” manner. RRA investigates local insights to help obtain more effective research information.

The principles behind RRA include the involvement of local people to increase participation and empowerment; learning from the local classifications and terminologies. One other important principle of RRA is "Optimal ignorance" which is a deliberate attempt to limit the information collected. The range of circumstances can be explored rather than get a statistical sample. Each issue can be investigated in different ways and from different angles, to achieve what is called "triangulation".

An informal (iterative) approach which is changed as ones goes ahead is adopted. Learning is enhanced through inter-disciplinary teams of people from different backgrounds and with different areas of expertise working "in-the-fields"

The RRA approach provides a basket of choices of different techniques while any RRA exercise makes use of a particular combination of these techniques, depending on the available resources and desired out-put. The different techniques are:

1. *Secondary data review* which entails learning from existing official records, census reports, survey documents maps, photographs etc.
2. *Direct observation* of the conditions of agricultural practices, the people, the relationships, the problems etc.
3. *Semi-structured interviewing* with informal discussions based on a flexible checklist of topics. The individual or groups can be interviewed while only casual notes are taken.
4. *Group interviewing* which may be done to focus on investigating group interest.
5. *Diagramming* is used to help communication and learning. Maps, transects, seasonal calendars, flow diagrams, cartoons roughly drawn can help in understanding.
6. *Ranking* is used to investigate decision-making preferences and why people make choices can be done in ranking games. Wealth ranking in particular is a tool used for investigating

local perceptions of wealth and is a rapid way of stratifying the population.

7. *Games and role playing* such as adaptation of traditional board games (e.g. the Ayo board to investigate attitudes, strategies and preferences), futures possible (to find people's ideas for opportunities), and the Why? Game (to find people's perceptions of the root causes of problems). Informal dramas by the RRA team, or the local people, or both, for communicating and learning, and stimulating discussion.
7. *Stories and portraits* can be used as part of the report of RRA, recording interesting stories told during the interviews, and describing portraits of households with interesting or unusual situations.
8. *Workshopping* is used for brainstorming, analyzing and presentation sessions in the field or in the meeting room.

RRA has been used mostly in less developed countries but has also been used in the developed ones. It has been used mostly in rural situations in the agricultural field. It has been used to a lesser extent in urban situations and in other fields such as economics, health, nutrition, forestry and energy. It has been used in most cases at the village level but can also be used as large scale exercises.

The RRA approach can be used throughout a project cycle.

Exploratory RRA can be conducted when exploring an area to learn about the key problems and opportunities to help plan research or development projects.

Topical RRA is conducted when investigating one specific topic, question or problem.

Participatory RRA is conducted when involving local people in research and planning.

Monitoring and Evaluation RRA is used when monitoring and evaluating a research or development activity. *Conflict Resolution RRA* is used when dealing with conflicting differences between different groups.

The RRA approach is not without certain limitations. RRA techniques are complementary to other research methodologies. It might be necessary to use RRA in addition to other techniques. Although the RRA techniques may be rapid, the process of development is not. When participatory approaches are used local expectations may be raised and follow-up is necessary. The RRA techniques may not be cross-culturally transferable and may need to be adapted to local situations and for their appropriate uses, training of facilitators and participants is

essential. RRA produces questions, hypothesis, or best bets for development and usually not the final answers.

An example of how we used the RRA is shown below for the IDRC Solar Dryer Project. This is reproduced from the National Farming Systems Research Network Newsletter Number 8.

DETERMINATION OF SOLAR CROP DRYER NEEDS OF FARMERS USING THE RAPID RURAL APPRAISAL TECHNIQUE

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I. Introduction

A. The Problem:

Over 79% of the total crop production in Nigeria is grown during the rainy season between April and September. Due to the inadequate or nonexistent preservation facilities, prices of the crop commodities at local level have been observed in the field to fluctuate by at least 50% during the year. Most of these crops may require drying after harvest for short or long-term preservation.

The needs for grain-crop drying are more serious in the middle-belt and southern parts of Nigeria where ambient relative humidity is relatively high during the harvest season. This makes it extremely difficult to dry crops naturally in the field. A means of heating the relatively humid air artificially to permit drying of grains is therefore needed.

Ordinary traditional sun-drying is widely practised in drying various crops in Nigeria. Although

sun

drying requires little capital or expertise, it has many limitations and problems, including:

- i) Intermittent and irregular loss of moisture, and low rate of drying leading to high risk of spoilage by micro-organisms during the drying process,
- ii) High moisture content of the dried product due to low air temperatures and high relative humidities resulting in crop spoilage during subsequent storage,
- iii) Contamination by dust, sand and stones, infestation by insects and rodents, theft or damage by birds, animals and humans,
- iv) The need to move crops under cover in the event of rain and
- iv) The need for relatively large areas of land or surfaces to spread crops.

Due to nonexistence of alternative drying technology, over 95% of agricultural products are still sun-dried in Nigeria.

B. Objectives of the Solar Dryer Project

1. To develop design procedures for direct, Nigeria indirect and mixed mode solar dryers including energy storage by using the results of previous studies.
2. To design and lab test improved dryers using local materials and a more efficient collector.
3. To design and lab test dryer using heated chimneys and wind-driven fans on chimneys.
4. To field test the improved solar dryers in various selected localities in Nigeria and assess their socio-economic impact.
5. To disseminate the results of the study in Nigeria and other West African countries.

In order to guide the engineers in the type of dryers they should design, a Rapid Rural Appraisal (RRA) was conducted in Suleja area of Nigeria. The RRA approach was employed because of the necessity to fine-tune the researchers' knowledge of the drying needs in the area of study by actively involving the farmers.

In order to have ample time for the design and construction of the prototypes it was necessary to use a methodology that would lead to quick determination of the crop drying needs.

II. Methodology

The RRA team which was made up of two engineers, three socio-economists and two interpreters conducted the RRA between 19th and 22nd June, 1990. After the initial introduction to the Emir of Suleja, the team proceeded to conduct individual interviews in four that were found to be representative of the study areas (New Wuse for Abuja FCT, Kwaka and Dikko for Niger State and Jere for Kaduna State).

The objectives of the group and individual interviews are:

1. To understand the importance of crop drying in the domestic economy and food security situation in the study area.
2. To find out traditional systems of crop drying in the study area.
3. To identify crop drying problems faced and observed by farmers in the study area.
4. To identify with the involvement of farmers the crops needing improved drying techniques;
5. To determine the average quantities of products that require drying at a time for the purpose of guiding the design and construction of appropriate dryer sizes.
6. To determine the willingness and capabilities of farmers to invest in improved crop dryers individually or in groups.

The Check List is as follows:

- * Range of crops produced and relative importance
- * For each crop to prepare a calendar of operation
- * Crops consumed, sold and stored
- * Prices of crops variation during the year
- * Relative profitability of the various crops
- * Principal problems of production and utilization
- * Problems of drying each crop including time of drying, labour use and damage during drying.

II. Results

A Crops grown in order of importance

The most important crops grown by village are as follows:

KWAKA	NEW WUSE	DIKKO	JERE
Yam G. corn Maize G. corn Rice Red beans Soya bean Cassava	Yam Rice Maize G.nuts G.corn Red beans Cassava Sweet potato	G.Corn Maize Red Beans G. Nuts Yam Cassava Rice ----	Maize G. corn yam G. nuts Red bean Cassava Sugar cane ----

B. Greatest Problems with Drying

The crops that present the greatest problems as far as drying is concerned in order of importance:

KWAKA	NEW WUSE	DIKKO	JERE
G.nuts Red beans	Red beans G.nuts	Red beans G.nuts	Maize G.nuts

C. Months with greatest drying problems

The months with the greatest drying problems are July — October as shown in the Seasonal Calendar.

Seasonal calendar?

D. Production & Utilization Problems

1. Lack of land clearing equipment, tractors etc.
2. Lack of available fertilizer
3. Drying & Storage

Drying appears to be the third most important problem but drying problems will magnify as problem number (1) & (2) are solved. It was found that 50% of maize produced is sold while 80-90% of the red beans is consumed.

Groundnut is sold freshly cooked to prevent spoilage because farmers complain that groundnut loses flavour due to poor drying facilities.

Groundnut production could be expanded if drying facilities are improved.

E. Methods of Drying

The methods of drying crops found in the study area are as follows:

1. Drying crops in the sun in the open field, inside compound etc.
2. Smoking by hanging crops over cooking areas in the Kitchen
3. Hanging crops outside on trees, eaves of buildings
4. Piling them up in the field on stalks

F. Problems with Drying Methods

The present drying methods give the following problems:

- * Too slow: takes 2 — 20 days
- * Smoking darkens produce

- * Smoked crops fetch % the price of sun-dried grain in the market
- * Smoking is no more economical due to firewood cost
- * Smoking is not meant for modern buildings
- * Inconveniences of packing in and out till produce dries
- * Contamination very easy
- * Loss of quality, flavour, attractiveness, income
- * % loss of up to 5-30 for maize and red bean and 40% for groundnut.

G. Quantity to Dry at a Time;

1. To match the cropping pattern e.g. corn/maize mixture, maize must be removed early enough and dried. A farmer needs to dry 2 — 3 bags at a time.
2. An average farmer produces 5 — 20 100kg bags of maize, 3-5 100 bags of groundnut, 2-3 100kg bags of red beans and 2-8 100kg bags of rice.

H. Conditions to Dry Crops

Maize is dried in the unshelled condition while groundnut and red beans are dried in unthreshed condition.

I. Rate of Drying

Farmers would appreciate new drying methods that reduce length of drying periods from the present 20 days to 3—4 days.

J. Ownership Type Preferred

Farmers in all villages agree that their drying methods are inadequate. Some prefer individual ownership while others prefer group ownership. Some prefer that dryers are installed inside the compound while others prefer mobile types that can be carried in pick-up vans.

K. Types of Dryer Preferred

Farmers would prefer multipurpose dryers that can be used to dry as many different types of produce as possible. Dryers that are made of local materials and repairable by themselves would be much appreciated. The possibility of attaching dryer to their local (storage bin) would be very ideal.

IV. Implications Of Findings

The findings in the RRA have a lot of implications for the design of dryers and adoption of the technology by farmers. As much as the farmers want to see the options available in terms of size, nature of materials to be used, operations, efficiency etc. it will be worthwhile to expose them to various types of dryers suited to their local condition. It is difficult for them to decide how much they can invest in the dryer until they see, test and use the various options available. One hint is that the cheaper the dryer the more likely small scale producers can afford them while they should be made of materials that are locally available. It is also important that a multi-purpose type of dryer be introduced because each farmer produces a small quantity of various crops.

Combining storage with drying seems to have been suggested by the farmers. It would be far more convenient to just dump harvest in the *rhumbu* where it can dry without moving it up and down. The conversion of the local *rhumbu* to accomodate the drying process is highly recommended. While some farmers prefer mobile dryers which can be moved from one farm site to another by use of a pick-up van, others prefer to have them installed inside their compounds for security reasons and convenience of use and maintenance. Maintenance cost must be as low as possible while local expertise must be available to provide back-up services and spare parts.

There must be a trade-off between size and cost of the dryers. The higher the dryer the more expensive it would likely be. Since farmers prefer to dry their crops in unshelled/unthreshed conditions, the drying compartment would be much larger than when threshed to accomodate sizeable quantity of produce at acceptable thickness of drying layers or spread of the produce. The number of days needed to dry the crops must be drastically reduced from the farmers' 2 — 20 days to 2 — 4 days to accomodate other harvests. Since there is no electricity in the villages the natural convection types that would be able to dry 3 bags of produce at a time and be efficient enough to do so in two to four days are recommended. The modalities would need to be worked out for group ownership of dryers particularly where electricity is available the artificial dryers may be considered in addition to the natural convection types.

V. Problems and Limitations of Study

The first informant used though did his best in linking us with the administrative authorities had

problems with being concise interpreting questions and responses thus a lot of time was wasted. Two interpreters had to be used towards the end of the survey because there are two different dialects in the area of study. Women are not easily accessible and have to be interviewed in the presence of their husbands. They were usually very shy and answers were not freely, forthcoming. However, in general their answers were in confirmation with what their husbands reports. Every effort was made to avoid bias as the RRA was the first attempt for some of the team members especially the engineers.

VI. Conclusion

This study has established the need for an improved device for drying crops in the area of study. Researchers' previous knowledge about the crop drying needs has been fine-tuned by the use of RRA methodology. The villagers have expressed the willingness to invest in dryers with the aim of being able to dry their crops at a faster rate, obtain better quality products, fetch better prices for their products, able to expand farm size and obtain higher income. It is anticipated that the use of the dryers would reduce the inconveniences and losses encountered in the use of the traditional methods. Improved devices for drying would have wider acceptability among small scale farmers if they are made from local materials, maintainable by the villagers, cheap enough to attract investment, built for multipurpose crop drying, fitted into the existing traditional storage system and developed with adequate farmer involvement.

Lessons Learnt From RRA

1. RRA allows progressive learning
2. RRA is flexible, exploratory, interactive and inventive
3. RRA allows information to be collected with different methods, sources, and disciplines
4. RRA allows direct contact between investigators and local people in the field
5. However RRA is extractive
6. Knowledge of rural people counts but for outsiders' use

This last point leads us to the next level of farmer involvement called Participatory Rapid Appraisal

4. Participatory Rapid Appraisal (PRA) and Lessons Learnt

Participatory Rapid Appraisal is a newer concept developed from the RRA. PRA shifts the initiative from the outsiders to the villagers.

What then is PRA?

PRA in practice has three Foundations namely (1) Methods (2) Behavior and attitude and (3) Snaring.

The Menu of Methods

During the 80's more creative methods evolved. P.RA seems to pay more attention to semi-structured interview of individuals and interaction of outside team PRA empahsizes group discussions and diagramming by rural people and pays special attention to outsiders' behaviour, attitudes and interactions with them.

RRA and PRA Methods Include:

'Secondary data Review

- * Direct Conversation
 - *DO-IT-Yourself
- * Key Informant
 - Semi-Structured interviews
- * Group interviews and discussions
- * Sequences of Interview
- * Key Indicators
- * Workshops and brainstorming
- * Transects and group walks
- * Mapping, modeling and aerial photographs
- * Diagramming
- * Wealth Ranking
- * Other ranking scores
- * Quantification
 - * Ethno histories and trend analysis
 - * Time lines (chronologies of events)
 - * Stories, portraits and interactions
-] * Key probes
 - * Short simple questionnaires, (late in PRA process)
 - * Rapid report writing in the field

These methods enable the villagers to do the investigations, mapping, modeling, diagramming,

ranking, scoring, quantifications, analysis, presentations and planning by THEMSELVES.

Behaviour And Attitudes

The methods in themselves will NOT be effective if the approach is wrong. The approach depends on the ATTITUDES and BEHAVIOUR of the outsiders and their ability to facilitate the participation of villagers.

The apparent ignorance of rural people is the product of OUTSIDERS' ignorance of how to enable them express, share and extend their knowledge.

Attitudes needed for good rapport include:

- *Participation by the outsiders
- *Respect for the villager
- *Patience, wandering around, not rushing (i.e. no FLYING VISITS) and not interrupting
- *Humility
- *Materials and methods that empower villagers to express and analyse their knowledge.

Visual Sharing

Visual sharing is a common feature in PRA. Visual sharing of the maps, model, diagram or units by all present who can see, discuss, manipulate and alter physical objects is key to understanding.

Triangulation and cross-checking take place on the spot and learning is progressive.

The information is visible and public, owned and verified by participants.

Core Principles of PRA

The three core principles of PRA are:

1. Triangulation 2. Optimal Ignorance 3. Appropriate Imprecision

1. Triangulation

Triangulation is the introduction of two or more different points of view into the analysis so as to get more complete and more accurate picture of the situation.

A. Triangulating Team Composition should include:

1. Multi-disciplinarity

- variety of disciplines (social and technical scientists)

2. Women and Men

3. Diverse backgrounds and skills

- people's experience affects approach to problems
- variety of skills is also needed

4. Insiders and Outsiders (include both)

B. The study should include a wide range of view points, opinions to get understanding of all sides of the issues

The team should interact with INDIVIDUALS and GROUPS and HAVE a balanced section of:

- * men and Women
- * young and old
- * notables and "typicals"
- * ethnic groups
- * newcomers and old timers
- * professions etc

C. Triangulating use of tools and techniques:

- * Every tool has its own biases.
- * The more you diversify the tools the more you can offset the bias.
- * People can tell you one thing and you SEE another
- * A diagram may show you something that people are embarrassed to mention
- * Secondary data may suggest avenues for inquiry that respondents may forget to mention,

2. Optimal Ignorance

TIME is one of the most precious resources of PRA. Optimal ignorance is to remind the team

that "HE CANNOT AND SHOULD NOT LEARN and NEED NOT learn or know EVERYTHING in a brief field visit. The team must be willing to remain ignorant in some areas.

Spend time on THINGS which are most important to the topic. Checklist will help keep activities and interview on track. Always judge things to get the right balance.

3. Appropriate Imprecision

This is a subset of Optimal Ignorance. PRA is not suited to very specific, quantitative information. It is better at identifying trends, orders of magnitude. Appropriate imprecision reminds one NOT to spend time or energy getting information that is more precise than one needs, e.g. 1/3 of cowpea is lost in storage can be obtained through PRA while 33.50% of cowpea may have been found to be lost in storage using a qualitative technique which could have cost a lot than the PRA.

A few hints on BIASES:

You cannot eliminate bias, you can only minimize it. Caution should therefore be taken on these biases to try to minimize them:

1. Spatial Bias - locations favoured for projects may lead to tarmac bias
2. Seasonal Bias - include seasonal effect and ask for changes during the year
3. Wealth and Influence - tendency to meet the rich only should be avoided as well as being hosted by the rich?
4. Male Bias-include females
5. Politeness-Some cultures tell interviewers what they like to hear.
6. Expectations - If villagers perceive benefits to be associated with the project you want to bring, their answers will meet your expectations and lead to bias.

-Nodding in agreement to what the farmer says may encourage biases.

Lessons Learnt From PRA

1. The goal of PRA is to allow the rural people to do their own investigations
2. PRA allows the rural people to share their knowledge and teach us
3. PRA encourages the rural people to do their own analysis and presentations
4. PRA allows the rural people to plan and to own the outcome

5. Participatory Learning and Action and Lessons Learnt

As more and more emphasis were placed on community participation in research and development efforts it became obvious that farmers can also be resource persons from whom outsiders can learn. Learning therefore was considered a two-way traffic. The farmers and the outsiders can learn from each other. Participatory Learning became more important in addressing the problems encountered by the communities. Having gone the stages of learning together the action is taken jointly by the insiders and the outsiders.

Lessons Learnt from PLA:

1. Respect for rural people become more important such that they are given the role of the teachers rather than those that will be taught by the outsiders
2. The action stage becomes much easier to implement by the insiders because they own the outcome and the process
3. Learning is a continuous process for the two sides hence the insiders are now open to more learning to improve their lot
4. With support from the British Development Overseas (ODA later called DFID) some funds were secured to establish a network called Nigerian Participatory Rural Appraisal Network (NIPRANET). NIPRANET was a network that brought together scientist, extension workers, government officials farmer organizations and persons interested in the approach. The country was zoned into five- North West, North East, Middle Belt, South West and South East. I was the co-coordinator for the North West from 1996-2000. Regular workshops were held in the zones to train participants and to plan and deliberate on results of researches sponsored on the PRA. Platform.. . .

6. Indigenous Knowledge Systems in Agriculture (IKS) and Lessons Learnt

The write-up below highlights the basics of IKS. It is reproduced from the National Farming Systems Research Network Newsletter Number 11.

OVERVIEW OF IKS

BY

Dr S.O. Titilola, ARCIK Coordinator NISER, Ibadan

Dr J.O. Olukosi, NIRCIK Coordinator, IAR, Samaru

WHAT IS IKS?

Indigenous Knowledge (IK) is the sum of experience and knowledge of a given ethnic group that forms the basis for decision-making in the face of familiar or unfamiliar problems and challenges. Farmers of agrarian and industrialized societies have sophisticated ways of looking at the world. They have names for many different kinds of plants, ways to diagnose and treat human and animal diseases, and methods to crop fertile and infertile lands. This knowledge has accrued over many years and it is critical and a substantial part of the culture and technology of any society.

Indigenous knowledge is therefore native or local knowledge-knowledge that is unique to a given culture or society. It is the basis for agriculture, health care, food preparation, education, environmental conservation, and a host of other activities. Such knowledge is passed down from generation to generation, usually by mouth. IK has been institutionalized, built upon, and passed from one generation to the next.

Today IK is, however, facing a risk because of its oral tradition and introduction of new technologies. IK is often ignored by researchers and development workers. They are thought to be primitive, backward, culture bound and myths and irrational. This underscores the importance of IKS.

WHY STUDY IKS?

1. Nigeria has a valuable, largely untapped reservoir of indigenous agricultural and natural resources, experience and knowledge. IKS can be considered as a natural resource useful for development

2. By studying IKS it helps researchers to apportion respect to local people where it is due. It has been the experience of many people all over the world that the more researchers spend time with people the more they come to respect their knowledge.
3. Studying IKS will help us to minimize project failures because it may suggest alternative solutions or provide opportunity for blending IKS with outside technologies.
4. IKS will enhance participation and empowerment. Change agents and farmers can work as partners.
5. Faster rate of adoption and development will yield result. When farmers see genuine interest in their ideas, views and what they think by change agents, they give information readily and WILL LISTEN to them better.
6. Helps to change negative things in the tradition of people.
 - When you understand why people do what they do you will better know how to change them.
 - To ignore IKS is not only arrogant and wasteful but also counterproductive.
7. IKS should serve as a bench mark.
 - Starting with the basics.
 - Modifying, adding to and, building on knowledge.

WHERE TO START?

1. Bottom of the ladder.

From the basics by starting with what the farmers know. We should learn to crawl before running. - Just like many diagnostic surveys have been conducted the NFSRN network members are urged to embark upon widespread IKS documentation. There are several topics of interest on soils ,animal, agroforestry, fisheries etc.

3. Use of IKS for decision-making.

IKS may provide solutions to problems and usher in a faster rate of development.

IKS EXAMPLES

1. Development of cereal banks in Senegal was never used by the villagers intended for. An RRA team found that the villagers had a long tradition of managing their food stocks to meet the needs of the "hungry season". It was concluded that the decentralized, traditional system was adequate and no need of modern complex cereal bank. If this had been taken into account initially it would not have been necessary to go into the centralized cereal bank.

2. Conversion of traditional land measurement to hectares

As reported in No. 10 issue (page 2) of the NFSRN newsletter, Mr J. Ortese derived a formula for converting extension recommendation rates into the local measurement units.

For example: of input:

$$R = r/7$$

Where

R = rate of input/*akundu sule* (ak)

r = recommended rate/ha

7 = equivalent number of ak per hectare

And $R = r/i$

Where

R = quantity of recommended input/*ula*

r = quantity of recommended input/ha

i = equivalent number of *ula*/ha

3. The use of the Neem Tree for age pest control was reported in the NFSRN Newsletter Number 10 page 5.

4. *Leucaena Leucocephala* (also reported in NFSRN Newsletter 10 page 6) is used for deworming

goats. Many more examples will be documented in the course of the various zonal workshops.

Lessons Learnt

1. A lot of information was flowing in from various institutions as scientists became aware of the existence of IKS in their localities.
2. The knowledge of the people have enabled them to survive for several decades in their own environments.
3. The African Resource Centre for Indigenous (ARCIK) was established in Nigeria Institute for Social and Economic Research (NISER) , Ibadan to conduct research on IKS throughout Africa.
4. The Nigerian Resource Centre For Indigenous Knowledge (NIRCIK) was established in the Institute for Agricultural Research, Ahmadu Bello University, Zaria. I was the coordinator from 1993-2000.. NIRCIK had the following objectives:
 - a. To carry out documentation activities for published and unpublished documents , newly recorded IK systems and existing databases.
 - b. To conduct research on the validity of I against scientific criteria
 - c. To conduct training and national workshops on IK
 - d. To establish linkages with regional, global and other international IK centres and networks.
 - e. The PRA methodology was used for the Kano state food and nutrition security survey. A training manual titled, “ Improving Household Food Security and Nutrition in Nigeria: A Training Manual for Agriculture, Health, Education and Community Development Extension Workers" was prepared.

7.Emphasis on the Poorest of the Poor

The poorest of the poor were the focus of my first socio-economic survey of 1968/69 in Omu Aran Area. The level and income distribution among the households were studied and analyzed in detail in both Ipetu and Odo-Ore villages. When the study was repeated in 1973-74, it was possible to analyze the inter year variation in the level and distribution of incomes.

The essence of this study was to allow recommendation domains to be identified for various levels of income groups.

Another important survey was the identification and sensitization of the marginalized and vulnerable groups for participation in the Fadama II project in Gombe state using the PRA methodology.

Pictures from Gombe project

The needs of these groups of people are enormous and not usually considered when developmental issues are discussed. They are voiceless!

8. Holistic Approach to Solve Multi-dimensional Problems

A. Farming System Research and Extension Approach and Lessons Learnt

A critical review of the performance of most strategies put in place by the Federal and state governments have either been unprofitable and unproductive. This is because strategies and technologies being promoted were not feasible for farmers to adopt under their circumstances. Another constraint is the lack of discussion with the farmers and rural dwellers by those planning the projects and lack of knowledge of the existing farming systems.

Another approach became mandatory to ensure that relevant improved technologies are generated that will address the farmers' constraints.

The Farming Systems Research and Extension (FSRE) approach focuses on the dynamics of small scale farm operations with a more holistic and interdisciplinary approach. It is concerned with the interactions of all the interacting components making up the farming systems in the area.

FSR involves explicit attempt to understand the farm, the farmer, and farm environment in a system of interdependent parts through the combined efforts of teams of social, technical and biological scientists.

The four stages of the FSRE are diagnostic Surveys, on-station studies, on-farm studies and mass adoption studies.

Diagnostic Surveys and Soil Surveys

The major objective of the diagnostic or exploratory surveys is to identify and describe important cropping systems and utilize the knowledge in shaping cropping systems research. Several

diagnostic surveys were conducted under the auspices of the ADPs.

Soil surveys were conducted in many state ADP areas principally to classify and map the soils at reconnaissance level in order to provide useful information for land use planning.

On-Station Research

The studies carried out at this stage are designed to develop relevant technologies which are meant to alleviate the constraints identified from diagnostic surveys or those observed from other sources. The primary aim is work towards or improve on technologies to be subjected to on-farm testing.

On-Farm Research (OFR)

On-farm research is to test the most current promising improved technologies arising from on-station studies to assess the costs and determine the level of dependability of output and income from a given improved technology. The aim also is to identify the constraints to adoption and to use the test results to improve further the technology for mass adoption.

Based on the level of management and involvement of the farmer, on-farm studies can be classified as follows: a) researcher managed b) Researcher managed and farmer executed c) farmer managed and farmer executed.

On-Farm Adaptive Research (OFAR)

The promising technologies from the OFR stage are now replicated in various locations of the ADPS for on-farm adaptation. These are done practically by ADP research staff like the SMSs. The ones found acceptable are passed to extension agents for mass adoption using the Small Plot Adoption (SPAT) which is explained further under the Training and Visit (T & V) Extension system section.

Lessons Learnt from FSRE

The lessons learnt among others include:

1. The diagnostic surveys provided researchers with the institutes and universities with a concrete basis for finding solutions to “real” and “identified” farming problems as opposed to conducting research to solve “assumed” problems.

2. A number of soil surveys were conducted which aimed at classifying, describing and mapping the soils of the agro- ecological zones of Nigeria useful for land use planning.
3. A range of improved technologies developed both for sole and mixed cropping systems were found to remove constraints identified at the diagnostic survey stage.
4. Desired linkages between research and extension have been made possible through MTRMs and OFAR.
5. It became possible to institutionalize FSRE. The Federal Ministry of Science and Technology mandated each crop research institute in the country to establish a distinct Farming Systems Research Programme. FSR was one of the 12 Nationally Coordinated Research Projects created by the ministry.

In 1986 it was possible to establish the National Farming Systems Research Network through Ford Foundation sponsorship.

National Farming System Research (NFSRN)

The NFSRN is an association of individuals in the national institutions in Nigeria who are practicing the FSR approach as strategy for increasing production. The primary objective of the network is to improve the flow of information among researchers in the national research institutions. It is for improving the FSR methodology, achieve rapid success of increasing agricultural production in the country and improve the welfare of farmers. I was the Zonal Coordinator for the North West before I became the National Coordinator in 1988-1992.

The NFSRN published a newsletter twice a year of which I was the editor.

West African Farming Systems Research Network (WAFRSN)

WAFRSN membership covered individuals using the farming systems research approach in 17 West African Anglophone and Francophone countries. The major objective was to institutionalize FSR in all the West African countries.. When I served as the coordinator (1991-2000), I moved the headquarters from Ougadougou Burkina Faso to the Institute for Agricultural Research , Ahmadu Bello University, Zaria. Many research projects were sponsored for the development of relevant technologies in member countries.

The Journal titled “Agricultural Systems in Africa” was published quarterly in both French and

English languages of which I was the editor.

African Association of Farming Systems Research Extension and Training (AFSRET)

This is the network for the whole of Africa with the same aim and objectives as the WAFSRN. I was te pioneer chairman from 1992-1994

Association of Farming Systems Research and Extension (AFSRE).

I served on the Steering Committee of AFSRE-the global (international) association between 1994 and 1996.

B. Training and Visit (T&V) Extension

The World Bank in 1986 identified Dr Ray Unamma of National Root Crop Research Institute (NRCRI), Umudike and myself from Institute for Agricultural Research Ahmadu Bello University, Zaria to implement the T&V extension throughout all the ADPs in the country. This assignment took us to all the Local Government Areas in the country between 1986 and 1987. We held training workshops for the village extension agents (VEAs), Subject Matter Specialists (SMSs), Area Extension Officers (AEOs), Block Extension Supervisors (BESs) , Zonal Extension Officers (ZEOs) etc, in each zone of the ADP. Practical training were held in the field to demonstrate how each category of staff was expected to do his/her work.

The T&V extension has the following key features:

- 1) Professionalism
- 2) Single line of command
- 3) Concentration of effort
- 4)Time-bound work
- 5) Field and farmer orientation
- 6) Regular and continuous training
- 7) Linkages with research.

Professionalism

Appropriate advice and support of farmers to enable them increase their incomes can only from an extension service that is professional art all levels. Extension staff must keep in close touch with relevant scientific development and research in order to formulate specific recommendations useful to farmers.

Extension workers must develop ability to identify production constraints in the field and develop appropriate measures to counter them. Extension staff must be confident of what he/she is bringing to the farmer in by being adequately prepared professionally.

Single line of command

Extension worker must face extension work only. A VEA should not be burdened with distribution of fertilizer and other inputs. Such activities should be left for the suppliers and distributors. He/she should not be dealing with loan processing, data collection etc. Activities that can undermine the integrity of extension worker among farmers or interrupt his visit schedule and the continuous and regular training should be discouraged. Each staff should be left to perform his/her own duty.

Time-bound Work

Messages and skills should be taught to farmers in a regular, timely fashion so that they will make best use of the resources at their command. The VEA must visit a group of farmers regularly fortnightly on a fixed day of the week known to the farmers in the group. All other staff must make regular visits to the field as required to fulfill their job responsibilities.

SMSs must meet with research scientists regularly monthly and pass information from MTRMs to the VEAs at fortnightly trainings. Any break in this time-bound system of training and visit causes ineffective extension.

Field and Farmer Orientation

To serve farmers effectively, an extension service must be in constant contact with them. Contact must be on a regular basis, a schedule known to the farmers. The farmers served by a VEA is divided into eight groups. Each group must be visited on a fixed day once every two weeks.

VEAs meet the farmers in the fields not at home. The AEOs, SMSs, and all other staff supervising the VEAs must meet the VEAs in the field with the farmers. All supervisors must also pay regular visits to the farmers' fields to understand the problems faced by the farmers and VEAs. In order to make VEAs spend time in the fields, their

administrative and report= writing duties should be kept to the minimum.

Regular and Continuous Training

Regular and continuous training of extension is required both to teach and discuss with them the specific recommendations required by the farmers for the coming fortnights and to upgrade and update their professional skills.

Without regular training extension workers have very little to say to the farmers and there is no channel of communicating back to the researchers problems farmers face for further investigation, Trainees also have opportunities to learn from each other

Linkages with Research

Effective extension depends on close linkages with research. Problems faced by farmers that cannot be resolved by extension workers are passed on to researchers for either an immediate solution or investigation. During seasonal and monthly workshops and joint field trips, extension and research staff formulate production recommendations that will be adapted by extension workers, as necessary, to make best use of the specific local environment and actual farmers' resources.

Researchers' awareness of and reaction to actual farm conditions is increased through responding to problems that have been put forward by extension workers, through training of extension staff and through field visits.

Lessons Learnt

1. The T&V was an eye opener to correct the ills of the past extension approaches particularly that of relieving the VEAs the burden of distributing fertilizer and other inputs which has caused the loss of integrity of VEAs before the farmers.
2. Transportation was provided to the VEAs and BESs which was not done before.
3. Close contact between the extension and research brought better understanding of the enormity of the problems farmers face.
4. Farmer involvement in adaptive research to remove their own identified farming constraints generated a lot of enthusiasm and interest on the part of the farmers.

5. Government officials understood their roles better than previously in tackling the problem of food security.
6. Appreciable increases in crop yields were noticeable through this research-extension–farmer linkages.

9. Various Modes of Farmer Participation in Research

This section turns our attention to the reversal of the top-down approach used in past in which the scientists thought they knew it all. It was a case of the scientist is the teacher and the farmer is the pupil. Things are being handed down from the top. The current trend is to put the farmer at the drivers' seat as far as research is concerned. This is why I have reproduced my article below to highlight the situation.

MODES OF FARMER PARTICIPATION IN FARMING SYSTEMS RESEARCH

By J. O. Olukosi

[Reproduced From National Farming Systems Research Network Newsletter Number 8]

The modes of farmer participation in farming systems research have been described in various ways by different authors. Farmer involvement starts with the diagnostic surveys in which problems are identified in conjunction with the farmers on their own fields and using their knowledge. Towards the tail end of on-station research, multi-locational trials are conducted on farmers' fields to pre-test the adaptability to their environments. The on-farm adaptive research (OFAR) phase of FSR has greater degree of farmer involvement than the on-station phase. The farmers' fields are used for the experimentation and in addition the farmers supply labour input, help in the trial layout and monitoring throughout the period of the experiment. In most cases, the produce belongs to the farmers hence it is to their advantage to take good care of the OFAR plots.

Farmer involvement in OFAR is broken down into three categories depending on the degree of farmer participation. For some delicate, risky and complicated trials, the researcher carries out the plan, design and execution of the trials. This type of trial is called researcher-managed trial. The second type is called joint researcher-farmer managed trial and as the name suggests it is managed by both the researcher and the farmer. This form of trial is less risky, delicate and less complicated for the farmers but still considered unsafe to leave the total management aspect for the farmers. The farmer

managed trial is one in which the whole process is left to the farmer while the researcher only pays occasional visit to the site.

At the mass adoption stage of FSR, the involvement of the farmer is, however, obvious. In the case of Nigeria, the small plot adoption technique (SPAT) is used to extend certain messages to the farmer. It aims at demonstrating and allowing the farmer to practice the operation in the presence of the extension agent. The success of the thousands of SPATs being established by the farmer with the extension agents' assistance is leading to faster rate of adoption of technologies at farmers' level in Nigeria..

The modes of involvement of farmers in FSR have been classified by Stephen Biggs in the 1989 ISNAR's OFCOR Comparative Study Paper No. 3 entitled, "Resource –Poor Farmer participation in research: A synthesis of experiences from nine national agricultural research systems". It was pointed out by Biggs that even though the idea of farmer participation is not new there is a wide difference of opinion over central issues such as how farmers should participate, for what purpose and at what stage in the research process. The four modes of farmer participation identified are (1) contractual (2) consultative (3) collaborative (4) collegial modes.

The key feature that distinguishes the different methods of farmer participation is the researcher's attitude towards the farmer. The farmers, though may not be trained in formal scientific methods, carry out experimentations in a systematic manner as part of their everyday production activities. These types of research-minded farmers contribute to the stock of indigenous technical knowledge in rural areas and are important sources of technological innovations. The informal research and development systems operate side by side with the formal system within the political, economic, institutional and agro-climatic context.

The researcher's views and attitudes concerning the existence and use of the indigenous knowledge influence the mode of research that is followed. Though there may not be as clear-cut a division as proposed, there is merit in Briggs' classification. For example, the contract mode of participation has little interest in the indigenous technical knowledge. Both the consultative and collaborative modes recognize the importance of indigenous technical knowledge but the former mode places greater emphasis on tapping into this knowledge to better inform scientists about local conditions and innovations. The collaborative mode learns actively from the informal system about how to do research under farmer's circumstances. We hereby consider each type of mode in more detail.

Contractual Mode

Scientists contract with farmers to provide land and services. Farmers' involvement is minimal and limited to provision of land in most cases. The researchers manage the trial according to their own design while the views and opinions of the farmers are not emphasized. A large number of routine testing of technologies such as varieties, fertilizer management trials are common features of the contract mode.

Consultative Mode

The consultative mode is characterized by a sequence of research stages: diagnosis, design, technology development, testing, verification and diffusion. At the start, farmers are interviewed about their problems after which the scientists accord priorities, take most of the decisions in designing the trials and surveys. Farmer involvement increases again towards the end of the research process when they are requested to evaluate the new technology.

This mode entails a hierarchical structure with senior staff supervising the junior. The field staff may be given a number of trials to supervise or a set of questionnaires to administer. The participation of farmers becomes one of being supervised or being made to respond to questions. The farmers may often be represented by leaders or key informants in the village.

The emphasis of this mode is on adaptive research. New varieties, fertilizers or pesticides are, for an example, taken from the commodity and disciplinary programmes adapting them to local conditions and from them developing broad extension recommendations for specified groups. The consultative mode sometimes places emphasis on extension, and there may be field days to show extension workers and farmers new technologies coming out of the on-farm programme.

Collaborative Mode

This type of participation involves continuous interaction between researchers and farmers, who are seen as partners in the research process. The emphasis of the collaborative mode is on treating farmer's participation as a "monitoring" function to help plan the on-farm and on-station research each year. Diagnosis and assessment are carried out continuously with farmers and are not seen as activities which occur at the beginning and end of the project.

Farmers are asked for advice at the beginning whether they have already investigated a given problem or tried a certain technology. They are also asked how they would go about testing, for

example, a new variety under their conditions. This approach could lead to the re-design of an experiment from say, a randomized block design for a crop trial to a strip design because it is easier for farmers and researchers to compare treatments.

This mode does not follow strict stages of research. The emphasis of an on-farm programme at a given time depends on the specific nature of the problems being faced by resource — poor farmers and the capabilities of the programme. Considerable time is given to special meetings with farmers for research purposes. For example, innovative (research-minded) farmers are brought together as often as possible to interact with research scientists for many years so as to establish confidence and an ongoing dialogue. This relationship results in continual open-ended assessment of all aspects of research.

Collegial Mode

Under the collegial mode the formal research system actively strengthens the informal research development system at the farmer, village and community levels,

Under the consultative and collaborative modes of participation, scientists recognise that farmers and other people in the rural environment have indigenous knowledge which is useful to formal research systems, and this information is collected and used. This indigenous knowledge is known to be changing as a result of existence and dynamic nature of informal and dynamic nature of informal research and development systems.

The major point of difference of the collegial mode with other modes is that activities are designed to increase the ability of the informal systems to do research, and of informal systems to request information and services from formal ones.

The term "collegial" is used to emphasize that the two research systems are like two complementary colleagues in an academic environment. Though independent, they are recognized as having complementary skills and knowledge, and they both need to support and strengthen each other. Under this mode the research-minded farmers have the major say in the running of the research site. For many activities, the scientists are the periodic guests in the local programme. The advantage of the collegial mode could be in removing certain logistical support which researchers may not be able to provide to isolated research sites. Local research-minded farmers can be identified to multiply

seeds and provide storage facilities for inputs and equipment. Where there is high turnover of staff, the local research-minded farmers can help provide continuity passing information to new junior field workers.

Question: Which Mode?

Answer: The collegial mode is henceforth recommended.

XI. RECOMMENDATIONS FOR LANDMARK UNIVERSITY AGRARIAN REVOLUTION MANDATE

Permit me at this juncture, Vice- Chancellor sir, to advance some suggestions based on my experiences so far described for moving research, extension and the agrarian revolution mandate forward at Landmark University to hasten the attainment of food security.

A. Research

From the Farming Systems Research background the following can be suggested:

1. Adoption of the interdisciplinary and multi-disciplinary approaches to our research agenda. For example civil, mechanical, electrical and chemical, agricultural engineers and other basic scientists from College of Science and Engineering could team up with faculty staff from College of Business and Social Sciences to address problems regarding production, processing and distribution on the farm. This team will collaborate with the agricultural team comprising of agronomists, animal scientists, soil scientists, agricultural extension specialists and agricultural economists. Each problem will dictate the types, numbers and extent of specialists' involvement.
2. Adoption of the involvement of technology users (e.g. farmers) from problem identification to on-station experimentation, on-farm trials, on-farm adaptive research to multi-locational testing and mass adoption.
3. College Based Baseline Surveys:

It is also recommended that each College conducts baseline surveys to discover areas of research needs and generate data upon which future impact can be measured. The College of Agriculture has

carried out similar survey and data analysis is in progress.

4. Soil Surveys and Land Use Planning

Soil surveys and mapping of all farm sites of Landmark University Farms at Eleyin, Agbamu, Rore, Ejiba and elsewhere should be carried out to ensure proper allocation to best suited ventures.

5. Indigenous Knowledge Systems in the surrounding communities should be documented, tested, perfected and related back to the communities for more effectiveness. Bottom-up involvement of surrounding communities in our research endeavours will stimulate faster development.

6. Establishment of a Consultancy Unit at Landmark University to conduct Soil Surveys, Soil Testing, Economic Feasibility Studies, Monitoring and Evaluation of Projects. I and some others in my College are versed in this areas and ready to offer our expertise.

B. Extension

7. Formation of Landmark University Pathfinders Monitoring and Evaluation Network (LUPMEN)

There is need to establish a strong linkage with The Pathfinders for forward and backward integration when the students graduate from Landmark University. Data Base should be kept by LUPMEN on the Pathfinders to monitor their progress, assess their impact and keep records of challenges they face in the fields. The Agricultural Revolution Lead Scientists will deliberate on challenges coming from the Pathfinders while solutions will be disseminated back to them through LUPMEN. The production of a monthly LUPMEN Bulletin will go a long way in keeping in constant touch with the Pathfinders in addition to electronic media.

8. Landmark should revive the T&V Extension System in surrounding Local Government Areas (LGAs) like Irepodun, Ifelodun, Isin, Oke Ero, Ekiti etc. The Scientists in Landmark University can be formed into teams to train the ADP and LGA Subject Matter Specialists (SMSs) at Monthly Technology Review Meetings (MTRMs). The SMSs will in turn go and train the Extension Agents (EAs) fortnightly. EAs in turn will go and extend the messages to the farmers. In so doing collaborative research efforts will be strengthened between the university and the communities. Problems from the communities will be brought to the MTRMs and solutions passed back through the same medium.

9. Establishment of Landmark University Integrated Rural Development Project (LUIRDP)

In most developing countries, the universities are expected by tradition and common consent to provide leadership. It is also their duty to advance learning by teaching and research, and thus provide service for the whole society. But sometimes universities have been accused of complacency, and of being oblivious to the needs and aspirations of society which they were established to serve. For Landmark University to be an honourable exception and in recognition of its responsibility to extend practical knowledge acquired from research to the surrounding rural communities, there is the need to establish Landmark University Integrated Rural Development Project both within and outside the university which could be under the Department of Agricultural Economics and Extension in the College of Agricultural Sciences.

The project is to be set up as a model for rural development in selected villages around Omu Aran, the home of the University. This will be a pilot project, which will be directed at the improvement of economic and social conditions of the communities and in particular food and nutrition security.

The general objective of the project is to make appreciable impacts on the members of the public.

The specific objectives would include:

- i developing a model for approaching rural development in the selected villages that could be applied later and on wider scale.
- ii. to enhance field testing and demonstration of innovations.
- iii. to serve as research centre for testing and applying methods of community development and extension.
- iv. to assist the inhabitants of the area to improve their level of living

C. For farm Practice

10. Establishment of a forum to involve every staff in the Agricultural Revolution mandate by borrowing from the T&V Extension System approach. Without accurate and adequate information flow, the objective of the Agricultural Revolution particularly the Farm Practice cannot be totally achieved. The T & V Extension Approach emphasizes professionalism by arming the trainers with time bound, up-to-date, relevant technological messages. In essence, the trainer is equipped for what he/she will deliver each passing interaction with the students. This avoids trial and error delivery of messages to the clients. The client is given the exact dose of the message needed for that day and not the whole production story of say, land preparation

to harvesting for a crop. The message is delivered in a deliberate, systematic, sequential manner. This approach removes ambiguity in message content and delivery and engenders confidence in the trainer.

This proposed system requires mandatory, adequate and meticulous planning at each level for it to succeed. The following steps are recommended:

- i. The Agricultural Revolution Committee (ARC) that already exists will map out the whole arrangement for execution with the support of the University Farm Board and Landmark University Management.
- ii. The ARC will develop a detailed Annual Calendar of Activities for both crops and livestock and other ventures. These activities will be broken down into weekly components.
- iii. The ARC will identify among staff and faculty of Landmark University Agro-Revolution Lead Scientists (LSs) with whom they work out the calendar of operations in (ii) above.
- iv. The ARC will identify and draw Subject Matter Specialists (SMSs) among staff and faculty in collaboration with the LSs who are capable of covering specific topics. The SMSs are specialists in different aspects of crops, livestock, soil management, fisheries and other ventures as occasions demand. The Lead Scientists will interact (train) the SMSs with as much practical demonstrations as possible to ensure clear understanding. The meeting (training) between the SMSs and the LSs will be monthly where all possible topics for that particular month are treated.
- v. The ARC will identify the Agro-Revolution Trainers (ARTs) who will be trained by the SMSs fortnightly. They will cover topics that the ARTs will pass to the students in the next two weeks period. The ARTs interact with the students weekly.

As an example, the flow is shown here for the month of May 2015:

- a) April 29: LSs meet with SMSs to cover materials for the whole month of May

- b) April 30: SMSs meet with ARTs to cover two weeks materials up to May 15.
 - c) May 14: SMSs meet with ARTS to cover two weeks materials for the rest of May.
 - d) The ARTS meet weekly with the students (Monday to Friday) according to their levels to pass on information received from the fortnightly meetings. .
- vi. The last category is that of the Supervisors who keep daily records of the students' attendance and also can serve as SMSs or trainers. They need to be present weekly with their groups of students.

This ensures that opportunities exist for faculty and staff to be involved one way or the other in the Farm Practice. Any relevant staff member can be called upon to play a role in any of the five categories listed above in (ii to vi). Everyone, irrespective of discipline, will have something to contribute one time or another.

XII. SUMMARY AND CONCLUSION

Poverty is a phenomenon found not only in Nigeria but all over the world. The poor will always be with us says the Holy Book in Matthew 26:11. The same Holy Book in Galatians 2:10 says that we should remember the poor. Therefore we must try our best to face the challenges of poverty. The Landmark University mandate is to tackle the challenges of food insecurity which is caused by poverty.

Poverty and food insecurity are inseparable brothers. Food insecurity is multi-faceted, multi-sectoral, multi-dimensional, multi-disciplinary in nature of which agriculture has a major role to play. Time has therefore been taken in this lecture to identify all areas of challenges that need to be addressed in tackling this monster. Effort has been made to review what various past governments have put in place to tackle the food security challenges. Among the multi-faceted dimensions of the agricultural challenges is research and extension. This lecture therefore focused attention on research and extension from historical perspective.

The first point of call was the “lack of data” upon which meaningful development plan and policies can be formulated to tackle poverty and food insecurity. From my own personal experience the history of data collection was traced from the cost route method to Sundeo Approach, Rapid Rural Appraisal (RRA), Participatory Rapid Appraisal (PRA), Participatory Learning and Action (PLA), up to and including Indigenous Knowledge Systems (IKS) with PRA/ PLA methodology. All these data collection approaches were used in the context of Farming Systems Research and Extension

(FSR&E) paradigm which direct efforts at generating relevant technologies and innovations to address the poverty and food security challenges.

“Why the FSR&E approach?” one might ask. This is for the purpose of using a holistic approach to tackle poverty and food security problem which is multi-dimensional in nature. The Farming Systems Research & Extension approach makes it mandatory for researchers from relevant different disciplines, be it agronomy, crop protection, animal science, soil science, agricultural extension, agricultural economics, agricultural engineering, breeders etc. to come together to contribute their quota in solving a particular problem faced by farmers. The FSR&E approach has been used in Nigeria in the context of the Training and Visit (T&V) Extension system which in itself emphasizes research- extension- farmer linkages in a bottom- up rather than top- down approach.

I have inserted my own personal contributions to the development, propagation, dissemination and sustenance of the approaches described in this lecture by training the trainers, organizing local, national and international workshops and conferences, and by coordinating local, national, international and global networks. Training of trainers have been followed by monitoring and evaluation of on-farm research and extension activities in various local, regional, international and global settings.

The lecture has been concluded with recommendations for achieving the Landmark University Agrarian Revolution mandate particularly in the adoption of interdisciplinary and multi disciplinary research approach, early involvement of technology users in the development of technologies, the T&V Extension systems approach in our Farm Practice, formation of Landmark University Pathfinders Monitoring and Evaluation Network (LUPMEN), and establishment of Landmark University Integrated Rural Development Project (LUIRDP), conducting College-based Baseline Surveys, revitalizing the T & V extension in Local Government Areas (LGAs) surrounding Landmark University

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XIV. REFERENCES

- Abdulsalam, Z., J.O. Olukosi and S.A. Ogunwale (1998) "Impact of Cross-Border Trade on the Production of the Relevant Crops in Katsina State, Nigeria". *Nigerian Journal of Rural Economic and Society*, Vol.1 No.4 pp.38-43.
- Abubakar, M.I. and J.O.Olukosi (2008) "Analysis of Cowpea Production under the National Programme on Food Security in Argungu Area, Kebbi State, Nigeria"
- Akanya, B.A., T.K. Atala and J.O. Olukosi, 1992 "Nigeria's Environmental Protection Policies And Sustainable Development -A Critical Appraisal" Paper presented at the Workshop on policies and Strategies for Sustainable Development in Africa South of the Sahara, Kongo Conference Hall, Zaria, 17-20 August.
- Alamu J.F. and J.O.Olukosi,2008. *Simplified Research Methodology: Principles and Practice*, Great Glory Publishers, Zaria Nigeria, 150 pp.
- Adeoti, J.O., R.N. Kaul, J.O. Olukosi, and E.O. Adebisi, 1989. "Characteristics of Rural Transport Needs: A Case Study of Savannah Region of Nigeria". *Indian Roads Congress and International Labour Organization (ILO) Geneva Publication on Rural Transportation*. April 26-28.
- Adeoti, J.S. and J.O. Olukosi, 1989. "Appropriate technology for rural development". Paper presented at the 5th National Conference of the Nigerian Rural Sociological Association, University of Jos, March 1-3, 1989.
- Aduku, A.O. and J.O. Olukosi, 1990. *Rabbit Management in the Tropics*. (Text book for B.Sc. Agriculture) Living Books Series, GU Publications, P.O. Box 220, Abuja FCT, Nigeria. 115 pp.
- Aduku, A.O. and J.O. Olukosi, 1991. *Animal Products: Processing and Handling in the Tropics*. (Text Book for B.Sc. Agriculture) Living Books Series, GU Publications, P.O. Box 2280, Abuja FCT, Nigeria. 103 pp.
- Ahmad, M.M. and J.O. Olukosi, 1986 "The wheat input subsidy: A challenge for the river basin development authorities". Paper presented at the 2nd Conference of Agricultural Society of Nigeria held at AERLS Conference Hall, Ahmadu Bello University, Zaria, 1-4th September, 1986.
- Ahmed, B., A.O. Ogungbile, J.O. Olukosi, M.I. Kolawole and V.O. Chude (1997) "Economic Analysis of Maize Response to Nitrogen Fertilization in the Northern Guinea Savanna of Nigeria". *Samaru Journal of Agricultural Research*, Vol.14 pp.3-10.
- Akinola, M.O., J.O. Olukosi and M.K. Ahmed. 1996. "The Management and Economic Analysis of Grapevine Production in Zaria, Kaduna State". Paper presented at the 11th Horticultural Society
- Asota, C.N., J.O. Olukosi and K.A. Elemo, 1989 "Structure and guidelines for farming systems

- research activities at IAR". Paper presented at the Inaugural Meeting of the Creation of Collaborative Research Group on FSR in the Sudan-Sahelian Zone, Sikasso, Mali.
- Atala, T.K. T.D. Ajia and J.O. Olukosi, 1992. "Adoption of Soyabean Utilization Innovations Among Women in Samaru village of Sabon-Gari Local Government Area of Kaduna State". *Journal of Agricultural Systems in Africa*, Vol.2, NO.2, IAR/ABU, Zaria, Nigeria pp.18-24.
- Banta, T.A., J.O. Olukosi and C.E. Nwagbo, 1986. A socio-economic evaluation, of the improved sorghum technology: The case of the Guided Change Project Area". *Samaru Miscellaneous Paper* No- 114. Institute for Agricultural Research, Samaru, 58 pp.
- Barau, A.D., J.O. Olukosi and Y.A. Amin, "Performance of the Nigerian seed cotton market under the deregulated market system. *Journal of Agricultural Systems in Africa*, Vol.3 .No .1, IAR, ABU, Zaria, Nigeria. pp.64-70.
- Bezunneh, T., M. Kamuanga, T. Kibreab and J.O. Olukosi, 1992. Ed. *Appropriate Technologies for Sustainable Agricultural Systems in Sub-Saharan Africa*. SAFGRAD, Ouagadougou, Burkina Faso.
- Elemo, K.A., V. Kumar and J.O. Olukosi, 1990. "Review of Research work on Crop Mixtures in the Nigerian Savanna", *Samaru Miscellaneous Paper* No.127, Institute of Agricultural Research, Samaru.
- Elemo, K.A., J.O. Olukosi and U.A. Zango, 1986. "Design of Experimental Logbook for OFAR" in *Summary Proceedings of the Third OFAR Workshop in the Nigerian Savanna*. Ed. by Ogunbible A.O. and S.A. Ingawa, Inst. for Agric. Research, Ahmadu Bello University, Zaria 27th-28th May, 1986, pp. 26-30.
- Ephraim Nkoya, J.O.Olukosi, S. Ingawa, A.G. Shetima, D. Phillip, P. Idisi,
M. Madukwe (2010) Baseline Report of Fadama III Impact Assessment
Study in 36 states of Nigeria. IFPRI/World Bank/NFDCO/National,
Zonal and State Consultants . NFDCO Abuja.
- Erhabor, P.O., B.A. Kalu and J.O. Olukosi, 1990"Economics consideration in Family Planning", *Journal of Rural Extension and Administration*, Department of Agricultural Extension Services, University of Ibadan, Vol. 1, No.1.
- Ezeh, C.C. and J.O. Olukosi, 1992. "Farmers' Perception of Risk and their Response in Dry Season Farming: A Study of the Kano River Project". *Nigerian Journal of Agricultural Extension*, Vol. 6, NAERLS Samaru, pp.12-17.
- Ibanga, I.J., J.O. Olukosi *et al.*, 1986. *Soil survey, crop production and management of the proposed farm at Kabojii, Niger State*, Vol. 1, Institute for Agricultural Research, Ahmadu Bello University, Zaria. Research Commissioned by the Northern Nigeria Flour Mills Ltd., Kano, March 1986, pp. 117.
- Ibanga, I.J., J.O. Olukosi *et al.*, 1986. *Financial and economic appraisal of the proposed farm at*

- Kaboji, Niger State*, Vol. II, Institute for Agric. Research, Ahmadu Bello University, Zaria. 'Research Commissioned by the Northern Nigeria Flour Mills Ltd.' Kano, March, 1986, pp. 99.
- Ibanga, I.J., J.O. Olukosi *et al.*, 1986. *Soil survey, crop production and management of the proposed farm at Duguri, Bauchi State*, Vol. III, Inst. for Agric. Research, Ahmadu Bello University, Zaria, Research commissioned by Northern Flour Mills, Kano.
- Ibanga, I.J., J.O. Olukosi *et al.*, 1986. *Financial and economic appraisal of the proposed farm at Duguri, Bauchi State*, Vol. IV, Institute for Agric. Research, Ahmadu Bello University, Zaria. Research commissioned by the Northern Nigeria Flour Mills Ltd., Kano, October, 1986, 58 pp.
- Ibanga, I.J., J.O. Olukosi *et al.*, 1986. *Soil survey, crop production and management of the proposed farm at Azara, Plateau State*, Vol. V, Inst. for Agric. Research, Ahmadu Bello University, Zaria. Research Commissioned by the Northern Nigerian Flour Mills Ltd., Kano, December, 1986, pp. 107.
- Ibanga, I.J., J.O. Olukosi *et al.*, 1986. *Soil survey, crop production and management of the proposed farm at Azara, Plateau State*, Vol. VI. Institute for Agric. Research, Ahmadu Bello University, Zaria. Research commissioned by the Northern Nigerian Flour Mills, Ltd., Kano, December, 1986, pp. 60.
- Ibanga, I.J., J.O. Olukosi *et al.*, 1986 Executive summary on the feasibility study of the proposed farm at Kaboji, Duguri and Azara, Vol. VII. Inst. for Agric. Research, Ahmadu Bello University, Zaria, Research commissioned by the Northern Nigerian Flour Mills Ltd., Kano, December, 1986, pp. 32. Iheanacho, A.C., Olukosi, J.O. and A.O. Ogungbile (2000). "Economic Efficiency of Resource Use in Millet- Based Cropping Systems in Borno State of Nigeria." *Nigeria Journal of Tropical Agriculture*, Vol. 2: 33-42.
- Jongur, A .A.U, J. O. Olukosi and A.O.Ogungbile (2007) "Economics of Masakwa Production by Farmers in Yola South Local Government Area of Adamawa State" *Nigerian Journal of Tropical Agriculture* vol. 9
- Maiangwa, M.G., A.O. Ogungbile, J.O.Olukosi and T.K. Atala (2007). "Land Degradation: Theory and Evidence from the North-West Zone of Nigeria". *Journal of Applied Sciences* 7 (6) 785-795. Asian Network for Scientific Information
- Makanjuola, G.A., J.O. Olukosi *et. al.*, 1981. *Grain Processing in Kano State of Nigeria*. Published by Centre for Agricultural Development (Nigeria) Ltd.) and Federal Department of Rural Development, Federal Ministry of Agriculture, Lagos (co-author) 252 pp.
- Norman, D. W. (1972) An Economic Survey of Three Villages In Zaria Province:: Input-Output Study, Samaru Misc. Paper 37and 38
- Norman, D.W. and Pryor, D.U. (1979) Tehnical Change and the Small Farmer in Hausaland, Northern Nigeria. African Rural Development Paper No. 21. Department of Agricultural Economics , Michigan State University, East Lansing, Michigan, U.S.A.
- Ochi, J.E., J.O. Olukosi and S.B.L. Gupta (1996). "Social, Economic and Cultural Evaluation of the

- Small-Scale Cropping Systems in Benue State, Nigeria." *Journal of Scientific Research*, Vol. 46, 1996: 75-84.
- Ogungbile, A.O., P.O. Erhabor, J.M. Olomu, J.O. Olukosi, 1990. "Minimum Cost Ratios and Optimum Weights in Broiler Production" *Journal of Agricultural Extension* Vol. 5 No.1 and 2, NAERLS Samaru pp. 2-11.
- Ogungbile, A.O., J.O. Olukosi, Y. A. Abdullahi, T.K. Atala, 1988 "Monthly Technology Review Meeting: Experiences from the North-West Zone" *In the Proceedings of AERLS/ARMTI/FACU 3rd Joint Annual Conference for Chief Manpower Development and Training Officers*, NAERLS, Ahmadu Bello University, Zaria held Dec. 13-15.
- Ogungbile, A.O., J.O. Olukosi and B. Ahmed, 1986 "Women's participation in agricultural development in Nigeria". *In Agriculture in Rural Development in Nigeria* ed. Mijindadi, N.B. Phillip D.O.A. and Otu, M. *Conference Proceedings of the Nigerian Agricultural Economists*, Zaria, December 4-5.
- Olukosi, J.O. and P.O. Erhabor, 1988. *Introduction to Farm Management Economics: Principles and Applications*. (Text book for B.Sc. Agriculture) Agitab Publishers, Zaria, Nigeria. 114 pp.
- Olukosi, J.O. and A.O. Ogungbile, 1989. *Introduction to Farm Management Economics: Principles and Applications* (Text book for B.Sc. Agriculture) Agitab Publishers, Zaria, Nigeria.
- Olukosi, J.O. and S.U. Isitor 1990. *Introduction to Agricultural Marketing and Prices: Principles and Applications*. (Text book for B.Sc. Agriculture) Living Books Series, GU Publications, P.O. Box 2280, Abuja FCT, Nigeria, 116 pp.
- Olukosi, J.O., A.O. Ogungbile and B.A. Kalu, 1991. Appropriate Technologies for Nigerian Resource-Poor-Farmers. *Ed. National Farming Systems Research Network, Zaria, Nigeria*, 22pp
- Olukosi, J. O. and J.F. Alamu, 2008. *Agricultural Finance : Principles and Applications*. Great Glory Publishers,Zaria, Nigeria.
- Olukosi, J.O., 1976. "Kwara State Farm Institute Programme", *Samaru MiscellaneousPaper No. 57, Institute for Agricultural Research*, 35pp.
- Olukosi, J.O., 1986. "Income Generation and Distribution: A Case Study of Ipetu and Odo-Ore villages in Omu-Aran Area of Kwara State". *Samaru Miscellaneous Paper No.112*.Institute for Agricultural Research Samaru, 110 pp.
- Olukosi, J.O., 1986. "Inter-Year Variation in the Level and distribution of income among farmers in Ornu-Aran Area of Kwara State". *Samaru Miscellaneous Paper No.115*. Institute for Agricultural Research, Samaru, 72 pp.

Olukosi, J.O., K.A. Elemo, V. Kumar and A.O. Ogungbile, 1991." Farming Systems Research and the Development of Improved Crop Mixtures Technologies in the Nigerian Savanna". *Journal of Agricultural Systems in Africa* Vol. 1, No. 1.

Olukosi, J.O. and T.A. Atala. 1992. "Recent Development in Agricultural Extension in Nigeria". *Nigerian Journal of Rural Economy and Society* Vol. 1, No. 1. Department of Agricultural Economics and Rural Sociology, ABU, Zaria. Pp. 1-8.

Olukosi, J.O. and A.O. Ogungbile, 1992. The Feasibility of Hybrid Maize Production Technology for Small-Scale Farmers in Northern Nigeria" *Journal of Agricultural Systems in Africa*, Vol. 2, No.1. Ouagadougou, Burkina Faso. PP. 58-65 .

Olukosi, J.O. and P.O. Ofojekwu" 1982. "Economics of dry season tomato production under a small-scale I surface irrigation scheme" _*Proceedings of the 5th Annual Conference of the Horticultural Society of Nigeria*. (HORTSON), Nov., 21-25,1982, A.B.U., Zaria, pp. 125-136.

Olukosi, J.O., 1984. "Socio-Economic Problem of Horticultural Crop Production in Nigeria", *Proceedings of the In-Service Training Course for Field Extension Workers in Horticulture*. AERLS A.B.U. 27th- 31st August.

Olukosi, J.O., S.A. Ingawa, R.O. Agbunbiade, K.A. Elemo, 1985 (Ed.) "On-farm adaptive research in the Nigerian Savanna". *Summary Proceedings of the 2nd Workshop on-farm Adaptive Research in the Nigerian Savanna*: April 1-3, 1985, AERLS Conference Hall, A.B.U., Zaria. 63 pp.

Olukosi, J.O., 1986. "On-farm adaptive research at I.A.R." in *Summary Proceedings of Third OFAR Workshop in the Nigerian Savanna* Ed. by Ogungbile A.O. and S.A. Ingawa, Institute for Agricultural Research, Ahmadu Bello University, Zaria, 27-28 May, 1986, pp. 6-25.

Olukosi, J.O., 1976 "Decisions of farmers under risks and uncertainty: The case of Ipetu and Ode-Ore farmers in Kwara State", *Samaru Agricultural Newsletter*. Institute for Agricultural Research, Samaru, Vol. 18, No.3, 15 pp.

- Olukosi, J.O. 1988. "The New Agricultural Policy in Nigeria" Editorial in *National Farming Systems Research Network Newsletter* No.4, Samaru, Nigeria, December issue.
- Olukosi, J.O., 1989. "Chemical fertilizers: Are there alternatives? Editorial in *National Farming Systems Research Network Newsletter* No.5, Samaru, Nigeria, June issue. pp.1-2.
- Olukosi, J.O., R.P.A. Unamma, A.R. Chheda and S.W. Eremie, 1989. "Research-extension linkages in Nigeria-past experience, present trend and ,future prospects" *National Farming Systems Research Network Newsletter* No. 5, 9, 1989, 7 pp. 3-10.
- Olukosi, J.O., 1989 "Women in Agriculture" Editorial in *National Farming Systems Research Network Newsletter* No.6, Samaru, Nigeria, December issue. pp.I-2.
- Olukosi, J.O., 1990. Wheat in Nigeria" Editorial in *National Farming Systems Research Network Newsletter*, No.7, Samaru, Nigeria, June issue. pp.I-2.
- Olukosi, J.O., 1990. "Rapid Rural Appraisal (RRA)" in *National Farming Systems Research Network Newsletter* No.8, Samaru, Nigeria, December issue. pp/1-2.
- Olukosi, J.O., E. Arinze, R. Ekechukwu, 1990. "Determination of Farmers' Drying Needs Using the RRA Approach" in *National Farming Systems Research Network Newsletter*, No.8, Samaru, Nigeria, December issue.pp.7-10.
- Olukosi, J.O., 1991. "Modes of farmer participation in farming systems research" in *National Farming Systems Research Network Newsletter*, Vol. 9, June issue. pp.I-2.
- Olukosi, J.O., 1992. "Indigenous Knowledge and Farming Systems" in *National Farming Systems Research Network Newsletter*, No.10. Samaru Nigeria, December issue. pp.I-2.
- Olukosi, J.O., 1993. "IKS and PRA Workshop Highlights" in *National Farming Research Network Newsletter*, No.11, Samaru, Nigeria Jan-Dec.' issue. pp.I-6.
- Olukosi, J.O. and A.O. Ogungbile, 1992. "Improving Farmer Participation in Farming Systems Research in Nigeria". *West African Farming Systems Research Network (WAFSRN) Bulletin*, Ouagadougou, Burkina Faso, No.12.pp.31-34 (English Version); pp.41-46 (French Version).
- Olukosi, J.O., 1992. "Impact Assessment of FSR-E Projects". *West African Farming Systems Research Network (WAFSRN) Bulletin* No.13. IAR A.B.U. Zaria Nigeria. pp.1-15 (English and French Versions).
- Olukosi, J.O., 1993. "Legume-based Systems and Sustainable Agriculture". *West African Farmings Research Network Bulletin* No. 14, IAR, ABU, Zaria, Nigeria. pp.1-39 (English and French Versions).
- Olukosi, J.O. (1998). Indigenous Knowledge and Conflict Management, *NOMA*, Vol.13 pp. 30-33.

- Olukosi, J.O., 1974. "Farm management survey and African development". Paper presented at the International Dialogue on Rural Development, Kumasi, Ghana, May 1974.
- Olukosi, J.O., 1975. "The research-extension linkage for rural development". Paper presented at the International Seminar on Rural Development, Michigan, U.S.A.
- Olukosi, J.O. and D.W. Norman, 1975. "The African Village Economy". Seminar paper at the West Coast U.S. Seminars, Oregon State University, Corvallis, U.S.A.
- Olukosi, J.O. and A.O. Ogungbile, 1981. "Farm records and accounts for farm owners and managers". Paper presented at the Training Seminar for Agro-Service Centre Managers, Zaria, 18th February to March 2, 1981 and March 23rd to April 2, 1981.
- Olukosi, J.O., 1981 "The poorest of the poor: Implications for Nigerian Green Revolution". Paper presented at the 1st National Seminar on the Green Revolution, September 24-31, 1981, Zaria.
- Olukosi, J.O., 1982. "Review of research on horticultural crops at IAR and elsewhere". Working Paper No.3, Department of Agricultural Economics and Rural Sociology, IAR, ABU, Zaria.
- Olukosi, J.O., 1982. "A Feasibility study of the proposed expansion programme of Samuel Oloyede's Poultry Farms". A Technical report submitted to the National Bank of Nigeria, Ile-Ife.
- Olukosi, J.O., 1982 "The role of the University in the establishment of a national integrated agricultural data bank". Paper presented at the Agricultural Data Bank Conference, Lagos April 13-15, 1982.
- Olukosi, J.O. and A.O. Ogungbile, 1984. "On-farm package trials of some selected crops in Kaduna State of Nigeria". Paper presented at the On-Farm Experimentation Training Workshop, Bouake, Ivory Coast, 17-27th September, 1984.
- Olukosi, J.O. and A.O. Ogungbile, Y.A. Abdullahi and S.A. Ingawa, 1984. "Gainful employment creation in the rural areas of Nigeria". Paper presented on request by the Committee on Gainful Employment Creation in Nigeria, Lagos.
- Olukosi, J.O., 1984. "Agriculture in the Nigerian Economy: For War, For Peace". Invited paper for the Nigerian Army School of Infantry, Direct Short In-Service Course No.13, November 6, 1984.

- Olukosi, J.O. and A.O. Ogungbile, 1985 "Approach to farming system research/extension in technology adoption, local programme planning and policy formulation: Experience from Nigeria". Invited paper for the Farming Systems Research Workshop at Egerton College, Njoro, Kenya, 19-23rd August, 1985.
- Olukosi, J.O. and A.O. Ogungbile, 1985 "Solving the food crisis in Nigeria: The farming systems research/extension approach to farm technology generation and adoption". Paper presented in the Poster Session of the XIX International Conference of Agricultural Economists, Malaga, Spain, 26th August-4th September, 1985.
- Olukosi, J.O., S.A. Ingawa and M. Kyari, 1985. "Agricultural pricing policy as a means of improving agricultural production in Nigeria". Invited Position Paper on Agricultural Pricing Policy in Nigeria, February, 1985.
- Olukosi, J.O., A.O. Ogungbile and G.O.I. Abalu, 1985 "On-farm studies sub-programme": In Proceedings of the 2nd Annual Workshop on On-Farm Adaptive Research in the Savannah, 1-3 April, 1985.
- Olukosi, J.O. and A.O. Ogungbile, 1985. "The role of women in Northern Nigerian agriculture". Paper presented at the Group Discussion on Women in Agriculture at the XIX International Conference of Agricultural Economists, Malaga, Spain, 26 August-4th September, 1985.
- Olukosi, J.O. and A.O. Ogungbile, 1985. "Integration of crops and animals in on-farm research in Northern Nigeria". Paper prepared for the Fifth Annual Farming Systems Research and Extension Symposium, Kansas State University, Manhattan, Kansas, USA, 13-16 October, 1985.
- Olukosi, J.O., 1986. "On-farm adaptive research work at the Institute for Agricultural Research". Paper presented at the 3rd OFAR Workshop in the Nigerian Savanna, 27th-28th May, 1986, Inst. for Agric. Research, Samaru, Zaria.
- Olukosi, J.O., 1986. "Farming systems in the Nigerian Savanna: Factors affecting small scale production". Invited paper for the Second Workshop on Assessing Agricultural Loan Proposals, AERLS, Samaru, 30th June-2nd July, 1986.
- Olukosi, J.O., 1988. "Input requirements, use and expected output of large-scale horticultural crops production". Paper presented at the Workshop for Large Scale Farm Managers and Proprietors,

AERLS , Ahmadu Bello University, Zaria, 25-29th April, 1988.

Olukosi, J.O., 1988. "Financing agriculture in Nigeria: Performance and challenges of the Nigerian financial system". Paper presented at the In- Plant Training Course in Agricultural Credit Management, NACB Kaduna, held at Kongo Conference Hotel, Zaria, 5th-30th December, 1988.

Olukosi, J.O., 1988. "Input requirements, use and expected output of major vegetable and tree production". Paper presented at the In-Plant Training Course in Agricultural Credit Management, NACB Kaduna, held at Kongo Conference Hotel, Zaria, 5th-30 December, 1988.

Olukosi, J.O., K.A. Elemo, V. Kumar and A.O. Ogungbile, 1989. "Contribution of farming systems research to the development of improved crop mixture in the Nigerian Savanna". Paper presented at the 2nd Conference of West African Farming Systems Research Network, Accra, Ghana. 28th August-2nd September, 23 pp.

Olukosi, J.O., 1989. "Researchers' expectations at the monthly technology review meetings". Paper presented at the Training Workshop for MTRM Resource Persons, Institute for Agricultural Research, Samaru 14-16th August, 1989, 12 pp.

Olukosi, J.O. and S.U. Isitor, 1990. "Factors affecting agricultural data". Paper presented at the National Workshop on Problems of Productivity Measurement, organised by National Productivity Centre, Central Hotel, Kano, 2-3 May, 1990.

Olukosi, J.O., 1990. "Improved crop technologies transfer to farmers in the Nigerian ADPs: Achievement and lessons". Invited paper for the IFDC/AERLS/KELLOG FOUNDATION ,International Course on 'The Development of Fertilizer Extension Support Materials for ADPs in Nigeria' NAERLS Conference Hall, ABU, Zaria. Jan. 23-26, 1990.

Olukosi, J.O. and M.T. Kudi, 1996. "Impact of SAP on Production and Income of Small-scale Farmers: A case study of Kaduna State of Nigeria". Paper presented at the Farm Management Association of Nigeria Workshop, Held at FUTO, Owerri, Imo State, Nigeria June 5- 8.

Olukosi, J.O., 1998, "Livelihood Systems in the Hadejia-Nguru Wetlands in the North-East of Nigeria". Technical Report prepared for the British Department for Decentralized Development (DFID), Kaduna, Nigeria.

- Olukosi, J.O., 2005, “ Identification and Sensitization of Marginalized and Vulnerable Groups for Fadama –II Project in Gombe State
- Olukosi, J.O., B. Ahmed, E. Okunade, I. Abubakar, M. Mustapha and A. Almu, 2006. Impact Assessment Study of IFAD Community Based Agricultural and Rural Development Projects in Six States of Nigeria. Reports in seven volumes prepared for the IFAD/PCU/PSO Katsina.
- Olukosi J.O., Ahmed Tijjani, A. D. Suleiman and Michael Degri (2007) Impact Assessment of Fadama II Project in Gombe State Agricultural Development Project (ADP), IFPRI/World Bank /NFDCO) Abuja.
- Olukosi, J.O. (2009) Technologies generated by National Veterinary Research Institute, Vom 1997-2008. Strategic Agricultural Technology Assessment And Validation Project Commissioned by Agricultural Research Council of Nigeria (ARC/N), Abuja.
- Omolehin R.A. , A.O. Ogunbible, J.,O. Olukosi and S.A. Ogunwale, 1996 "Cost and Returns on Mixed Cropping Systems of High- Yielding and Farmers' Varieties in Northern Nigeria Savanna". Paper presented at the Farm Management Association of Nigeria Workshop, Held at FUTU, Owerri, Imo State Nigeria June 5-8.
- Orakwue, F.C. and J.O. Olukosi, 1990. "Wheat production prospects in Nigeria". Invited paper by the Nigerian Consultative Committee on Industrial Research and Development (NCCIR & D), Industrial Technology Department, FMST, Lagos.
- O’ Sullivan, Frank: H. Cathala and J.O.Olukosi., 2005. Mid- Term Review of ADENI Project in Katsina, Kaduna and Kano States. Report prepared for NAERLS/ ADENI French Embassy of Nigeria.
- Otegbeye, G.O. and J.O. Olukosi, 1994 "Farmed Parkland Agroforestry Systems in Katsina State of Nigeria". *Journal of Agricultural Systems in Africa*, pp.28-37.
- Rayer, A.J., B.K. Kaigarna, J.O. Olukosi and A.B. Anaso, 1990. *Wheat in Nigeria: Production, Processing and Utilization*. Lake Chad Research Institute, Maiduguri, Nigeria. 300 pp.
- Stolper, W.F. (1966) Planning Without Facts” Lessons In Resource Allocation from Nigeria Development, Harvard University Press, Cambridge
- Weber, G.K (1990) Leguminous Species. Ed. Proceedings of the Second COMBS Workshop,

Kumasi, Ghana, 1990. Published by West African Farming Systems Research Network and IITA, Ibadan, 71 pp.

Weber, G.K., J. Smith and J.O. Olukosi, 1992 Eds. Characterization of Target Zones and Technological Adaptation for On-Farm Testing of Leguminous Species.

Ed. Proceedings of the Second COMBS WorkshoP, Kumasi, Ghana, 1990. Published by West African Farming Systems Research Network and IITA, Ibadan, 71 pp.