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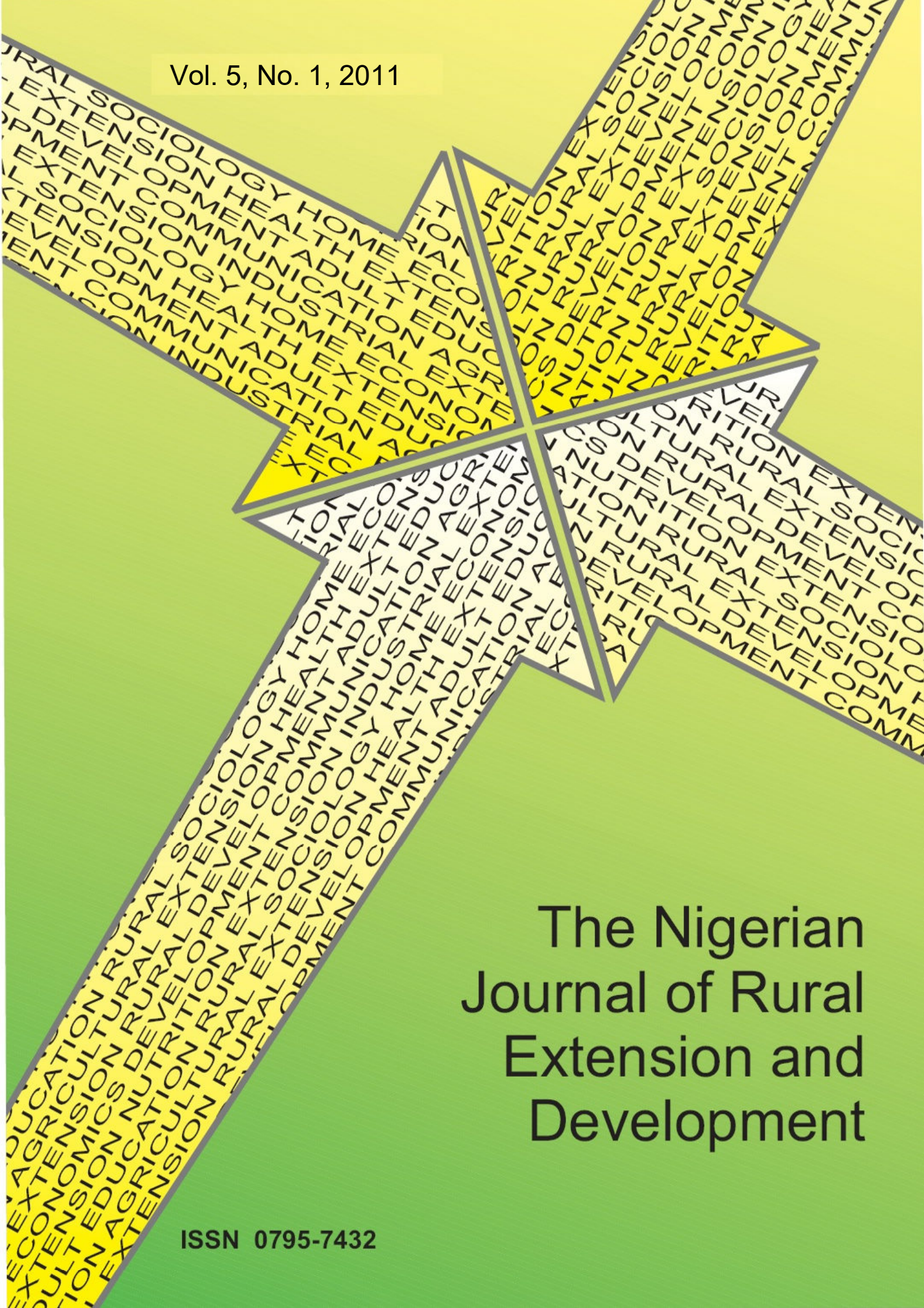

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Aims and Scope

The Nigerian Journal of Rural Extension and Development (NJRED), a referred journal, is an annual publication of the Department of Agricultural Extension and Rural Development, University of Ibadan, Nigeria. The journal is intended to encourage systematic and continuous publication of practical ideas and empirical research work in the area of Rural Extension and Development as it relates to Rural Development, Women in Development. Agriculture and Extension Education, Rural Sociology, Livelihood, Mass and Extension Communication, Health and Nutrition Extension, Home Economics, Adult Education and Multi-disciplinary Rural Extension issues.

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Socio-Economic And Cultural Factors Associated With Farmers' Use Of Sustainable Land Management Practices In Ondo State

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ABSTRACT

This study examined the socio-economic and cultural factors associated with farmers' use of sustainable land management practices in Ondo State, Nigeria. A multistage random sampling technique was used to select 320 crop farmers for the study. The results showed that majority (78.7%) of the sampled farmers were male while 67.5 % were married with children. Large proportion (81.8%) of the respondents fall within the ages of 35-49 years, and majority (82.5%) of them were Yoruba. The educational background showed that 75.3% had one form of education or the other and over half (55.4%) of the farmers belonged to one group or the other. The results showed that 91.6% of the respondents were aware of the sustainable land management practices while only (8.4%) were not aware of the sustainable land management practices. Inferential statistical results indicate that there was significant relationship between farmers' use of sustainable land management practices and their educational level (χ^2 = 15.31; p = 0.05) and government policies ($\chi^2$15.54; p<0.05). Also, age (r= -0.56 p <0.05); farmers' income (r= 0.19, p <0.05); farm size (r = 0.37; P <0.05) among other variables have significant relationship with the use of sustainable land management practices. The study concluded that in planning and formulating development programmes for sustainable land management practices, socio-economic and cultural framework within the programmes must be put into consideration.

Keywords: Cultural factors, Management practices, Socio-economic, Sustainability.

INTRODUCTION

Land degradation has become a threat to life and property in this country. Eboh, et.al, (1995), reported that environmental problems in rural areas are of varying nature and degree depending on the physical and vegetation characteristics of the area. Understanding the environment not only in its technical sense but also as well as on the socio-economic life of the people and cultural contexts will help in designing action oriented management of their environment (NEST, 1995, UNCED, 2000 and FAO, 1990).The rural people in Nigeria have developed over the years effective methods of managing the land sustainably. These include the setting aside of land for religious and other purposes (Osunde, 1998; Adekoya, 1997; Fakoya, 2000 and Stroup and Baden, 2001). Such land served as community forest estate protected by local laws and customs and serving the spiritual and material needs of the rural people. As a matter of fact, agriculture – the cultivation of land for food was the first occupation of the traditional man. Agricultural sacredness which accounts for approximate rites before farming (cultivation of land) took place in Yoruba cultural past and involves consulting the oracle before cultivating any land for agricultural purposes. The farmer would also be made to offer prescribed sacrifice for two main reasons; to ensure safe cultivation devoid of accident and untimely death and to guarantee success and bountiful yield (Opefeyitimi, 1998).

Osunde (1998) opined that, ethnic practices among Yoruba militate against sound environmental management. However, some aspects of these norms augur well for an improved environment and conservation of vegetation which promotes bio-diversity and while ensuring ecological balance. Traditional religious belief and practices have resulted in preserving sacred groves throughout Yoruba land especially in the savannah region. Ayeni (1995) opined that the sacred groves are protected, conserved and maintained through a combination of taboos, prohibitions, beliefs and restrictions. In

most cases, burning trees, cutting and fuel wood gathering are prohibited in groves. Sanctions are enforced against those who contravene the taboos, and in some instances the culprits must perform certain rituals. The groves symbolize the dimensions vegetation cover could assume when there is maximum protection possible.

Sacred groves are believed to be the abode of gods and ancestral spirits and to provide protection for special members of the communities (fetish priests) organize periodic rituals, ancestral worship sessions and other customary performances in or around groves which are reserved as shrines (Osunde, 1998). On a similar note, not all portions of the land can or should be cultivated in Yoruba land because the untouchable portion of land included in these categories are sacred groves (Igbo Igbale) reserved for masquerades roarer (Oro), the wisdom god (Ifa) and the god of Iron (Ogun). The belief is strong that the spirits of these divinities actually live in those groves. Hence elders go there to commune with them on special occasions. Opefeyitimi (1998) maintained that changes in agricultural practices can be adapted to tradition and history of lands. Osunde (1998) opined that because of the close relationship between culture and land, any campaign for land management must take a new cultural tune calling for new ways of life and new orientation. The protection of cultural and geographical ecosystems will go a long way in ensuring sustainability in agricultural land.

Therefore, land use and management systems have to be matched with social and economic considerations within environmentally acceptable guidelines. (Ayeni, 1995 and Okali, 1991). In planning and formulating development programmes, the social, cultural and economic framework within which programmes will be implemented need to be put into consideration to ensure long term productivity and sustainability.

This paper therefore focuses on:

1. Describing the socio-economic and cultural factors associated with the use of sustainable land management practices.
2. Determining the level of awareness of the farmers' toward the use of sustainable land management practices.
3. Determining the significance of some of the prominent socio-economic and cultural factors associated with the use of sustainable land management practices.

METHODOLOGY

This study was carried out in Ondo State, Nigeria. The average annual rainfall is between 900mm and 1600mm. The land tenure system in the zone is a combination of communal and individual ownership. In spite of the 1978 land use decree, which vested state government with authority over all lands, land is still the property of the extended family in the community. At the discretion of the family heads and other principal members, land can be leased out to other families or even to strangers but sales of farmland are traditionally prohibited. Recently however, commercialization of production resources has permeated every facet of human life in Nigeria and sales of land have consequently become common (Omotayo *et.al*, 1999; Fakoya, 2000).

Sampling procedure and sample size

Multistage sampling technique was used in drawing samples from the zones of Ondo State Agricultural Development Programme (ODSADEP). The first stage involved the selection of the two zones, Owo and Ondo that fell in the derived savannah. Owo zone comprises of eight (8) blocks while Ondo zone is made up of ten (10) blocks. Twenty percent of these were randomly selected, that is two (2) blocks in each zone. . The second stage involved random selection of 25 percent of the cells in each of the selected blocks. Each of the blocks is made up of 8 cells, which gave a total of 4 cells in Owo and Ondo zones. Ten percent of crop farmers in ODSADEP list were randomly selected to give a total of 320 respondents for the study. The information collected on socio-economic and cultural factors associated with use of sustainable land management practices is part of a larger survey by (Fakoya, 2000) on farmers' use of sustainable land management practices in the study area. A pre-tested interview guide probing into the various socio-economic and cultural factors affecting sustainable land management practise was administered on the respondents. Both the nominal and interval levels of measurement were adopted. A test-re-test reliability coefficient of r=0.84 was achieved when the of the instrument was tested for reliability. Carried out (r = 0.84) and in addition, cogent validity test to show the representativeness of the various items used and the measuring instrument was performed. Data collected were analysed using chi-square and correlation coefficient tests.

RESULTS AND DISCUSSION

Socio-economic and cultural characteristics

Table 1 indicates that 320 crop farmers interviewed for the study, 78.7% were males while 21.3% were females. Majority (81.8%) of the crop farmers were between 35-49 years of age. This shows that majority of the farmers were more involved and active in farming activities. This can be attributed to the fact that people are more energetic during this period. The table also indicated that a large proportion of the respondents (over 82 percent) were Yoruba. The sampled farmers were relatively socially homogenous. A very small proportion of farmers were representative of the Hausa, Igbo, Efik and Tiv ethnic groups. About (68%)were married. Among the married male crop farmers, it was observed that majority of them had two or more wives with an average of 8 children per family. The educational background shows that a high proportion of the farmers (76.0%) had completed one form of formal education while about one quarter (24.7%) of the respondents had no formal education. On a general note however, the level of education of the respondents could be described as moderately high. The findings showed that majority of the respondents are Christians (57.2%) while a little over one-third were Muslims. Majority of the farmers belonged to more than one group as 34.9 %, 15.3% and 5.2% responded that they were members of different groups. The significance of group membership for this study comes from the realization that groups are possible avenues for mobilizing the farmers for collective farming activities and land management practices.

Table 1: Distribution of respondents by their socio-economic and cultural characteristics (N=320)

Variables	Freq	Percent
Age (years)		
34 and below	25	7.8
35-39	94	29.4
40-44	122	38.1
45-49	46	14.3
50-54	21	6.6
55 and above	12	3.8
Sex		
Male	252	78.7
Female	68	21.3
Ethnic background		
Yoruba		82.8
Hausa	265	6.6
Fulani	21	2.2
Igbo	7	5.3
Marital status	17	
Married		67.5
Single	216	16.3
Divorced	52	10.3
Widowed	33	5.9
Educational level	19	
No formal education		24.7
Adult literacy	79	18.4
Primary education	59	21.6
Secondary education	69	23.7
Tertiary education	76	6.3
Religion	20	
Christian		57.2
Muslim	183	33.2
Traditional	106	9.6
Membership in social group	31	
Community/environment ass.		48.1
Saving and credit association	154	40.3
Community Development	129	
Association		37.2
Farm Cooperation	119	32.2
Land User Association	103	27.2
Work Exchange Groups	83	32.2
	103	

Awareness of land management practices

Table 2 indicates that the land management knowledge systems have contributed to sustainable agriculture. However, awareness remains limited even among the elite. There is a need to expand the level and scope of environmental management practices through formal and non-formal approaches. Environmentally, all literate people all over the country have been aware and are convinced that crop existence is being seriously threatened. This threat is recognised due to natural disasters and the process caused by human activities. As shown on the Table 2,A large proportion (91.6%) of the respondents were aware of the use of sustainable land management practices while only 8.4% were not aware of the use of sustainable land management practices. Eighteen sustainable land management practices in the study area were identified (Fakoya, 2000). The level of awareness of the respondents was determined. The result shows that half of the respondents (50.4%) were aware of 11-16 sustainable land management

practices such composing, bush burning, tree planting, bush fallow. crop rotation .mulching, green manuring, shifting cultivation, farmyard manuring, erosion control and drainage . About 17.0 % were aware of all the practices while 13.1% were aware of 6-10 practices and only 8.4 percent of the farmers were not aware of any sustainable land management practices. This implies that farmers that were aware and engaged in high use of the sustainable land management practices while farmers that were not aware believed strongly in using 'juju' (magical powers) for land management.

Table 2: Distribution of respondents by their awareness of land management practices

Awareness	Freq	Percent
Aware	293	91.6
Not aware	27	8.4
Total	320	100.0
Level of awareness		
All practices	57	17.8
Aware 11-16 practices	161	50.4
Aware 6-10 practices	42	13.1
Aware 1-5 practices	33	10.3
Not aware	27	8.4

Correlation analysis of socio-economic and cultural factors affecting the use of sustainable land management practices

In Table 3, it was assumed in the study that the data collected from the crop farmers is normally distributed. The socio-economic and cultural factors affecting sustainable land management practices were subjected to correlation analysis at 0.05 level of significance. Each coefficient generated represents the relative combination of its associated variables to that of farmers' use of sustainable land management practices. This implies that the higher the magnitude of the coefficient, the more important the corresponding variables. Table 3 shows that age of the farmers in relation to the use of sustainable land management practices has an inverse relationship ($r = -0.56$, $p<0.05$), indicating that as age increases, the use of sustainable land management practices decreases. There were significant relationships between farm size ($r = 0.37$, $p < 0.05$), farmers' income ($r = 0.19$, $p < 0.05$), household size ($r = 0.19$, $p < 0.05$), and use of sustainable land management practices.

Table 3: Correlation coefficient between selected socio-economic and cultural factors affecting the use of sustainable land management practices

Variables	r	P	Decision
Age	-0.56	0.017	S
Income	0.19	0.00	S
Household size	0.17	0.02	S
Farm size	0.37	0.04	S
Farming experience	0.71	0.13	NS

NS = Not significant at 0.05 level of significance

Chi-square analysis between selected socio economic and cultural factors associated with the use of sustainable land management practices

The Chi-square analysis in Table 4 reveals that there were significant relationship between farmers' use of sustainable land management practices and education level ($\chi^2 = 15.31$; $p <0.05$), attitude of farmers towards land management ($\chi^2 = 8.14$; $p <0.05$), government policies ($\chi^2 = 15.54$; $p <0.05$), among others. While religion ($\chi^2 = 5.45$; $p <0.05$), ethnicity ($\chi^2 = 5.45$; $p <0.05$), gender ($\chi^2 = 6.13$; $p <0.05$) among other variables had no significant relationship with the use of sustainable land management practices. The management of land involves a complexity of interaction of variables such as population growth, gender, rural urban migration, government policies, poverty, urbanization and cultural practices. The rapidly intensifying pressure of population increases demand for higher food production and more land for other social and economic activities. Poverty is also a major social factor in that the level of poverty in the country in rural and urban areas makes the populace have no choice but to opt for immediate benefit, which is often at the expense of long term sustainability of land resources. The relationship between land use pattern and income level is often direct all thing being equal.

Table 4: Chi-square analysis between selected socio economic and cultural factors associated with the use of sustainable land management practices

Variables	χ^2 cal	df	χ^2 tab	Contingency Coefficient	Decision
Level of education	15.31	2	8.14	0.53	S
Ethnicity	5.45	2	9.03	0.16	NS
Gender	6.13	2	7.84	0.34	NS
Migrant status	4.43	2	9.32	0.24	NS
Level of awareness of land problems	10.13	2	8.19	0.64	S
Attitude towards land management	8.14	4	5.83	0.71	S
Investment in land management	7.15	2	6.95	0.34	S
Membership in social groups	7.89	3	10.34	0.31	NS
Population pressure on land	6.81	2	6.14	0.67	S
Social norms	13.13	2	11.82	0.54	S
Values and beliefs	8.34	4	7.41	0.49	S
Constraints to land management resources use	6.61	6	5.17	0.71	S
Extension agent activities	7.84	4	13.28	0.24	NS
Government policies	15.54	3	12.14	0.45	S
Types of land degradation	8.43	2	7.35	0.64	S
Poverty level of the farmers	7.64	2	7.11	0.55	S
Religion adherence	5.45	4	8.39	0.19	NS
Urbanization	6.14	2	9.85	0.18	NS
Sources of information	5.32	6	6.99	0.21	NS

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it is concluded that most respondents were males with majority of them between 35-49 years of age. The sampled farmers were relatively socially homogenous. The study clearly showed that fourteen out of twenty four socio-economic and cultural factors had significant relationship with sustainable land management practices. They are age, educational level, farmers' income, household size, government policies, migrant status, types of land degradation among others.

The complexity and diversity of socio-economic and cultural factors affecting land management in Nigeria are such that no single recommendation will fit all circumstances. It will therefore be pertinent to consider legal and institutional systems that are tailored to meet national and local needs. There are however, certain key issues that require attention.

These are:

- increased population pressure on land
- intensification of agriculture and need for increased population
- poverty level of people which enhance irrational use of land resources
- increasing monetary value of land and
- unequal access to land

These issues and others have been the major bane in the sustainable use of land resources in Nigeria. In view of this, the following recommendations are given to further alleviate land use problems and enhance sustainable land management for future generation. There is the need to establish land management information centres for proper dissemination of land management practices to extension workers so as to be in a better position to help farmers in the aspect of soil management. Due to the close relationship between culture and land use, any campaign for land management practices must take a new cultural tone calling for new ways of life and new orientation.

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Contributions Of Information And Communication Technologies To Enterprises Of Rural Dwellers

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ABSTRACT

Information and Communication Technologies are offering new ways for communicating and exchanging information and knowledge. The study pursued the potentials of use of ICTs to enhance rural people's livelihood in terms of access to relevant information for their occupation. The study was carried out in Oyo state, using multistage random sampling technique to select 120 respondents. Data collected was analysed using frequencies and percentages to describe the findings while multinomial logit model and PPMC were used to test for relationship between the variables in the study's hypotheses. The study found that most (63.3%) of the respondents were male, 72.5% were married and with mean of 6.84 years of formal education. They were mostly crop farmers and the crops cultivated by most of them were cassava, maize, cowpea, cashew and vegetable, and they have mean of 16.58 years of experience. They mostly required price and sales information for their enterprises. The major sources of information to the respondents were fellow professionals and family and friends while the main ICT sources were radio, GSM and television. The GSM features appreciably used by the respondents were voice call, SMS and voice SMS. The study found that 55.0% of the respondents were in the low level category of ICT users, 51.7% of them had benefited appreciably from the use of the facilities. The mostly realised constraints to use of the ICTs were unreliable power supply, missed information, technical knowledge and network fluctuation. Multinomial logit result found that education (β=0.246; p=0.000) and number of dependants (β=-0.412; p=0.006) significantly influenced the respondents' use of ICT tools. PPMC analysis revealed that use of ICTs is significantly increased by the benefits realised (r=0.638; p=0.000) and significantly (r=-0.258; p=0.005) reduced by constraints to ICT use. The study provided empirical evidence that access to ICTs can significantly improve the enterprises of rural dwellers and hence a poverty alleviation strategy in rural areas.

Keywords: ICT, utilisation, rural enterprise, poverty

INTRODUCTION

Background to the study

The contemporary society is characterised by the importance of information components in all facets of life; this is conceptualised as the information age. This period is typified by the development and proliferation of electronically communicated information, which has accelerated economic and social change across all areas of human activity worldwide, and it continues to do so at a rapid pace. While the use of information and communication technologies (ICTs) remains concentrated largely in the developed world, ICT diffusion is beginning to reach developing countries, including poor rural areas, bringing with it high hopes of positive development outcomes. Despite the fact that technological innovations, such as cellular telephones and wireless broadband access, are playing an important role in building ICT levels globally, strong inequality still remains.

ICTs are unique by their nature by having an impact beyond the individual user's welfare. ICT infrastructure offers economies of scale that stimulate network building and consequent spill over benefits (Maximo and von Braun, 2006). ICTs enable interactive communication unhindered by distance, volume, medium, or time. They promote greater inclusion of individuals within networks and increase the diversity of participants by overcoming the barriers of physical distance and social standing; which are

issues of critical deprivation to most rural entrepreneurs. The immediacy and reach of ICTs also promote faster, more efficient, and ultimately better decision-making across all fields of endeavour.

Some sceptics, however, hold much more different views of the benefits of ICTs for development. They argue that access to ICTs largely depends on education, income, and wealth and that the so-called digital divide is only a part of a much broader development divide. Limited education, inappropriate language skills, or lack of resources could prevent disadvantaged segments of the population from accessing ICTs, ultimately exacerbating information gaps and increasing income inequality between and within countries. The income gap could be further widened if ICT use raises the demand for skilled labour and, by its introduction into manufacturing and service industries reduces the demand for unskilled labour, at least in the short term. It is often argued that developing countries have other, more pressing investment priorities, such as food, safe water, education, and public health, and that devoting limited resources to ICTs must be justified on the basis of its opportunity costs relative to other development agendas. The foregoing depicts variety of views about ICTs and reveals that their role in development is unclear, especially without convincing evidence of their impact, and little research has been conducted on the direct and indirect links between ICTs and poverty reduction.

Statement of problem

The rural poor constitute the engines of agricultural production in developing countries while agricultural production and post-harvest activities account for the primary livelihood strategies available to them. Hence, any effort made to address the problems of livelihood of the rural poor will equally have significant impacts on agricultural production at household, regional and national levels. The development stakeholders therefore have the responsibility to make the farmers among other stakeholders withstand the challenges of globalisation. There is growing recognition that farmers and members of rural communities have needs for information and appropriate learning methods that are not being met (Greenridge, 2003 and Lightfoot, 2003). The emerging issue is how Information and Communication Technology (ICT) can be integrated into local knowledge and information networks to address locally identified knowledge gaps.

A major indicator of infrastructural requirement for ICT use is Teledensity. It is a measure of the penetration of telephone lines within a territory. Nigeria's teledensity grew from near zero at the turn of the millennium to about 8% in just four years; whereas by 2009, it has grown to over 53%. This shows a geometric increase in the availability of the facility to the extent that Nigeria was declared as the largest growth market for telecommunication in Africa and the Middle East (NCC, 2005). There have been increases in access to various ICT tools such as Global System for Mobile Communications (GSM), television (TV), and radios, internet and newspapers even in rural areas. These facilities can be used by people to access information on prices, markets, technology, and other enterprises. Community-based telecentres are being established, with the goal to empower rural communities and facilitate socioeconomic development through communal access to the facilities. It would therefore be relevant to determine the extent to which the available ICT tools contribute to development of rural enterprises and hence the welfare of the rural people.

Therefore, this study is proposed to address the following research questions:

1. What are the enterprise characteristics of the respondents?
2. Which ICT tools are available to the entrepreneurs in the study area?
3. What are the benefits to the respondents' enterprises from the use of ICT facilities?
4. What are the constraints to the use of ICTs in the study area?

Objectives of the study

The general objective of the study is to ascertain the contribution of ICTs to the development rural enterprises in the study area. The specific objectives are to:

1. ascertain the enterprises characteristics of the respondents
2. identify the ICTs tools are available to the entrepreneurs in the study area
3. document the benefits to the respondents' enterprises from their use of ICTs facilities
4. determine the constraints to the use of ICTs in the study area

Hypotheses of the study

The hypotheses of the study, stated in null form, are as follows:

1. There is no significant relationship between socioeconomic characteristics of the

respondents and extent of use of ICTs in their enterprises.
2. There is no significant relationship between constraints realised, benefits derived and extent of use of ICTs.

Justification of study

The notion of ICTs contribution to development of rural enterprises highlights the capacities of new technologies to develop the rural communities. Thus, use of the ICTs facilities may ultimately lead to real rural development in Nigeria because of its capability to harness all the required information needed by the people to withstand the trends in the contemporary world. This strategy is proposing a way of effective use of the ICT facilities in the country to fulfil the critical needs of the people. This study will ultimately provide milestone indicators of how to integrate rural development efforts into the country's IT policy. This development will assist in achieving the elusive sustainable food security in Nigeria as well as facilitate the nation's economic diversification efforts into the agricultural sector. The strategy will equally facilitate extension delivery systems by making it ultimately more effective and less expensive in comparison to the traditional methods that were hitherto in use. Empirical evidence about the relevance of the facilities to rural enterprises will assist the government and private agencies with concerns on agricultural and rural development.

Relationship between ICT and economic growth

In assessing the potential for ICTs to promote economic growth that benefits the poor, two central questions remain to be answered: First, to what extent has a causal relationship between ICTs and economic growth been established, or are there other factors involved? Second, is the resulting growth pro-poor, and, if not, what conditions could make it so? According to Maximo and von Braun (2006), estimates for 113 countries for over a 20-year period show a positive correlation between telecommunications infrastructure and income, as well as between telecommunications infrastructure and gross domestic product (GDP). The estimates suggest that a 1.0% increase in the telecommunications penetration rate might be expected to lead to a 0.03% increase in GDP. At the same time, models for different country groups reveal that telecommunications infrastructure has a nonlinear effect on economic output, particularly for lower and higher middle-income countries. These results imply that telecommunications networks need to reach a critical mass to have a discernible impact on economic output. In particular, growth effects were found to be strongest in areas with telecommunications penetration rates of between 5% and 15%.

Adaptation of ICTs to low income earners and SMEs

Collectively, small and medium-sized enterprises (SMEs) are perceived as the engine of growth in developing countries, but they face a formidable task in terms of surviving and competing in a global market. As one of the driving forces of globalisation, ICTs may deliver unprecedented opportunities. SME case studies provide substantial evidence of increased ICT adoption in low-income countries and positive ICT effects on SME performance. Wide use of the available technologies shows that ICT adoption can be a key element in remaining competitive. Nevertheless, the impact on firm performance in most cases is small. Low penetration rates in developing countries, below the reported minimum threshold level, may be responsible. In addition, and perhaps more important, the lack of complementary infrastructure may reduce the opportunities for firms adopting ICTs to perform better. The concentration on quantitative performance indicators may also have omitted notable improvement in the qualitative performance of the firms.

More data need to be collected over longer time periods. Such data, especially those collected from the same subjects, should focus on SMEs and on eliminating any doubt about a causal relationship between the diffusion of ICTs and economic and social benefits in developing countries and regions. Such results may confirm a positive correlation, in some cases quite strongly, between ICT access and improved SME performance.

Surmounting constraints to ICT use

The reduction of the information gap at a low cost is of central importance for the poor. Even though access is still very restricted in most rural areas, it is fair to say that ICTs have an important positive impact on rural households. The welfare effect of telephone use in rural households is verified by users' perceptions of the benefits, the high demand for service, the substantial consumer surplus associated with telephone use, households' willingness to pay and results from some econometric analysis. It is possible to increase the positive impact by making

ICTs more accessible in rural areas, adapting new technologies to rural settings and using old technologies in innovative ways, such as providing information services by telephone.

However, in both SMEs and households some policy problems remain. First, most case studies reveal that major regulatory impediments lead to lack of private-sector participation in telecommunications and consequently to insufficient competition. As a result, access costs are too high, interconnection between networks is problematic, and infrastructure cannot be shared among operators. Second, a number of potential barriers to the effectiveness of ICTs remain. Apart from issues of access and price, barriers to ICT effectiveness fall into three principal categories:

i) barriers involving skill levels, such as in accessing Internet information;
ii) barriers involving ICT use for development-related purposes; and
iii) barriers related to content relevance.

These factors have the potential to influence the rate of adoption and the degree to which available Internet information reaches individuals in the community. Given these barriers, expanding ICTs in rural areas may require complementary measures, such as computer and Internet skills training, web pages designed to direct users to locally relevant content, or access that targets specific groups, such as youth, who may experience fewer sociocultural barriers to ICT use. In many low-income countries, access to telephones is the basis of pro-poor ICT growth because specialised skills are not needed and because telephone access forms a platform for more advanced ICT adoption.

With respect to cost barriers, it will be important to learn from existing models. Public Internet access, for example, provides efficient, low-cost access to multiple users, at both the SME and household levels. This business model could be modified to suit a dual broadband strategy, promoting both the deployment of wireless broadband networks and the adoption of voice telephony applications targeted to low-income users.

METHODOLOGY

Study area

The study was carried out in Oyo State. It lies between Latitudes 7°23′47″ and $8^0$00′0″N; Longitudes $3^0$55′0″E and $4^0$00′0″ and covers a total of 27,249 square kilometres of landmass. It has such towns as Ibadan, Ogbomoso, Oyo, Iseyin, Saki Igboho, Kisi, Igbo-Ora, Okeho, Lalupon and Ileto. It consists of thirty-three local government areas. Agriculture is the main occupation of the people in the state. The climate favours the cultivation of crops like maize, yam, cassava, cowpea, rice, plantains, cocoa, palm produce, cashew among others.

Sampling procedure and sample size

The population of the study consist of all rural households in the study area. Multistage sampling procedure was used to select the respondents of the study. The first stage involved a stratification of local government areas in the state on rural-urban basis; this gave 20 rural and 13 urban local government areas. The second stage involved a selection of 20% of the rural local government areas using simple random sampling technique, which gave four local government areas. The third stage involved a random selection of two communities from each of the four selected local government areas. Fourth stage involved a systematic selection of 15 households from each of the selected eight communities. The study sampled an individual from each of the selected households, which gave a sample size of 120 respondents.

Instrument and method of data collection

The research instrument contains question items that were used to solicit information along the objectives of the study. The respondents were asked to indicate the ICT tools available to them and the extent to which they used the available ICT tools. The index created from extent of use of ICTs was used to categorise the respondents into low and high levels based on ‘above and below the mean’ criterion.

Structured questionnaire was used to collect information from literate farmers but was administered as interview schedule to illiterate farmers, so as to circumvent the barrier of illiteracy.

Method of data analysis

Descriptive statistic such as frequencies, percentage and mean were used to describe some of the variables. Inferential statistical tools such as PPMC and Binomial logit regression model were used to test for relationship between the variables in the hypotheses of the study.

RESULT DISCUSSION

Personal characteristics of the respondents

The result of the analysis on the respondents’ socioeconomic characteristics, as given in Table 1 revealed that most (63.3%) of

them were male while others were female. This implies that the rural enterprises are dominated by male in the study area. The result also shows that that while 72.5% of the respondents were married, 12.5% of them were single. Distribution of the respondents by age reveals that most (41.7%) of them fell between the ages of 36 and 51 years, while 32.5% were between 52 and 68 years. The mean age being 44.9 years showed that the respondents are still fairly young in the rural area.

Table 1: Distribution of respondents by socioeconomic characteristics

Characteristics	Freq	Percent
Sex		
Male	76	63.3
Female	44	36.7
Marital status		
Separated	14	11.7
Widow	4	3.3
Married	87	72.5
Single	15	12.5
Age (Years)	Mean = 44.90	
20 - 35	31	25.8
36 - 51	50	41.7
52 – 68	39	32.5
Years of formal education	Mean = 6.85	
None	33	27.5
Primary	39	32.5
Secondary	24	20.0
Tertiary	24	20.0
Family size (Mean = 7.33)		
1-5	36	30.0
6-10	64	53.3
More than 10	20	16.7
Income/month (N)	Mean = 25,333.33	
1500 – 19000	44	36.7
19001 - 36500	56	46.6
36501 - 54000	16	13.3
71500 – 100000	4	3.3
Total	120	100.0

Distribution of respondents' education revealed that most (32.5%) of them had primary education, 20.0% had tertiary education while 27.5% did not have any formal education. The mean years of formal education (6.85 years) showed that the respondents merely had primary education in the study area. The study also showed that more than half (53.3%) of the respondents had between 6 and 10 persons within their families while 30.0% had between 1 and 5 persons as their family sizes; an average family size of 7.33 persons depicted a fairly large family size in the study area. The results also show that about half (46.6%) of the respondents' income fell between N19,009 and N36,500 per month, while 36.7% had between N1500 and N19000 as their monthly income. With the mean income at N25,333.33/month, translating to about $5 per day, the income is fairly low among the respondents in the study area.

Enterprise characteristics

The distribution of the respondents' enterprise characteristics, as given in Table 2 showed that 40.8% had farming as their primary occupation while 22.5% were traders/artisans. It further shows that most of the respondents (59.2%) had farming as their secondary occupation. This implies that farming is the main activity in which most of the respondents in the study area are involved. Distribution of the respondents by crops cultivated showed that all of them cultivated cassava and maize, 90.8% cultivated cowpea while 53.2% cultivated varieties of vegetable crops. This implies that cassava and maize among others are the mostly cultivated crops in the study area.

Regarding information sought in their enterprises, the results show that 71.7% required price information while 50.8% required sales information. This means that the mostly sought information by the rural entrepreneurs is the price information. This need, according to Okunmadewa (1998), is critical because farmers are mostly not well remunerated in their enterprise activities as their share of retail prices is as low as 40% for most food crops.

The results also show that 56.7% of the respondents had between 2 and 19 years of experience in their rural enterprises while 40.0% had between 20 and 37 years of experience. With average years of experience at 16.58 years, it shows that the rural entrepreneurs are well experienced in their activities.

Table 2: Distribution of respondents by enterprises characteristics

Enterprises characteristics	Freq.	Percent
Primary occupation		
Trading/Artisan	27	22.5
Farming	49	40.8
Civil servant	25	20.8
Teaching	19	15.8

Secondary occupation		
Farming	71	59.2
Trading/Artisan	30	25.0
Masonry	16	13.3
Crops cultivated*		
Cassava	109	100.0
Maize	109	100.0
Cowpea	99	90.8
Cocoa	91	83.5
Cashew	99	90.8
Yam	37	33.9
Vegetable	58	53.2
Nature of information required*		
Sales information	61	50.8
Market information	39	32.5
Price information	86	71.7
Year of experiences		
2 – 19	68	56.7
20 – 37	48	40.0
38 – 50	4	3.3
Total	**120**	**100.0**

* Multiple responses

Sources of information on enterprises

The study pursued and obtained data on sources of information for enterprise activities in the study area. Distribution of respondents, in Table 3 shows that information for their enterprises were obtained from social sources as well as through the ICT tools.

The results revealed that fellow professionals (weighted score = 192.4) are the most prominent sources of enterprise information to most rural entrepreneurs in the study area, then family and friends (179.1) and extension agents (90.1). This implies that the most useful social linkage to the entrepreneurs is fellow professionals, who are equally confronted by the same need, which emphasises the importance of the social capital resource in the study area.

The ICT tools, among others sources, from which respondents accessed enterprise information are radio (129.9), GSM (129.2), television (110.9) and newspaper (69.2). This showed that GSM, apart from radio is well used to fulfil information needs by most of the entrepreneurs. This prompted the need to assess the extent of use of GSM features by the respondents. This finding shows that voice call (165.8) was mostly used, then short message services (SMS) (99.9), voice SMS (65.8), multimedia messaging service (MMS) (56.9) and general packet radio service (GPRS) (41.7) in that order. This revealed that voice call is the mostly used GSM feature by the respondents in the study area.

Distribution of the level of use of ICTs in Table 4 shows that 55.0% of the respondents do not use the ICTs substantially on the basis of their enterprise concerns.

Benefits derived from use of ICTs

The study found out the areas of benefits to the respondents' enterprises from their use of ICTs. Findings in Table 5 show that their ability to communicate easily to customers is the mostly (153.8) realised benefits by the respondents. Thereafter, relevant information from media (113.4), ideas on enhancement of quality of products (110.8), increased profits (105.1), risk management (98.4) and enhanced patronage due to adverts (96.6) are the other benefits realised by the respondents. This revealed that the mostly realised benefits is the one conferred by the use of GSM, while other emanated from the use of mass media tools such as radio and television. This finding underscores the importance of GSM as an important tool to the entrepreneurs in the study area. According to Gelb *et al* (2008), mobile telephony provides access to markets and has strengthened farmers bargaining power, as they now have access to real time information and marketing alternatives. According to Stienen *et al* (2007), such access to ICT enables rural communities to interact with other stakeholders, thus reducing social isolation, widens the perspective of local communities in terms of national or global developments, opens up new business opportunities and allows easier contact with friends and relatives.

Table 3: Distribution of respondents by sources of information on enterprises (n=120)

Sources of enterprise information*	To a large extent	To a lesser extent	Not at all	Weighted score
Social sources				
Fellow professional	93.3	5.8	0.8	192.4
Family and friends	83.3	12.5	4.1	179.1
Extension agent	31.7	26.7	41.7	90.1
ICTs				
Radio	48.3	33.3	18.3	129.9
GSM	54.2	20.8	25.0	129.2
Television	41.7	27.5	30.8	110.9
Newspaper	20	29.2	50.8	69.2
Bulletin	12.5	21.7	65.8	46.7
Poster	3.3	22.5	74.2	29.1
Internet	5.0	15.8	79.2	25.8
E-mail	0.0	13.3	86.7	13.3
Fax	0.0	6.7	93.3	6.7
GSM features used*				
Voice call	77.5	10.8	11.7	165.8
SMS	38.3	23.3	38.3	99.9
Voice SMS	27.5	10.8	61.7	65.8
MMS	13.3	30.3	56.7	56.9
GPRS	11.7	18.3	70.0	41.7

* Multiple responses

Table 4: Distribution of respondents by level of use of ICTs

Levels	Frequency	Percent
Low	66	55.0
High	54	45.0
Total	120	100.0

Table 5: Distribution of respondents by benefits derived for enterprises from use of ICTs (n=120)

Benefits	Agreed	Undecided	Disagree	Weighted score
Easy to communicate to costumers	70.0	18.3	11.7	158.3
Information from mass media has assisted my enterprises	36.7	40.0	23.3	113.4
Enhanced quality control of enterprises	42.5	25.8	31.7	110.8
Profits has increased significantly	39.2	26.7	34.2	105.1
Information has helped in managing risks	34.2	30.0	35.8	98.4
Advert on mass media enhanced patronage	30.8	35.0	34.2	96.6

The benefits derived by the respondents were categorised into low and high levels based on 'above and below the mean' criterion. The distribution of the respondents by benefit levels in Table 6 showed that 51.7% of them have high level (substantial) benefit in their enterprises from the use of ICTs. This implies that despite limited level of use of the facility, the benefit was more pervasive.

The fact remains that the realisation of these benefits may not come just because the ICT infrastructures are in place; there is a huge gap between information residing in agricultural knowledge centres and rural communities. At local level, multi-stakeholder mechanisms are important to make relevant information accessible to the end users. Intermediary organisations need to connect rural communities to the available knowledge. The reality is that the users will

always want tailor-made, quality answers to their questions. These, among other challenges are the issues that need to be addressed alongside the provision of ICT facilities for the rural populace.

Table 6: Distribution of respondents by level of benefits derived from use of ICTs

Levels	Frequency	Percent
Low	58	48.3
High	62	51.7
Total	120	100.0

Constraints to use of ICTs

Data on constraints to the use of ICTs in the study area were solicited. Results in Table 7 shows that the areas in which the respondents realised substantial constraints to the use of ICTs were unreliable power supply (149.1), missed information (137.4), technical knowledge in the use of facilities (120.1), lack of relevance of information channel (114.1) and network fluctuation (112.6) among other ones. This revealed that irregular power supply is the most realised constraint to the use of ICTs in the study area. This is an issue that borders on public policy domain in the deployment of the tool. This informs the opinion that exploration and support of the connectivity details of ICTs are areas of significant research priority (Gelb *et al*, 2008). The social and political environment within which ICT projects operate is crucial and supportive policies and measures are required. Awareness-raising, developing functional supporting systems and enhancing the capacities of stakeholders are some of the issues the experts have identified over time (Stienen *et al*, 2007). This is also based on the general lessons that success is not derived automatically from inserting ICT into isolated and poor communities.

Table 7: Distribution of respondents according to constraints to use of ICTs

Constraints	Serious constraints	Mild constraints	Not a constraint	Weighted score
Unreliable power supply	58.3	32.5	9.2	149.1
Missed information	50.8	35.8	13.3	137.4
Technical know how	39.2	41.7	19.2	120.1
Lack of relevance of information channel	30.8	52.5	16.7	114.1
Network Fluctuation	36.7	39.2	24.2	112.6
High cost of subscription	38.3	35.8	25.8	112.4
High cost of maintenance	30.0	50.0	20.0	110.0
Maintenance of tools and equipment	27.5	54.2	18.3	109.2
Inadequate access to ICT tools	30.0	44.2	25.8	104.2

Hypotheses of the study

The first hypothesis was tested between selected socioeconomic characteristics of the respondents and level of ICT use. This hypothesis was tested using a binomial logit regression model. The result of the analysis in Table 8 showed that formal education increased the odd of being a high level user of ICTs, while number of dependants reduced the odd of being a high level user of the facilities. This findings implied that those who have more formal education uses ICTs more than others and those who have larger number of dependants do not use ICTs as much as those with fewer dependants. The finding on relevance of education to use of ICTs can be explained by the fact that the educated respondents will appreciate the relevance of the facilities more and encounter lesser constraints to use of the facilities. Some authorities (CTA, 2006; Munyua, 2000) have established that one of the obstacles to the use of ICTs in the pursuit of sustainable livelihood is lack of access to education and training. The finding about number of dependants as disincentive to use of ICTs can be explained by burdensome logistic associated with the maintenance of the dependants which may hinder their use of ICTs.

Table 8: Binomial logit regression between socioeconomic characteristics and level of ICT use

Personal characteristics	Standardised coefficient	t-value	p-value
Constant	-2.786	-1.180	0.238
Sex	0.955	1.521	0.128
Marital status	-0.359	-0.894	0.371
Age	0.680	1.836	0.066
Number of children	0.795	0.392	0.695
Formal education	0.246	3.642	0.000*
Other education	-0.316	-0.867	0.386
Family size	-0.210	-1.256	0.209
Number of dependants	-0.412	-2.747	0.006*
Religion	-0.465	-0.831	0.406
Monthly income	0.342	1.798	0.072
Sample size = 120	Log likelihood function = -46.94567		
Chi-squared = 71.262	Restricted log likelihood = -82.57666		
Degree of freedom = 10	Level of significance = 0.05		

* Significant variable

The second hypothesis was proposed to test whether constraints and benefits informed the use of ICTs among the respondents. The hypothesis was pursued using Pearson's Product Moment Correlations. The results of the analysis in Table 9 revealed that there is significant but negative relationship between constraints and use of ICTs while there is significant and positive relationship between benefits derived and use of ICTs. The findings imply that the use of ICTs is significantly impeded by constraints while the benefits derived significantly encouraged the use of the facilities.

Establishing the fact that constraints are strong enough to impede the use of ICTs is instructive. It is important to identify specific issues that constitute greatest constraints to the deployment of the technology. According to Gelb *et al* (2008), researchers have not devoted sufficient time and resources to identify solutions for effective adoption of technologies, including the ICTs. Such dedication is necessary and would amount to prioritising the pursuit of practical solutions to constraints to effective ICT uptake.

Table 9: Correlations analysis between constraints, benefits derived and level of use of ICTs

Variables	Correlation (r) value	p-value	Decision
Constraints	-0.258**	0.005	Significant
Benefits derived	0.638**	0.000	Significant

** Correlation is significant at the 0.01 level (2-tailed)

CONCLUSION

The study established that most of the respondents in the rural areas are into farming as an occupation. Price and sales information are the mostly sought information by the rural entrepreneurs. The radio and GSM are the mostly used ICTs to access enterprise information. The study also established that accrued benefit was commensurate with extent of use though there are constraints that are strong enough to discourage use of ICTs in the study area. It can be safely concluded that better access to ICTs will promote rural enterprises and removal of constraints will facilitate further use.

RECOMMENDATIONS

Based on the findings of the study, the followings are recommended:

1. ICT Infrastructure for rural areas must be part and parcel of national infrastructure planning and programmes
2. The problem of reliable power supply must be addressed to encourage ICT use

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SOCIO – ECONOMIC FACTORS INFLUENCING UTILIZATION OF BANK OF AGRICULTURE CREDIT SCHEME BY FARMERS IN OYO STATE, NIGERIA

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ABSTRACT

The study examined the socio–economic factors associated with credit disbursement and utilization by farmers, in Oyo State, Nigeria. A systematic random sampling technique was used to select 130 beneficiaries and 130 non–beneficiaries from the Bank of Agriculture Mobile Credit Officers at the Zonal Headquarter of the Bank, in the State Capital, Ibadan. Data were collected through structured questionnaire and analyzed using frequency counts, percentage, Chi-Square and Pearson Product Moment Correlation (PPMC). The result showed that majority (50.0%) of the beneficiaries and non–beneficiaries (52.3%) were within the age bracket of 41 – 50 years. In addition, majority (93.5%) of the farmers were married with children, while (88.5%) of them were males. Beneficiaries (17.7%) were more literate than the non – beneficiaries (5.4%). More than one – half (60.0%) of the farmers had arable crop farming as their primary occupation, with a farm size of 6 – 10 hectares. The result further showed that (58.4%) of the farmers relied on Bank of Agricultural Credit Scheme, despite the fact that only a few of them (2.3%)benefited from the loan 4 -5 times. Also (52.3%) of the beneficiaries and (35.4%) of the non – beneficiaries utilized the loan to hired labour and for weeding. Socio – economic characteristics such as age (χ^2 = 2.52, P > 0.05),and sex (χ^2 = 3.84, P > 0.05), had no significant effect on credit utilization. However, secondary occupation (r = 13.04),and sources of labour (r = 17.4) markedly influence the utilization of credit by the farmers. The study recommends that, the loan should be granted to the real farmers, and more females should be included in the future credit scheme.

Keywords: Socio – economic, disbursement, utilization, loan

INTRODUCTION

Nigeria ranks the 55th worldwide and first in Africa in farm output, although agriculture in Nigeria has suffered mismanagement, inconsistency and poorly conceived government policies, lack of basic infrastructure and credit facilities over the years. Despite the speedy growth in other sectors, agriculture is still the single largest sector contributing nearly 22% to the national income, and employing nearly 70% of the work force, as much as 75% of the country population living in rural areas directly or indirectly dependent on agriculture for its livelihood (Nasir and Uwelo 2011). Given its importance to national economy almost all governments gave high priority to raise agricultural productivity and hence farmers income. Decline in agricultural production in Nigeria began with the advent of the petroleum boom in the early 1970's, the boom in the oil sector brought about a distortion of the labour market. The distortion in turn resulted in adverse effects on the production levels of both food and cash crops, as food production could not keep pace with its increasing population, hence Nigeria, began to import food. It also lost its status as a net exporter of cash crops like cocoa; palm oil, and groundnut (Verheye, 2000). According to United State Department of Agriculture, (2001). Nigeria's total food and agricultural imports are valued at approximately $1.6 billion per year. Among the major imports from the United State are: wheat, sugar, milk powder and consumer ready food products.

Credit is the backbone of any business and more so agriculture, which has traditionally been a non – monetary activity for the rural population in Nigeria. Agricultural credit is an integral part of the process of modernization of agriculture and commercialization of the rural economy. The introduction of easy and cheap credit is the quickest way for boosting agricultural production. Therefore it was the prime policy of all successive governments to meet the credit requirements of the farming community in Nigeria. Agriculture as a sector depends more on

credit than any other sector of the economy, because of the seasonal variations in the farmers returns and a changing trends from subsistence to commercial farming. Credit may provide them the opportunity to earn more money and improve their standard of living. Under the bank of agriculture loan scheme, credit is provided for relief of distress and for purchasing seeds, fertilizers, cattle and implements (Balogun and Otu,1992)

The role of agricultural credit in enhancing agricultural productivity is well recognized and its contribution to alleviate poverty in rural areas is enormous. It significantly contributes in the total supply of food intake and increases the productivity of human labour, Olomola, (1994). The agricultural sector plays vital roles in providing nutritive food rich in animal protein and also helps in supplementing family incomes and generating gainful employment in the rural sector (Ihimodu, 2003).

Despite the efforts of various successive governments to increase agricultural production through its various programmes on agricultural credit, agricultural production in Nigeria which is dominated by small scale farmers is still on the decline. Most government agricultural credit programmes are good on paper but the implementations are faulty (Berger, 2002).

The problem of agricultural credit administration include those of assessment of application and project, the grounds on which a loan application is assessed often include the applicants personal qualities such as honesty, credit worthiness and repayment capacity as well as availability of security for the loan. Most of these yardsticks are at present time difficult to measure in the Nigerian small scale farming sector relative to other sector of the economy. Another major constraint of credit is the increasing default rate by the farmers, their loan repayment rate is not encouraging, and this is one of the reasons why commercial banks shy away from financing agriculture (CBN, 2002).

These problems according to Singh and Nasir (2003) were made worst by the complex nature of agriculture, which makes its financing relatively difficult compared to other sector of the economy. Inherent uncertainty in agriculture like natural hazards which cause unexpected and considerable losses to farmers makes banks less likely to finance or give farmers credit facilities. The production process of agriculture is such that there is long interval between effort and reward, During this interval the demand for agricultural produce may change in a manner that upsets the calculations of farmers thus introducing an additional uncertainly in the business of agriculture (Fischers, 2003).

The assumption of agricultural credit, is that loan are difficult to obtain, which means it is difficult to access fund, due to timing, duration and condition of repayment which are not favourable to beneficiaries. In this context, the present study was conducted to examine the socio – economic factors influencing the disbursement and utilization of Bank of Agricultural Credit Scheme by farmers in Oyo State, Nigeria.

Specifically, the study attempted to;

1. describe the socio – economic characteristics of the respondents;
2. identify the sources of credit, times and amount applied for credit;
3. ascertain the level of credit utilization by farmers in the study area;
4. determine the major constraints associated with credit procurement disbursement, and proffer solutions.

METHODOLOGY

The research work was conducted in Oyo State, Nigeria. The state was created in February, 1976 by the then military government of Nigeria. The state has thirty – two (32) Local Government Areas, and lies between longitudes $2^0 25$ and $4^0 30$ East of Greenwich Meridian and latitude $7^0 10$ and $9^0 25$ North of the equator. The state occupies a surface area of 28, 454 square kilometers of land, with a total population of about 5, 591, 589 (NPC, 2006). It shares common boundaries with Osun, Ogun and Kwara states. The state is characterized by two distinct seasons, the raining and dry seasons. The annual rainfall varies from 1150mm to 2000mmm, which is responsible for the luxuriant climatic condition enjoy by the state. The preponderance of the rural population in Oyo State, lends relevance to any rural development study carried out in the area. Primary data were collected from 130 beneficiaries and 130 non – beneficiaries from the Bank of Agriculture Mobile Credit Office at the Zonal Headquarters of the Bank, in the State Capital Ibadan, through systematic random sampling technique using structure questionnaire. Secondary data were obtained through survey of existing literature, banks journal and other research works relevant to the study. Data collected were analysed using descriptive and inferential statistics like frequency counts, percentages Chi – Square, and Pearson Product Moment Correlation (PPMC).

RESULTS AND DISCUSSION

Socio – economic characteristics of farmers

Table 1 shows that majority (50.0%) of the beneficiaries and non – beneficiaries (52.3%) were within the age bracket of 41 – 50 years, with a mean age of 45.5 years. This findings supported the report of Ekong (2003), Ogunfidimi (1981) and Oyeyinka (2002) which opined that most Nigeria Farmers are between 45 – 50 years of age, the aged people are not as adventurous as the young ones who explore new horizons for green pastures, and hence the tendency for middle aged people taking to farming as a vocation with the utilization of agricultural credit facilities to adopt new agricultural technologies.

Also, majority (86.2 and 90.8% respectively) of the beneficiaries and non – beneficiaries were males while a small proportion (13.8 and 9.2% respectively) were females. The implication of this finding is that more women should be encouraged to access credit from the Bank of Agriculture (BOA) credit scheme. Further, more 92.3% of the beneficiaries and 93.8% non – beneficiaries were married, while just 4.6 and 3.8% of the beneficiaries and non beneficiaries were single respectively. This shows that majority of the sampled farmers in Oyo State, were married. This could imply a cooperation between wives and husbands in the study area providing encouragement to either spouse to access BOA credit facilities.

On literacy level Table 1, shows that 53.8% of the beneficiaries and 60.0% of the non – beneficiaries could not read and write in English Language. Also, 38.5% of the beneficiaries and 35.6% of the non – beneficiaries could communicate only in English, while 17.7% and 5.4% of the beneficiaries and non – beneficiaries respectively could read and write in English language. The beneficiaries are more literate than the non – beneficiaries.This could be the bane of their in ability to obtain credit facilities due to the completion of certain complicated formalities associated with loan disbursement by the Bank of Agriculture (BOA).

On household size, Table 1 further shows that, 75.4% of the beneficiaries and 71.5% of non – beneficiaries have a family size of between 10 and 20 family members. This findings support the assertion that many of the farmers in the rural community of Oyo State practice polygamy, which eventually lead to large family size. The more the member of the family, the more the commitment of the farmers' in terms of school fees, clothing and other related family expenditure. This trend could encourage the diversion of loan collected to other activities that are inimical to the proper use of the loan for intended purposes.

Table I shows that 60.0% of beneficiaries and 57.7% of non beneficiaries were involved in arable crop production, while 12.3% of the beneficiaries and only 1.5% of the non – beneficiaries were civil servants. This findings points to the fact that there is need to focus the attention of the Bank of Agriculture (BOA credit scheme to its target audience,which primary are small scale farmers.An appreciable proportion of the beneficiaries revealed in this study is a danger signal and subtle manipulation by civil servants who used their priviledge position to accessed the credit.

Table I shows that more than one – half of the beneficiaries (56.8%) and (38.5%) of non – beneficiaries have a farm size of between 6 – 10 hectares. Only 0.8% of the beneficiaries and none of the non – beneficiaries had above 20 hectares of farmland. The implication of this findings is that those farmers who were beneficiaries of the Bank of Agriculture (BOA loan scheme cultivated more land than those without access to credit facilities. Therefore, more funds should be provided to the farmers so as to increase their farm size and boost food crop production in the study area.

Other sources of Credit

Table 2 shows that, 58.4% of the beneficiaries did not rely on any other sources of credit, besides the Bank of Agriculture (BOA) credit scheme. The reason adduced for this, was that most of the other sources of credit are unreliable and also they charged exorbitant interest rates which make repayment of loan difficult for the beneficiaries. However, 84.6% of the non – beneficiaries depended on other sources of credit such as money lenders and relatives, due to their inability to secure loan from the Bank of Agriculture loan scheme.

Numbers of times of application for loan:

Figure 1, indicated that, over one–third of the non–beneficiaries (35.4%) were new applicant, while the beneficiaries were just (0.8%). Majority of the beneficiaries (41.6%) applied for the loan between 3-4 times, while the non–beneficiaries were just (19.4%). The high frequency of application from the beneficiaries for the Bank of Agriculture (BOA) credit scheme might be due to their high literacy level, which has enable them to know the procedure and process of credit application, disbursement, and utilization.

Table I: Distribution of farmers by their socio – economic characteristics.

Variables	Beneficiaries n = 130		Non-beneficiaries n=130	
	Frequency	Percentage	Frequency	Percentage
Age				
Less than 20 years	5	3.8	3	2.4
20 – 30 years	10	7.7	16	12.3
31 – 40 years	23	17.1	19	14.6
41 – 50 years	65	50.0	68	52.3
Above 50 years	27	20.8	24	18.4
Sex				
Male	112	86.2	118	90.8
Female	18	13.8	12	9.2
Marital Status				
Single	06	4.6	05	3.8
Married	120	92.3	122	93.8
Widow/Widower	04	3.1	03	2.4
Literacy Level				
Can read & write English	20	15.4	07	5.4
Can nor read & write English	40	30.8	78	60.0
Can speak English only	70	53.8	45	35.6
Household Size				
Less than 10	28	21.5	36	27.7
11 – 15	42	32.5	48	36.9
16 – 20	56	43.1	45	34.6
Above 20	04	3.1	01	0.8
Primary Occupation*				
Arable crop farming	78	60.0	75	57.7
Livestock farming	28	21.5	26	20.0
Mixed farming	21	16.2	20	15.4
Food processing	21	16.2	18	13.4
Civil servant	16	12.3	02	1.5
Artisan	20	15.4	08	6.2
Farm Size				
1 – 5 hectares	0.3	2.4	38	29.2
6 – 10 hectares	74	56.8	50	38.5
11 – 20 hectares	52	40.0	42	32.3
Above 20 hectares	01	0.8	-	-

* Multiple Responses

Table 2 – Distribution of Respondents by Other Sources of Credit

Variables Response	Beneficiaries n = 130		Non-Beneficiaries n = 130	
	Frequency	Percentage	Frequency	Percentage
Commercial Banks	14	10.8	08	6.2
Cooperative Society	08	6.6	20	15.4
Agro-allied venture	09	6.2	10	7.7
Money lenders	12	9.2	42	32.2
Relative/friends	04	3.1	24	18.4
Sales from crops	07	5.4	06	4.6
Not applicable	76	58.4	20	15.4
Total	130	100.0	130	100.0

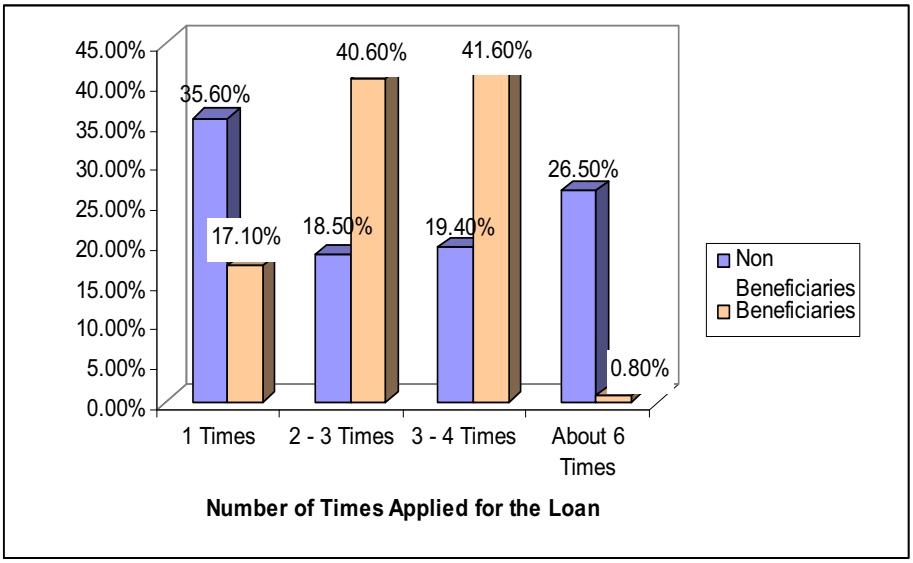

Figure 1: Distribution of respondents by number of times they had applied for loan

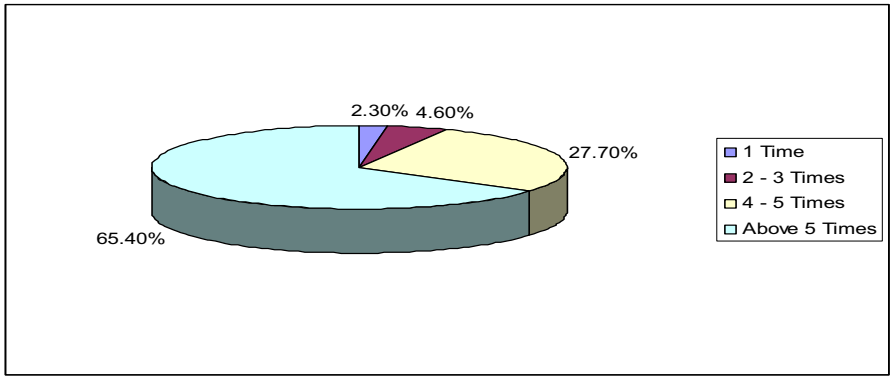

Figure 2: Distribution of respondents by number of times respondents benefited from the loan

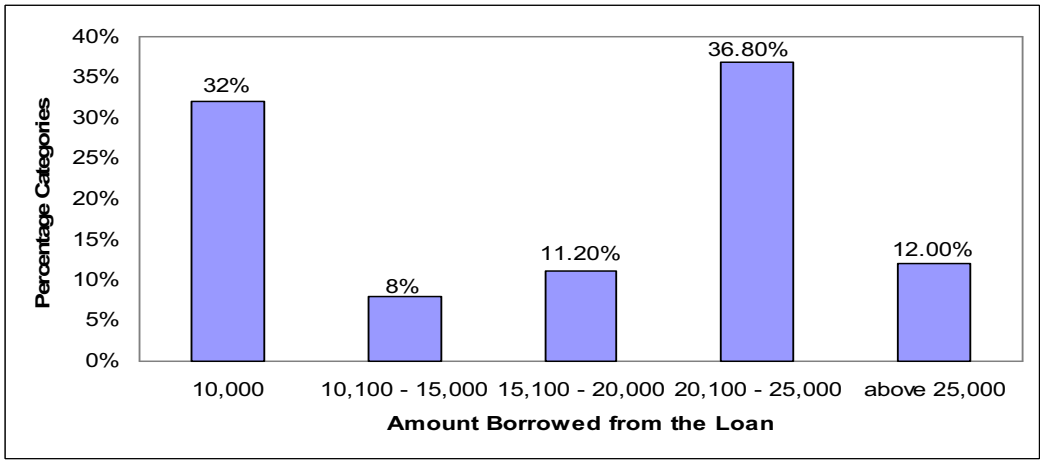

Figure 3: Distribution of respondents by amount borrowed from the scheme

Number of times respondents benefited from loan scheme

Figure 2 shows that, majority (65.4%) of the beneficiaries of the loan scheme had the opportunity of obtaining the loans once, 27.7% got it 2 -3 times, 4.6% secured it 4 -5 times, while just 2.3% obtained the loan more than 5 times. The implication of this is that, a few number of the beneficiaries had access to the loan scheme. Perhaps the delayed associated with the loan disbursement that had characterize the credit scheme could explain the trend observed in this findings. Delay in loan disbursement can result in either the loan missing its intended utilization or increase in the number of visits to the bank by the farmers (Olomola, 1994 and Oyeyinka, 2002). Increases in number of visit imply increase in the cost of production.

Amount borrowed by the farmers.

Figure 3 shows, that, a high proportion of the beneficiaries (51.2%) got between ₦10,000 and ₦20,000 loan, while (36.8%) got between ₦20,000 and ₦25,000. A few of them (12.0%) secured a loan of above ₦25, 000. The implication of this is that, the amount disbursed as loans to farmers was too small especially if one considered the high cost of agricultural inputs and chemicals. It would be suggested that, the amount loan able to the farmers in the future should be based on the current economic value of the naira.

Loan utilization by farmers;

The non – interest borrowing transaction cost of loans and timeliness tend to be more important to the farmers, this affects their utilization (Olomola, 1994 and Oyeyinka, 2002). Table 3 shows that (52.3%) of the beneficiaries and (35.4%) of the non – beneficiaries requested for the loan to hired labour, 16.2% of the beneficiaries and 10.0% of the non – beneficiaries need the loan to increase farm size, 13.8% of the beneficiaries and 9.2% of the non – beneficiaries required the loan to improve their standard of living, 3.8% of the beneficiaries and 29.2% of the non – beneficiaries applied for the loan to solve family problems, 6.2% the beneficiaries and 12.4% of the non – beneficiaries required the loan to pay children school fees, while 7.7% of the beneficiaries and 3.8% of the non – beneficiaries gave purchase of fertilizers and chemicals as the reason for the application of loan. However weeding which is the tedious aspect of farm work could not be carried out by the use of chemicals, because they are inadequate and very expensive. So the farmers had to rely on manual weeding. The rural labour de-capitalization had made labour scare and expensive, hence over–half of the loan was spent on hiring labour.

Table 3 – Distribution of farmers by loan utilization

Variables Response	Beneficiaries n = 130		Non-beneficiaries n=130	
	Frequency	Percentage	Frequency	Percentage
Increase farm size	21	16.2	13	10.0
Improve living standard	18	13.8	12	9.2
Purchase fertilizers & chemical	10	7.7	05	3.8
Hired labour	68	52.3	46	35.4
Solve family problems	05	3.8	38	29.2
Pay children schools fees	08	6.2	16	12.4
Total	**130**	**100.0**	**130**	**100.0**

Suggestions on how the loan scheme can be improved.

Table 4 shows that, majority (78.4%, 80.0%, 85.3% and 75.4%) respectively of the beneficiaries suggested that the loan scheme can be improved upon through the; increase in loan amount, reduction of interest rate, disbursement of loan on time, and adequate information from extension agents. While a large proportion of the non – beneficiaries (78.4%, 80.0%, 73.0% and 76.9%) respectively were of the opinion that monitoring of loan by extension agents, prosecuting of loan defaulters, establishment of more branches of bank of agriculture (BOA), and simplification of loan procedures are the panacea to effective credit disbursement and utilization. Based on the above suggestions, it is therefore pertinent for government to make use of some of these ideas, so as to ameliorate the problems encountered by farmers during loan processing application.

Socio – economic factors affecting loan utilization

The result of the Chi – square analysis in table 5 shows that, there is no significant association between respondents age (χ^2 = 2.52, P > 0.05), sex (χ^2 = 3.84, P > 0.05), marital status (χ^2= 0.02, P > 0.05), and literacy level (χ^2 = 1.23, P > 0.05), and credit utilization. However respondents household size (χ^2 = 17.16, P > 0.05) had significant effect on credit utilization. Also table 6 shows that, there was no significant relationship between respondents primary occupation (r = 0.42) and credit utilization. However, the effect of secondary occupation (r = 13.04), sources of labour (r = 17.14) and farm size (r = 14.83) and credit utilization were markedly significant.

Table 4: Distribution of farmers by suggestions on how the credit scheme can be improved

Suggestions	Beneficiaries n = 130		Non-beneficiaries n=130	
	Frequency	Percent	Frequency	Percent
Increase in loan amount	102	78.4	64	49.2
Reduction of interest rate	104	80.0	82	63.0
Disbursement of loan on time	111	85.3	84	64.6
Adequate information from extension agents	74	56.9	102	78.4
Prosecuting of loan defaulters	56	43.0	104	80.0
Establishing more loan bases	77	59.2	95	73.0
Simplification of loan procedures	76	58.4	100	76.9

Multiple Responses

Table 5 Chi-Square (χ^2) analysis of association between socio–economic characteristics and the level of credit utilization

Variable	χ^2 Calculation	DF	P	Contingency co-efficient	Decision
Age	2.52	4	0.831	0.23	NS
Sex	3.84	1	0.060	0.15	NS
Marital status	0.02	2	0.883	0.22	NS
Literacy level	1.23	2	0,936	0.26	NS
Household size	17.16	3	0.001	0.001	S

S = significant at 0.05
NS = Not Significant at 0.05

Table 6: Product Moment Correlation analysis of relationship between socio – economic characteristics and the level of credit utilization

Variables	'r' Value	P – value	Decision
Primary Occupation	0.42	0.676	NS
Secondary Occupation	13.04	0.04	S
Sources of Labour	17.14	0.001	S
Farm Size	14.83	0.018	S

S = significant at 0.05, NS = Not Significant at 0.05

CONCLUSION AND RECOMMENDATIONS

The study concludes, that the socio – economic factors influencing the disbursement and utilization of Bank of Agriculture (BOA) credit scheme are, household size, secondary occupation, sources of labour and the farmers farms size. Also, it was observed that giving adequate credits, at the right time and at a considerable interest rate will go a long way in enhancing prompt utilization of the credit facility. Therefore the study recommends, that the amount loan able to the farmers in the future should be based on the current value of the naira, also more loan bases or offices of the Banks should be established in the study area.This will facilitate the disbursement of credit to beneficiaries on time

or as at when due. It will be beneficial to the Bank and indeed the farmers ,if the credit mobile officers liase with the extension agents who operate at the village/cell level.This will enhance the monitoring and simplification of loan procedure.

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EFFECT OF PARTICIPATION IN FADAMA – II PROGRAMME ON SOCIO-ECONOMIC STATUS OF FARMERS IN OYO STATE, NIGERIA.

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ABSTRACT

The study investigated the effect of Fadama – II project on socio-economic status of Fadama users in Ibarapa North Local Government Area of Oyo State. The study area consists of three (3) principal towns - Ayete, Tapa and Igangan. A total of one hundred and ten respondents were proportionately sampled. Data collected through a validated and reliable questionnaire were analysed using descriptive and inferential statistics. Result reveal that 85.45% of the respondents were married and their ages ranged from below 20 to above 50 years with most having formal education. About 40% held leadership positions. Majority of the respondents in the study area participated actively in meetings and other activities involved in the project. Benefit was greatly derived in all the areas expect research linkage and fish pond establishment. There was an increase in the number of materials possessed by Fadama-II beneficiaries after the introduction of Fadama-II project compared to the number available before Fadama-II project introduction. Socio-economic status of most respondents improved following participation in the project . Age was significantly related to farmers' socio-economic status before and after the project while participation correlated significantly with SES after the project.

Keywords: Fadama, Benefit-derived, Participation.

INTRODUCTION

Due to an ever increasing demand for food throughout the year, there has been a high pressure on land by various land users. With the annual 3.5% increase in population, food production has to increase. To do this however, will require intensification of land use and opening up of more land (Oluwatosin, 2001). Relying on the rain fed agriculture has become inadequate due to climate change and it can no longer cope with increase in food demand. Efforts are now being geared towards opening up more hydro-morphic land (valley) to complement the rain-fed farming. It was the desire to increase food production while harnessing the full potential of Fadama resources in Nigeria that led to the design of the National Fadama Development Project I (NFDP-I) which was implemented in 25 states from 1993-1999 (Ephraim et al, 2008). It was funded by the Federal Government, the government of the benefiting state and the World Bank.

Fadama connotes the river valley areas which are seasonally flooded or have high water table throughout all large part of the year. Fadama is a Hausa word meaning low lying area that is susceptible to seasonal flooding. Fadama is a product of seasonal or almost permanent flooding whose water source may be from direct run-off or capillarity from seepage water in the surrounding catchment. They are generally low lying hydro-morphic flood plains that with sufficient water available for crop survival. Such land is becoming popular for urban agriculture especially production of vegetable (both leafy and fruits. This has been acclaimed to provide income for practitioners and marketers while supporting food and nutrition security. In particular, Fadama serves to encourage all year round agricultural production (Umar, 1994).

Reasons for Fadama – II Project in Nigeria.

The issue of rain fed agriculture has been a challenge for all year round farming and food production. Successive efforts to harness water resources for agricultural use like the River Basin and Rural Development project have not fully utilized the water potentials as the irrigation equipment do not function well and the agricultural sector was still stuck with rainy season production. All efforts to develop those programmes and transform the rural communities

did not yield expected result (Fawole, 2001) for reasons which include lack of active participation by farmers in general decision making (Amao, 2004).

In the year 2004, Fadama – II project was established as a follow-up to the Fadama – I project that spanned five years between 1993 and 1999. NFDP-II aimed at alleviating poverty among beneficiaries in the participating states. The project adopted the Community-Driven Development (CDD) approach which is a way of empowering local communities to shape their future by empowering them with resources and authority to use the resources. The following components existed as objectives of the project:

Capacity Building: Which aim at strengthening the capacity of the beneficiaries through technical assistance and training provided through facilitators. Specific areas to be covered will vary depending on the needs of the individual beneficiaries which is to be identified through a participatory planning process (Project implementation manual, 2004).

Rural Infrastructure Investment: Whose output is to increase the supply of small-scale infrastructure, prioritized, planned, implemented operated and maintained by the beneficiaries. The infrastructure provided will contribute to the project development objectives of raising the income of the beneficiaries by reducing some of the constraints of production, storage, processing, transportation and marketing faced by Fadama – II beneficiaries (PIM, 2004).

Pilot Asset Acquisition: Support the finance of matching grants for the purchase of productive assets such as equipments, tools, installations etc. that support the local small-holder agriculture. It is based on the assumption that lack of productive assets for poor Fadama resources users is one of the principal constraints on economic development in Fadama communities.

Demand responsive advisory service: Whose goal is to enable Fadama user groups (FUGs) participating in the project to adopt productivity enhancing techniques and appropriate marketing practices in order to overcome major constraints on increased productivity of their Fadama enterprises and increased incomes. This will be achieved through demand-responsive advisory services provided by a wide range of private and public service providers (PIM, 2004).

The overall aim of the NFDP – II is to combat poverty through enhancement of productivity of participants and ultimately improve the socioeconomic status. This study therefore focused on the extent to which the NFDP has impacted on the participants by assessing the changes to participants' socio-econimic status..

Objectives of the Study

It is against this background that the study investigated the effect of Fadama – II project on socio-economic status of participant farmers in Ibarapa North Local Government Area of Oyo State. The study specifically;

The specific objectives were to:

1. investigate the areas of respondents' involvement in Fadama-II project.
2. analyse benefits derived by respondents from their involvement in Fadama II project.
3. determine the impact of Fadama – II project on socio-economic status of Fadama users.

Area of Study

The study area was Ibarapa North Local Government of Oyo State and one of the benefiting Local Government Areas of Fadama – II project in Oyo State. Though a Yoruba settlement, it hosts people of diverse ethnic groups like Hausa, Fulani and Igbo. It is located in the tropical guinea savannah zone of western Nigeria, hence rich in the production of arable crops and livestock. The inhabitants are farmers, petty – traders and very few are civil servants all engaging in farming activities.

The population of the study included all Fadama users groups who are crop farmers, livestock farmers, pastoralists, agro-processor and fruit gatherers. Ten out of fifteen Fadama Community Associations (FCAs) were proportionately selected from the three main towns in the study area (Ayete, Tapa and Igangan). Thirty percent of the number of beneficiaries from each FCA were further randomly selected. Structured questionnaire was used to elicit information from a total of one hundred and ten respondents for the study.

Measurement of Variables

The independent variables of the study included the respondents' personal characteristics, participation of respondents in Fadama - II and benefits derived by the respondents from Fadama – II project. The dependent variable is socio-economic status of Fadama users before and after the project in Ibarapa North. This was inferred

from responses to number of items and attributes possessed by the respondents. This socio-economic scores was computed by summing the standardized values for item possession computed on a minimum of zero. The mean and standard deviation were found and used to categorize respondents into high and low socio-economic status.

RESULTS AND DISCUSSION

Personal Characteristics of Respondents

Table 1 shows that 77. 3% of the respondents were between 30 and 49 years old, and 11.8% were above this range. Most (72.7%) of the respondents were males contrary to the finding of Ayanwale and Alimi (2004) in a baseline study in Southwestern Nigeria, 85.45% were married while 3.63% and 3.63% were divorced and widowed respectively. Christianity accounted for 60.9% were Christians, 33.6% Muslims and others animists.

On residency, most (70.1%) have been residing in the area for more than 30 years and this implies they are familiar with the place. Similarly, 68.2% had formal education and could therefore read and write a situation that will predispose them to adoption of innovation (Idachaba, 1981).

The table further indicates that 28.2% of respondents were community leaders, 16.4% were religious leaders and 55.4% were not in any position of leadership. This shows that the community leaders and religious leaders partook in Fadama II in the study area. Their involvement would have enhanced leadership and control of the programme.

Participation of respondents in Fadama II project.

Fadama II was divided into several areas which served as sub-projects to which the beneficiaries were exposed for both knowledge and skill acquisition. Table 2 shows a multiple response from respondents indicating participation of respondents in Fadama II project. Generally, participation was high in all the areas but Needs Identification (98.2%), Selection of executives (94.5%), Prioritization of needs (98.2%), Contribution of Money (95.5%) and attendance of meetings (93.6%) formed the highest areas of participation. There may be a need to include other areas not as popular especially Cost preparation and Evaluation into the capacity building aspect of the programme. The high participation in the areas imply significant interest and positive attitude towards the project as echoed by Mohammed (2007) while urging traditional rulers to encourage participation in the Fadama project.

Table 1 Distribution of respondents according to personal characteristics (N=110).

Farmer's age (years)	Freq	Percent
20-29	12	10.9
30-39	43	39.1
40-49	42	38.2
50 above	13	11.8
Sex		
Male	80	72.7
Female	30	27.3
Marital Status		
Single	8	7.3
Married	94	85.5
Divorced	4	3.6
Widowed	4	3.6
Level of Education		
Non-formal	15	13.6
Formal education	75	68.2
Adult education	16	14.5
Koranic education	3	2.7
Religion		
Christianity	67	60.9
Islam	37	33.6
Traditional	6	5.5
Position		
Community leader	31	28.2
Religious leader	18	16.4
None of the above	61	55.4
Years of Residence		
< 30years	32	29.1
30-40years	34	30.9
41-50years	28	25.5
51-60years	5	4.5
> 60years	2	1.8
N/R (No-Response)	9	8.2

Table 2: Distribution of respondents according to involvement of in Fadama II project (n = 110)

	Involvement	**Yes (%)**
1.	Needs Identification	108 (98.2)
2.	Selection of executives	102 (92.72)
3.	Prioritization of needs	108 (98.2)
4.	Contribution of Money	105 (95.5)
5.	Preparation of local development plan (LDP)	101 (83.6)
6.	Preparation of detail cost of document	90 (81.8)
7.	Attendance at meeting	103 (93.6)
8.	Engagement of service providers	97 (88.2)
9.	Monitoring of subproject	96 (87.3)
10.	Evaluation of subproject	91 (82.7)
11.	Maintenance of subproject	95 (86.4)
12.	Conflicts resolution	90 (81.8)

Benefits derived by the respondents

All the listed areas of benefits derived in the project were indicated by a high percentage of the respondents with trainings, production enhancement, family welfare, and counterpart funding (97.5, 98.2, 95.5 and 85.5%, respectively) which would have impacted on SES being among the most popular. Nwachukwu *et al* (2008) made similar findings in a national appraisal of the Fadama II. Only areas like fish pond and research linkage were relatively low and this may be due to these areas not being familiar to the participants. The figures in Table 3 generally imply a favourable disposition to Fadama II project in the study area.

Table 3: Distribution of respondents benefit derived from Fadama II.

Items	Benefits	Frequency	Percentage
A	Increase in productivity pilot assets	105	95.5
B	Training attained	107	97.5
C	Increase level of production	108	98.2
E	Established poultry	82	74.5
F	Established fish pond	72	65.3
G	Farm expansion	102	92.7
H	Reduction in conflict	102	92.7
I	Family welfare improved	105	95.5
J	Reduction in time wasted on search of water	104	94.5
K	Increase in level of income	104	94.5
L	Sustainable market strategies	97	88.2
M	Use of improved technology	91	82.7
N	Capacity building	99	90.0
O	Increase in number of access roads	90	81.8
P	Assistance from advisory services	90	81.8
Q	Increase in disease control through provision of training attained	104	94.5
R	Provision of 70% of counterpart fund by Fadama II project individual ownership of pilot assets	94	85.5
S	Only 10% of infrastructure services rendered by Fadama II was paid	97	88.2
T	Research linkage	73	66.4
U	Provision of I million as counterpart fund by local government for running of local desk office	99	90.0

Socio-economic status

From Table 4, a slight improvement in SES was observed as 56.4% were in the high SES category after the project compared to 52.7% before. This implies that socio-economic status of the people in study area improved after the introduction of Fadama-II project. The standard deviation figures in particular indicate that SES gap increased among the participants after the project than before. A marginal increase was also discovered by *Adegbite et al (2007)*. This could only have arisen from the accruing benefits as a result of level of participation as also discovered by Nkonya *et al* (2008). Thus, if more people are encouraged to participate at high level, more benefits will accrue.

Table 4: Distribution of SES before and after.

Category	Before SD = 9.09			After SD = 12.83	
	Scores	Frequency	Percent	Frequency	Percent
Low	0-25	52	47.3	48	43.6
High	> 25	58	52.7	62	56.4

Relationships between SES and selected variables

Table 5 shows that there was a positive correlation between age of the respondents and socio – economic status before and after (r = 0.339 and 0.374, P = 0.00). Older farmers and obviously with more experience participated more in the project. This results in a combination of experience with all other provisions of the project including training and input. This may be an indictment for the youth who usually disdain agriculture and who could have shunned the project.

Also, participation significantly correlated with SES after. While this was expected *ab initio*, it goes further to emphasise the importance of recognizing SES in all community development programmes and to purposely design such programmes in a way that those of low SES can participate rather being alienated..

Benefit derived correlated significantly with SES before and after, although almost to the same extent. This may be because some of the beneficiaries possessed some of the items assessed even before the Fadama – II project and this could have resulted in a mix-up of the change in SES.

Table 5: Pearson Product Moment Correlation between farmers' socio-economic status (before and after) and selected variables

Variable Name		r-value	P	Decision
Age of farmer	Before	0.339	0.00	S
	After	0.374	0.00	S
Participation	After	0.301	0.001	S
Benefit	Before	0.222	0.02	S
	After	0.217	0.023	S

Correlation is significant at 5%

CONCLUSION

The participants of the Fadama – II project were mostly young to middle age with most being formally educated and some as community leaders, the latter being significant in legitimization of the project.

Beneficiaries participated highly in all areas of the project especially needs identification and prioritisation as well as meeting attendance. This obviously facilitated their benefitting from several fronts designed by the project like capacity building for production, family welfare and counterpart funding. The impact of the benefits derived is visible in the change in SES for some of the beneficiaries.

The significant relationship between age and SES implies that the youths in the programme may not be utilizing the full potential of the project compared to the older ones who seem to

have transformed the project into avenue for SES enhancement.

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Assessment Of Farm Record Keeping Among Farmers In Etsako East Local Government Area Of Edo State, Nigeria

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ABSTRACT

The study assessed the status of record keeping among farmers in Etsako East Local Government Area of Edo State. Sample for the study comprised one hundred and twenty (120) farmers who were selected using simple random sampling technique. Structured questionnaire was used to collect data which were analyzed with descriptive and inferential statistical tools. Majority of the farmers were fulltime farmers (84.17%), males (54.17%), aged between 51-60 years (34.17%) with almost half of the respondents (47.50%) having no formal education. Record keeping status was low as only 18.3% of the respondents kept any form of record..Major reasons adduced for not keeping farm reasons for not keeping farm records were lack of knowledge (39.8%) and not considered necessary which were (34.7) Chi-square test showed that there were significant relationships between the farmers' educational level (X^2 = 32.125; p≤ 0.05), types of enterprise (X^2 = 16.185) and farm record keeping status. The t- test result shows that there were significant differences between the age (t = 4.427; p=.003) and years of farming experience (t= 2.337; p=.009) of record keepers and non record keepers. The study recommends adult literacy programme for farmers in Etsako East LGA and capacity building of the farmers on farming as a business venture.

Key words: Farm records, Record keeping, Farm enterprises

INTRODUCTION

Nigeria's agriculture is characterized by small scale farmers who have low level of education and take up farming as a way of life rather than as a business. These farmers equally maintain low level of contact with extension services. At individual, regional, national and global levels, record keeping is crucial for resource planning, programme implementation and evaluation to achieve meaningful progress. The attainment of the Millennium Development Goals (MDGs) will depend on food security and alleviation of poverty which implies that agriculture must be practiced effectively and efficiently as a business. This connotes agriculture in which proper recording of farm operations, financial report and inputs owned and used, production and other relevant information about the farm enterprise is done. According to Emokaro and Ingawa (2007), record keeping is an integral part of the effective management of farm enterprises. Its profit maximization and other welfare goals are the objective.

Farm records are essential for effective farm management, which include providing detailed knowledge about the operations of the farm, identification of the trend of farm activities, having accurate control over finance and product qualities, identifying individual cost in order to allow changes to optimize profit, keeping track of money owned and to avoid theft (World Bank 2010). Farm records help to document important activities and provide data in order to make informed decisions. This is particularly so in agriculture, where problems tend to emerge from time to time as found in climate change, incidence of pests and diseases and drought.

In spite of the enormous usefulness, record keeping among farmers in Nigeria is generally low this is because farmers do not appreciate the value or know how to keep relevant records (Obasi, 2003). Farmers need to practice record keeping in order to move from subsistence to profit oriented farming. Oluwole and Olayide (2010) traced the challenges of data collection and low utilization of the data collected to the socio-economic characteristics of farmers. An average

local farmer in Nigeria has poor record keeping ability (Idekhai, 2001), mainly caused by low level of education. In addition, time consumption, lack of zeal and inability to afford the cost of procuring some recording materials such as ledgers, journals may be relatively high in relation to the income of these farmers.

Nigerian farmers, like other farmers in some developing countries of the world do not keep farm records, where they are kept, inappropriate methods are often used hence dearth of reliable data which will negatively affect attainment of the MDG target of eradicating extreme poverty and hunger through maximizing use of resources. Farmers in Edo State like others in the country are expected to be served by the extension service of the State Agricultural Development Programme (ADP) and other governmental and Non Governmental Organizations (NGOs) which should ensure that farmers acquire basic knowledge and skills needed to keep records of farming activities. One of the objectives of the extension sub-programme of Edo State ADP is to provide technical assistance to farmers in order to improve their productivity and income (Edo State ADP, 2008). This includes farm record keeping which could enhance their opportunity to meet bank loan conditions, determine profitability of far business and assist farmers to make informed decisions. Edo State ADP technical assistance to farmers on record keeping seems not to be effective or not achieving the desired impact.

Based on this background, it is important to assess the status of record keeping among farmers in order to know "where they are" in farm record keeping and consequently address the situation, considering its importance to the attainment of enhanced productivity and income consequently sustainable development. The main objective of the study therefore was to assess the level of record keeping among farmers in Etsako-East Local Government Area (LGA) of Edo State. The specific objectives were to:

i. examine the socio-economic characteristics of the farmers;
ii. examine farm record keeping status of the respondents; and
iii. identify the problems associated with record keeping among these farmers;

Study Hypotheses

Ho(1): There is no significant association between respondents' socio- economic characteristics and their farm record keeping status.

Ho(2): There is no significant relationship between selected characteristics of farm record keepers and non record keepers

METHODOLOGY

Etsako-East is one of the eighteen (18) Local Government Areas (LGAs) in Edo State. The LGA has an area of 1,133km^2 and a population of 145,996 according to the 2006 census (Etsako-East LGA, 2010). It is bordered by Kogi State in the North and Etsako West in the South, Akoko Edo LGA in the West and Etsako Central towards the South-East. Agriculture is the major occupation of the people in the study area. This involves the production of arable crops, livestock, fish, snail, poultry and some tree crop production such as cocoa, mango and orange. The farming system is predominately traditional with the use of farming tools such as hoes and cutlasses.

Simple random sampling technique was used to select six (6) villages namely; Okpella, Igiode, Ovao, Iviari, Iviebua, and Ivianokpodi from the thirty six (36) villages that make up the study area. Furthermore, twenty (20) farmers were randomly selected from each of these villages which gave a total sample size of 120 farmers (respondents).

Primary data were obtained using a well structured interview schedule. Data were analyzed using frequency counts, percentages and means while Chi square statistic was used to test the association between respondents' socio economic characteristics and their record keeping status. T-test was used to test the difference between the characteristics of record keepers and non record keepers.

Record keeping status was measured at nominal level (Yes/No) for any farm record kept. Regularity of keeping farm record was measured using a 4-point Likert type scale where never=1, sometimes=2, often=3 and very often=4. Any value ≥ 2.50 mean score value indicated regularly kept farm record.

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

As presented in Table1, 45.8% of the respondents were females while 54.2% were males. This implies that there were as much female farmers as there are male farmers in the area. Majority of the respondents (34.2%) were

between age brackets 51-60 years while the average age of the respondents was 43.2. The respondents were relatively old and probably not economically active. It was also shown in Table 1 that majority of the respondents (67.5%) were married with family size of nine persons and above (55.8%). The large family size could imply the availability of labour for farming because labour is a major constraint in peasant production in Nigeria (Gocowski and Oduwole, 2003). Furthermore, almost half of the respondents (47.5%) had no formal education which is crucial to record keeping. Ampaire and Rothchild, (2010) asserted that education enables farmers to know how to seek for and apply information in day to day problem solving. The major occupation of majority of the respondents (75.0%) was farming. This constitutes an important reason why their primary means of livelihood should be given attention to enhance performance beyond subsistence.

It was further shown in Table 1 that majority of the respondents (77.5%) had farm size below 2.0 ha with mean size of 1.31ha implying that they were mostly small scale farmers. Majority of the respondents (55.0%) had over 20years farming experience and practiced crop farming (70.0%). Only 18.3% kept one form of farm record or the other. This implies that most farmers in the study area do not embark on their agricultural enterprises as business ventures that need to be supported with documentation. It could also be that the subsistence nature of farming does not produce any incentives for keeping farm record. Ergano and Nurteta (2006) found lack of farm record to be a limitation to livestock development.

Table 1: Frequency distribution of the socio economic characteristics of respondents

Variables	Freq	%	Mean
Sex			
Female	55	45.83	
Male	65	54.17	
Age (range)			
30 & below	20	16.67	
31-40	29	24.17	
41-50	30	25.00	43.16
51-60	41	34.17	
Marital Status			
Married	81	67.50	
Single	29	24.17	
Divorced	10	8.33	
Family Size			
4 & below	28	23..3	
5-8	25	20.8	9.25
9 & above	67	55.8	
Education			
None	57	47..50	
Primary	15	12..50	
SSCE	26	21.67	
NCE/OND	13	10.83	
8HND/B.Sc	9	7.50	
Major occupation			
Teaching	11	9.17	
Trading	8	6.67	
Farming	90	75.00	
Artisan	11	9.17	
Farm Size (ha)			
1.0 & below	36	30.00	
1.1-2.0	57	47..50	1.31
2.1-3.0	22	18..33	
3.1-4.0	5	4.17	
Farming experience range (years)			
10 & below	16	13..33	
11-20	38	31.67	
>20	66	55.00	
Major agric enterprise			
Crop production	84	70.00	
Livestock	19	15.83	
Fisheries	5	4.17	
Processing	12	10.00	
Record keeping status			
Do not keep farm records	98	81.7	
Keep record	22	18.3	

Reasons for not keeping farm record

The various reasons advanced by the farmers for not keeping records are as presented in Table 2. The result shows that 39.8% do not know how to keep farm records. This could probably be due to the low level of education of these farmers, as 34.7% of the respondents thought it was not necessary as this would only make their job more complicated and demanding. About 9.2% felt they don't need it as it would make no difference to the way they have been operating while 14.3% expressed lack of interest because of the size of their enterprises

Table 2: Reasons advanced by respondents for not keeping farm record

Reasons	Freq	Percent
Don't know how	39	39.8
Not necessary	34	34.7
Don't need it/not important to me	9	9.2
Small farms do not require records	14	14.3
Indifferent	2	2.0
Total	98	100.0

Reasons for keeping farm record

The major reasons advanced by the respondents for keeping farm record are presented in Table 3. About 50% kept farm record mainly to enable them remember important events. This could help them see trends in their enterprises, make strategic plans to improve as well as take informed management decisions. Only13.6% of the respondents kept record to determine financial profitability of their enterprises. This could be an indication that agriculture is not practiced as a business by most farmers.

Table 3: **Reasons given by respondents for keeping farm records**

Reasons	Freq.	Percent
To determine profitability	3	13.6
To remember important events	11	50.0
For future references	4	18.2
Decision making	3	13.6
As obtain tax relief / benefit from agric development initiative	1	4.5
To while away time	-	-

Types of farm record kept

Types of farm records kept by the farmers and the degree to which they were kept are shown in Table 4. The findings show that finance/cash record ($\bar{x}$ = 2.59) and total wage cost ($\bar{x}$ = 2.50) were the most kept type of farm records while records on man-hour was the least kept (mean=1.59). Keeping accurate financial record which Fetuga, (2006) affirms is all a farmer needs, could be attributed to the need to meet the demands financial institutions or for the purpose other formal transactions. The records of wage cost, farm hands and input could be to articulate investment in order to determine profitability of the enterprise. Record of man-hour which was not regularly kept exposes the inadequacy of the agri-business skill of the record keepers or they prefer to pay for the task performed/piece rate.

Table 4: Type of farm record kept by the respondents

	Mean	SD
Finance	2.59*	.503
Wage cost	2.50*	.512
Number of farm hands	2.45*	.510
Input	2.36*	.492
Inventory	2.27*	.456
Time Spent	2.18*	.395
Date of Work done	2.00*	.000
Manhour	1.59	.503

*Regularly kept (mean > 2.50)

Constraints to keeping of farm records by respondents

Constraints faced by farmers in keeping farm records are shown in Table 5. Record keepers were mostly constrained by time (mean=2.41), unavailability of materials ($\bar{x}$ =2.27) and no motivation ($\bar{x}$ =2.27). the constraints of the non record keepers were lack of formal education ($\bar{x}$=2.38), inadequate knowledge due to poor contact with extension ($\bar{x}$ =2.30), unavailability of materials ($\bar{x}$=2.26), financial constraint unavailability of materials ($\bar{x}$ =2.21) and small size of enterprise unavailability of materials ($\bar{x}$=2.11). Record keepers and non record keepers were generally constrained to keep farm records due to lack of formal education (mean= 2.32), unavailability of materials (mean= 2.26), inadequate extension contact ($\bar{x}$ = 2.14) financial constraint ($\bar{x}$=2.19) and smallness of enterprise ($\bar{x}$=2.03). The constraints of the non record keepers were more in number and intensity. No motivation ($\bar{x}$=2.27) probably from extension service or close associates, time constraints ($\bar{x}$=2.09) posed more challenges to the record keepers. The findings could mean that the farmers were not sensitized on the importance of farm record to the performance of their enterprises by extension agents or enumerators. The finding is in agreement with (Obasi, 2003; Olayiwola, 2006)

that farmers often do not know the value of record keeping which is importance to the growth of the farm business. Alabi and Oguniyi (1990) attributed this to poor extension service on the subject matter.

Table 5: Constraints to keeping of farm records

Constraints	Farm record keeping categories					
	Record Keepers (n=22)		Non Record Keepers (n=98)		Total Sample n=120	
	Mean	SD	Mean	SD	Mean	SD
Unavailability of materials	2.27*	.417	2.26*	.758	2.26*	.587
Lack formal education	2.05*	.398	2.38*	.684	2.32*	.542
Don't know how to keep because of poor contact with extension service	1.45	.436	2.30*	.659	2.14*	.547
No motivation	2.27*	.508	1.49	.536	1.63	.522
Small size of farmland/enterprise	1.68	.438	2.11*	.477	2.03*	.457
Time constraint	2.41*	.393	1.59	.648	1.74	.520
Financial constraint	2.09*	.537	2.21*	.745	2.19*	.641

*Serious constraint (mean ≥ 2.00)

Association between socio-economic characteristics and farm record keeping

The chi-square result is shown in Table 6 in which age (χ^2= 13.0), education (χ^2= 32.1; p<0.05), farm size (χ^2=7.7; p<0.05), farming experience (χ^2= 7.2; p<0.05), and major enterprise (χ^2= 16.1; p<0.05) were significant to farm record keeping status. This implies that these were associated with record keeping status of the farmers. This could be explained with the fact that no formal education and small size of enterprise were constraints. The significance of major enterprise could be due to enterprises involving livestock and fisheries require some level of management records. This could be supported with Obasi (2003) which states that livestock farmers tend to keep records more than crop farmers.

Table 6. Chi-Square results

Variables	χ^2Value	Df	Prob level
Sex	3.439	1	.521
Age (range)	13.013*	3	.008
Marital status	4.373	2	.642
Education	32.125*	6	.007
Family size range	2.084	2	.626
Major occupation	8.98*	3	.650
Farm size (ha)	7.758*	3	.016
Farming experience range	7.285*	2	.003
Major agric enterprise	16.185*	3	.000

*Significant (p<0.05)

Difference in socio-economic characteristics of farm record keepers and non record keepers

As shown in Table 7, the t-test analysis is an indication that record keepers and non record keepers differed significantly with respect to age (t= 4.427; p=.003) and farming experience (t= 2.337; p=.009). Record keepers had lower mean age (45.5years) and less mean years or farming experience (19.32years). Although record keepers had higher mean farm size (1.64ha), it was not significant at 5% level. This implies that farm record keepers were younger with less farming experience compared to the non record keepers.

Table 7: Difference between socio-economic characteristics of farm record keepers and non record keepers

Variable	No. of cases	Mean	Mean Difference	t-value	P	Decision
Age (years)						
Farm record keepers	22	45.50				
Non Farm record keepers	98	58.16	12.66	4.427*	.003	Significant
Farm size (ha)						
Farm record keepers	22	1.64				Not
Non Farm record keepers	98	1.43	0.21	0.6439	.438	significant
Farming Experience (years)						
Farm record keepers	22	19.32				
Non Farm record keepers	98	25.73	6.41	2.337*	.009	Significant

* Significant at 5% ($p \leq 0.05$)

CONCLUSION

Based on the results discussed, we can conclude that most of the farmers in the study area are old, without formal education, engage in crop farming, with small farm sizes and have long years of farming experience but do not keep any form of farm records. Poor knowledge of record keeping and not seeing the need for record keeping such records are major constraints while younger farmers with less farming experience kept farm records compared to older farmers. However, education, farm size and major enterprise engaged in by the farmers are significantly associated with farm record keeping.

RECOMMENDATIONS

To improve the status of record keeping in Etsako East Local Government Area, Edo State ADP sensitize the different classes of farmers through the extension services on the value and need for farm record keeping. There is also the need to motivate the farmers and build their capacity building One way of doing this is by encouraging Edo State ADP, Etsako Local Government Council and relevant stakeholders to mount adult literacy programmes and agribusiness workshops for the farmers. Finally incentives should be put in place to encourage younger and more educated farmers to go into farming.

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Use Of Cell Phones Among Selected Food Crop Marketers In Ibadan Metropolis, Nigeria

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ABSTRACT

The introduction of cell phone services in Nigeria has eased the conduct of business activities including agricultural businesses with the elimination of hitches in the communication system. This study investigated the use of mobile phones among selected food crop marketers in Ibadan metropolis. Multistage sampling technique was used to sample two hundred and one respondents in the study area. Qualitative (In-depth Interview with Key Informants and Focus Group Discussion) and quantitative (surveys) were conducted. Data collected were described with frequency distribution and percentages, and analyzed with chi-square, and PPMC. Majority (94.5%) of the marketers in the study area had high knowledge of basic cell phone applications. Despite this, 52.2% of the marketers had low use level of their cell phones in their marketing activities. Their major sources of market information remain informal gatherings, trade unions, and radio. A significant relationship existed between respondents' knowledge of basic cell phone applications ($r = 0.230$; $p < 0.050$) and their use of cell phones in marketing activities. It is concluded that agricultural marketers have not been directly or intentionally using cell phones as a tool of communication in their activities in an effective manner. Extension agents should be trained to use cell phone applications beyond basics, like video sharing, bulk SMS and picture messaging to reach out to agricultural marketers, train marketers to use them, and inform them of its efficacy in curbing shortchanging activities.

Keywords: Communication Technology, Agricultural Marketing, Cell Phone, Information

INTRODUCTION

Access to information is crucial for ensuring that farmers, traders, and consumers can engage in buying and selling goods when and where needed most, thus increasing market performance (Aker, 2009). Information is a major driver of any economy, a critical element that allows efficient functioning of markets. Telecommunication provides a better platform for information transfer, as the mobile phone have become the single most powerful way to extend economic opportunities in all sectors, agriculture inclusive (CTA, 2009). Despite the liberalization of the telecommunication sector in Nigeria, experts still believe that the level of awareness and usage should have gone beyond what is presently obtainable in the country. One major debilitating issue remains the marketing information gap existing in the agricultural sector.

Communication gap is one major impediment in agricultural marketing activities; market information is inadequate, sellers and buyers of food produce are not well informed about the sources of supply and this reduces efficiency of market (Babatunde and Oyatoye, 2007). A lot of cooperation, coordination, and exchange of information are required to trace agricultural commodities and organize the transportation of these goods from producers to consumers. Overa (2004) stated that alternative to telephone calls in long-distance exchange of information had been personal travels, use of messengers/intermediaries or letters; drawing out the fact that physical travel is stressful, time consuming with a high risk of accidents and is such an expensive communication method.

CTA (2009) stated that huge amount of time and labour hours is lost due to long traveling distances and suggests that the money and efforts involved in this process can be better used for other family/socioeconomic needs. Transportation cost includes the cost of transporting people in order to exchange very simple information such as finding out prices of produce, negotiating, concluding and monitoring contracts (Overa, 2004); traders will not incur that as an opportunity cost, but rather spread the costs across the

obtained produce which ultimately leads to increase in prices of consumer goods. Although radio has been affirmed as a source of information that has a wide coverage around the country, rural areas inclusive, this means still provides a limited range of agricultural market information; while the television is deemed as too sophisticated and rarely gives detailed reports on agricultural news because it is not as attractive as reporting oil & gas, politics, and crimes.

Disruptions in supply chain occur when there is a communication breach between suppliers, intermediaries, processors, and buyers leading to spatial frictions. Traceability of produce, monitoring and co-ordination of marketing activities, variations in prices of consumer goods, time, money, and effort wastes, exploitations and inadequacies in storage, packaging, and processing, have been the consequences of inadequate market information flow. Despite the advances of the cell phone technologies in all sectors, the focus in relation to agricultural marketing is told as not effective enough in bringing about the much needed social cohesion that would allow both traders and farmers to act together more efficiently in pursuit of a shared objective which is, the disposal of agricultural produce to the final consumer; as Molony (2006) observed that dissension and lack of trust in direct cell phone communication still occurs until face-to-face confidence has been built between them. Thus, cell phones may have played a minor role between isolated farmers and marketers, because face-to-face contact is preferred to remoteness of the cell phones. Asheeta *et al.* (2008) faulted the lack of local relevance, easy to understand content in the local language of the users in cell phone applications (texting devices) and lack of well trained human resources to develop applications that will efficiently service every group of its users. These problems cited have indeed questioned the actual relevance of the technology to its users. It is expected that cell phone use should have positive impacts on agricultural market efficiency, but empirical evidence is still somewhat limited. The following research questions therefore become imperative to this study:

i. What is the selected food crop marketers' knowledge of basic cell phone applications?
ii. What is the marketers' use of cell phone applications in marketing activities?
iii. What are the other sources of market information of these marketers?

Hypothesis of study

The hypothesis of the study was tested in null form:

$H_0 1$ There is no significant relationship between respondents' knowledge of basic cell phone applications and their use of cell phones in marketing activities.

METHODOLOGY

The city of Ibadan which is the second largest in Africa was founded in 1829. The name Ibadan was derived from 'eba-odan' meaning 'near the grass land' which provided farm lands for the early settlers. Ibadan is the capital of Oyo State, a South West state in Nigeria that covers a total land mass of 27,249 square kilometers bounded by Ogun State in the South, Kwara State in the North, parts of Ogun State and Benin Republic in the West and Osun State in the East. This city comprises the Yoruba ethnic group who has rich culture and strong belief in kingship as a means of unity. Other ethnic groups are the Ibos, Hausas, Edos, Ebiras, Urhobos, Efiks, Ibibios, Ijaws, Itsekiri and Tivs who engage in farming, trading of food commodities among other activities. The climate of Ibadan is of tropical wet and dry seasons, the topographical formation of the city consists of different land forms like the hills, plains and valleys covering less than 5% of the total area. Some of the hills include Agodi Hill, Mapo Hill, Premier Hill, Mokola-Oremeji Hill, and Oke Aremo Hill. Ibadan occupies a central position of commerce with a large number of markets serving the economic needs of the people. Its markets are accessible to resident traders and others who bring produce from other parts of the country.

The population of this study is the food crop marketers (males & females) within three major markets – Bodija, Orita merin, and Oja oba in Ibadan metropolis. The primary data was sourced through In-depth Interviews with key informants, Focus Group Discussions, and survey. A reliability coefficient of 0.78 was obtained for the instruments. The secondary data sources were published literatures, conference proceedings, journal articles, bulletins and Newspapers. Purposive sampling technique was used to sample three markets from the thirty-two major markets in the metropolis. Bodija, Oja-Oba, and Orita-Merin markets were sampled because these markets are large, and well known for food crops. Sixteen food items associations were identified within the markets, out of which yam, yam flour (*elubo*), maize/millet, beans, and tomato/pepper sellers associations were sampled purposively

because these food items are produced outside Ibadan and have a high patronage and consumption rate in the metropolis. Five percent (5%) of the sampled associations population was drawn to obtain two hundred and one (201) sample size that was used in this study.

Independent variables measured in this study include respondents' knowledge of basic cell phone applications, and respondents' other sources of marketing information; while the dependent variable is respondents' use of cell phones in marketing activities. Respondents' knowledge of basic cell phone applications was measured by presenting a list of statements which respondents responded (Yes) and (No) to. A score of 1 was assigned to a correct response and 0 to an incorrect response. Mean scores were computed to categorize respondents into high and low levels of knowledge. A list of marketing operations was generated and presented to the respondents. The respondents were asked to indicate their use of the cell phones for marketing activities on a four point scale of Never (0), Rarely (1), Sometimes (2), and Often (3). Mean was computed to categorize respondents into high and low levels of use. Other sources of market information were measured by presenting a list of other possible sources of market information gathered from literatures to respondents. A three point scale of Never (0), Sometimes (1), and Regularly (3) was used.

RESULTS AND DISCUSSION

Respondents' knowledge of basic cell phone applications

Table 1 reveals that all the marketers knew the functions of the green button on cell phones which is used to dial out or answer calls. Well above average of them answer all the knowledge items correctly. This indicates their high level of knowledge of basic cell phone applications. However, only 60.7%, 63.2%, 63.7%, and 70.1% knew that cell phone could be used to surf the internet, function as data storage and transfer device, function as a reminder, and communicate with them in their mother tongue respectively. This suggests that some of the respondents do not familiarize themselves with the higher operational level of the technology, regarding it as extra-functions that are unnecessary, attesting to Aguero (2009) that there is a level of ignorance about cell phone functioning, inhibiting its full exploration.

Table 1: Respondents' knowledge of basic cell phone applications (N = 201)

S/No	Cell Phone Application Knowledge	True(%)	False(%)
1.	The green button on the cell phone can be used for dialing and answering calls.	100.0	0.00
2.	There is a provision for sending and receiving messages (SMS) on cell phones.	97.5	2.5
3.	Some cell phones have inbuilt radio facilities.	95.0	5.0
4.	It is possible to store people's names and numbers on cell phones.	99.5	0.5
5.	Calendars can be found on cell phones.	94.5	5.5
6.	Cell phones have time clocks.	95.5	5.0
7.	There are alarm systems in cell phones.	91.0	9.0
8.	A reminder is an element of the cell phone.	63.7	36.3
9.	Browsing with cell phones is very possible.	60.7	39.3
10.	Calculators are available on cell phones.	94.5	5.5
11.	Cell phones have different games that can be played.	92.0	8.0
12.	Some cell phones have cameras for taking pictures.	88.1	11.4
13.	There are torch light facilities on some cell phones.	94.5	5.5
14.	A number of cell phones have music playing functions.	82.1	17.9
15.	It is possible to transfer files from one cell phone to another.	63.2	36.8
16.	Activities can be captured using a video recorder on cell phones.	74.1	25.9
17.	Certain cell phones allow you to convert all words from English language to your local dialect.	70.1	29.9

Knowledge Level of respondents on basic cell phone applications

The highest score for basic knowledge of the cell phone applications was 17, the lowest score was 3, and the mean score was 9.0. All respondents having a score below 9.0 were categorized as having low knowledge of basic cell phone applications, while respondents having a score of 9.0 and above were categorized as having high knowledge of basic cell phone applications. Table 2 shows that 94.5% of the respondents had high knowledge of cell phone basic applications. Marketers have been able to transmit from a culture in which there was no telephone service of any kind to one in which mobile phones are now widely utilized among them (Mittal, Gandhi and Tripathi, 2010). They have been given equal opportunity to learn and acquire fundamental understanding of the technology.

Table 2: Respondents' level of knowledge of cell phone applications N=201

Level of knowledge	Scores	Freq.	Percent
Low	<9.0	11	5.5
High	≥9.0	190	94.5
Total		201	100.0

Use of cell phone in marketing activities

Results (table 3) reveals that the largest percentage (85.2%) requested for remittances from their customers with their cell phones, they indicated that market situations sometimes warrants them to sell goods on credit to customers they have established a relationship with because they are able to dispose goods faster by this means and the cell phone come in handy when there is need to pursue their debtors particularly when large sums of money is required to make bulk purchase from suppliers. Majority (84.1%) made use of mobile phones to affirm availability of produce from their suppliers, some marketers claimed to have deployed agents to different supply areas like Maiduguri, Kaduna, Ifiki, *etc*. They also call for information on availability of produce and the possibility of making purchases at those farm sites. Since market prices are liable to sudden changes, 81.6% of the respondents used their mobile devices to call other traders within and/or outside their trade zones to keep themselves abreast of the fall or rise in prices.

Table 3: Respondents' use of cell phones in marketing activities (N = 201)

S/No	Marketing Operations	No	Yes (frequency of use)		
			Rarely	Occasionally	Often
1.	To communicate market prices	18.4	5.0	16.9	59.7
2.	For product collection	22.4	2.5	14.9	60.2
3.	For product delivery	25.4	6.5	19.4	48.4
4.	For locating new storage facilities	56.2	8.0	10.9	24.9
5.	In searching for vehicles to transport goods	30.3	5.0	21.4	43.3
6.	In ensuring timely delivery of goods	33.8	8.0	14.4	43.8
7.	In monitoring loading and off-loading of goods	36.8	5.0	24.9	33.3
8.	In finding out availability of produce from suppliers	15.9	10.0	21.4	52.7
9.	To confirm the uniformity of measurement within and outside market	40.3	13.9	26.9	18.9
10.	To monitor the quantity of goods supplied	34.3	4.5	22.9	38.3
11.	To deal with problems regarding quality of supplies	50.7	10.9	18.9	19.4
12.	To arrange for security to guard goods	66.2	11.9	10.4	11.4
13.	To source for credit facilities	30.8	8.5	23.9	36.8
14.	Requesting for payments from customers	14.9	8.5	28.4	48.3
15.	Arrangements for financial contributions from association members	55.2	5.5	25.9	13.4
16.	Facilitating quick disposal of old stocks	61.7	14.9	11.9	11.4
17.	Looking for compensatory markets for goods	59.2	13.9	10.9	15.9
18.	Disseminating information on alternative markets where cheaper supplies can be gotten	25.4	9.5	30.8	34.3
19.	Disseminating information on alternative demands of consumers	57.2	11.4	17.4	13.9
20.	Receiving general market information	32.3	6.0	26.9	34.8
21.	In monitoring harvesting periods of produce	47.3	5.5	27.4	19.9
22.	Making social calls related with marketing activities	24.9	6.0	14.9	54.2

Level of use of cell phone in marketing activities

Respondents' highest score was 79, lowest score was 6, and the mean score was 39.5. Respondents with scores below 39.5 had low level of use while respondents with score above 39.5 had high level of use as illustrated in Table 4. Fifty-two point two percent (52.2%) of the respondents had low level of use of the cell phone for market activities. It is therefore agreeable that agricultural marketers do not adequately explore the importance of cell phone technology in their dealings.

Table 4: Respondents' level of use of cell phone in marketing activities

Level of cell phone use	Scores	Freq.	Percent
Low	<39.5	105	52.2
High	≥39.5	96	47.8
Total		201	100.0

Other sources of market information

Table 5 reveals that 35.3% of the respondents still choose personal travels above all other sources of market information. Also, 32.8%, 25.4%, 2.5%, 2.0%, and 2.0% prefers market information from associations, informal meetings, television, radio, and cooperatives respectively. This result shows a high regard for interactions stemmed from personal interrelationships as stressed by Molony (2008) that face-to-face interactions is dominant amongst agricultural players even among those with access to ICTs. Qualitative reports records traders' attestation to listening to agricultural market related programs aired on radio in their mother tongue even though it is still widely believed that radio provides a limited range of agricultural market information. The report also shows that agricultural marketers still regard middlemen as significant source of relevant market information. None of the respondents preferred middle men, letters, email and internet, news papers and the cell phone as sources of market information. Internet has been found to be and remains the least effective means of information exchange because it requires higher quality communication, electricity, technology, infrastructure, and literacy in computer-supported language (Obayelu and Ogunlade, 2006).

Table 5: Respondents' other sources of information N = 201

Information sources	Percentage of access (%)			Preference
	Never	Sometimes	Regularly	Most preferred
Associations	25.9	44.8	29.4	32.8
Cooperatives	76.1	11.9	11.9	2.0
Middle men	47.3	23.9	28.9	-
Informal meetings	21.4	24.9	53.7	25.4
Radio	37.8	47.8	14.4	2.0
Television	61.7	27.9	10.4	2.5
Letters	83.1	13.4	3.5	-
Newspapers	80.6	18.9	0.5	-
Email & Internet	88.1	8.5	3.5	-
Personal travels	18.9	38.3	42.8	35.3

Table 6: Respondents' knowledge of basic cell phone applications and their use of cell phones in their marketing activities (N = 201)

Variable	r-value	p-value
Respondents' knowledge of basic cell phone applications and their use of cell phones in their marketing activities	0.230	0.001*

* Significant at $p \leq 0.05$

Testing of Hypothesis

H_0 There is no significant relationship between respondents' knowledge of basic cell phone applications and their use of cell phones in marketing activities.

Table 6 shows a significant relationship between respondents knowledge of basic cell phone applications ($r = 0.230$; $p < 0.05$) and use of cell phones in marketing activities. The null hypothesis is therefore rejected. This implies that

respondents' knowledge of basic cell phone applications has a significant influence on their level of use of the technology in their marketing activities; the more the knowledge of the marketers of cell phone applications, the higher their level of use of cell phone in their marketing activities. This suggests that manufacturers of cell phones must device usability schemes that make their products acceptable and understandable to users, including feedback from usage as stated by Longe *et al*., (2010).

CONCLUSION AND RECOMMENDATIONS

Despite the high knowledge of respondents of basic cell phone applications, their use of the ICT in their marketing activities in the study area was low. The marketers still prefer the long aged traditional face-to-face mode of interaction in obtaining market information. This indicates that these marketers are yet to harness the full benefits offered by the cell phone. Issues relating to literacy level (which predisposes to risk aversiveness) and operational difficulties of these cell phones readily become significant.

It is recommended that extension services in Nigeria should exploit ways of widening their service base to cover agricultural marketing. Efforts should be made to involve compilation and distribution of produce prices, sensitization of traders as regards supply locations, synchronization of varied market information across borders in extension services. Extension agents should be trained to include the use of mobile applications like video sharing, bulk SMS and picture messaging to reach out to agricultural marketers. Many respondents utilize the radio facilities found in mobile phones (increasing the use of radio), therefore more agricultural programmes focused on production, distribution, prices and general market situations, should be aired on the radio. Also, manufacturers of cell phones must device models more understandable to users based on users' feedback.

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Use of Family Planning among Women Farmers in Ijebu North-East Local Government Area of Ogun State

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ABSTRACT

Reproductive life of women farmers has indirect consequence on agricultural productivity since women are greatly involved in agricultural production and processing activities. Family planning is one of the ways to ensure good reproductive health among women. The study assessed the use of family planning methods among rural women in Ijebu North-East Local Government Area of Ogun State, Nigeria. One hundred and twenty-six reproductively active women farmers were selected through random sampling technique from 10% of villages in the study area. Interview schedule was used to obtain data on respondents' socio-economic characteristics, awareness of family planning methods, sources of information, choice of family planning methods, attitude towards family planning and constraints associated with use of family planning. Results revealed that majority (85.7%) of the respondents were not more than 50 years old and became aware of family planning through the radio (86.5%), friends (80.2%) and health agents (77.8%). Methods utilized by most respondents included behavioural (52.4%), barrier (50.8%) and abstinence (42.1%). Choice of methods was influenced by ease of use (34.9), age (28.6%) and family size (27.8%). Majority of the respondents (79.4%) were favourably disposed to the use of family planning. Notable constraints faced by most women farmers in the study area included religious objection (55.6%) for abortion(55.6%), low level of exposure for rhythm method (51.6%) and spouse support for abstinence (46.8%). The study concluded that favourable disposition of the respondents to the use of family planning was a potential that could be harnessed towards improved agricultural productivity of women farmers in the study area.

Key words: Family planning, productivity, women.

INTRODUCTION

Agriculture constitutes the main source of livelihood for most people in Asia, Africa and Latin America and that a very large proportion of agricultural production is done by women, particularly in Asia and Africa. This amplifies the significant role of women in agricultural development process. Recognizing the role of women, Shodiya (1994) opined that women are great assets to agriculture due to their capacity for hard work, perseverance, endurance and ability to succeed in whatsoever they choose to do. Women also have some other responsibilities, which may affect their agricultural production activities. One of such responsibilities is child bearing. Child bearing process comes with some health challenges that may affect women participation in agriculture. This implies that improper management of reproductive life of women may result in loss of ample hands in agricultural activities. Therefore looking in the ways of initiatives that will assist women in their reproductive life comes handy in sustaining the productive women population. Family planning is one of the methods to ensure good reproductive health among women. Family planning is sometimes used as a synonym of birth control, though it goes beyond mere birth control. It usually applies to female-male couple who wish to limit the number of children to have and or to control or delay pregnancy to when couples desire one. Family planning services are defined as educational, comprehensive medical and social activities which enable individuals, including minors, to determine freely the number and spacing of children and to select the means by

which this can be achieved (United States Department of Health, 2007). Methods of family planning include abstinence, barrier methods (condom use), intra uterine device, behavioural, natural, sterilization, rhythmic and symptom-thermal and abortion. Cultural and religious attitude towards birth control varies significantly from the Christian (Roman catholic, who accepts only natural method, Protestants who maintain a wide range of views), Islam which allows contraceptives only if they do not threaten health or lead to sterility. Nigeria has also adopted family planning as a strategy to curb the high rate of population that it presently experiences. Obilade *et al* (2005) however opined that regardless of the government, non-government bodies and efforts of other programmes, the rural women still experience low access to and utilization of quality reproductive health education and services. This is evident in the fact that irrespective of various family planning methods available, rate of child bearing amongst rural people is still high. This has serious implication for loss of work time, decreased productivity, loss or decrease in family income and even death (loss in man power). It is against this background that this study sought to investigate the use of family planning among rural women in Ijebu North-East Local Government Area (INELGA) of Ogun State.

Objective of the study

The general objective of the study was to assess the use of family planning among women farmers in Ijebu North East Local Government Area of Ogun State. Specifically, the study aimed at:

1. describing respondents' personal characteristics;
2. ascertaining respondents' awareness of family planning;
3. examining respondents' choice of family planning methods;
4. ascertaining determinants of respondents' choice of family planning methods;
5. identifying respondents' constraints to the use of family planning methods
6. identifying respondents' sources of information on family planning.
7. ascertaining respondents attitude to family planning.

METHODOLOGY

The study was conducted in Ijebu North East Local Government Area (INELGA) of Ogun State. It is one of the rural councils in Ogun State. The Local Government is bounded by Ijebu East Local Government in the East, Ijebu North Local Government in the North, Ijebu Ode Local Government in the South and Odogbolu Local Government in the West. It is located approximately between latitude $6^{o}53'$ and $6^{o}55'$ North of the Equator and longitude $3^{o}45'$ and $4^{o}05'$ East of the Greenwich meridian. The inhabitants are predominantly Yoruba with Ijebu as the main dialect. The main occupation of the inhabitants of INELGA is farming. Common crops grown include oil palm, cassava, plantain, maize, cocoyam, melon and kola nut. Industrial activities in the area include lumbering and quarrying.

Target population

The population of the study comprised women farmers in INELGA area.

Sampling technique and sample size

A multistage sampling technique was adopted for the study. In the first stage, list of villages in INELGA was compiled and 10 percent of the identified villages were selected through random sampling technique. In the second stage, households in the sampled villages were listed and 30% of reproductively active women in the identified households were sampled for the study, resulting in 126 respondents. .

RESULTS AND DISCUSSION

Table 1 presents results on socio-economic characteristics of the respondents. Result reveals that majority of the respondents (85.7%) were not more than 50 years old. This suggests that rural communities are dominated by sexually active women labour force that could be harnessed for agricultural production. Sexual activeness is expected to influence respondents' opinions and decisions on family planning. Similarly, sexual activities of the respondents could have consequences on their agricultural activities. Results further show that majority of the respondents (63.5%) were Christians. This implies that family planning opinion and decisions of the respondents would be influenced by Christian's doctrines of the different denominations of the respondents. This will also impinge on respondents' engagement in agricultural production activities. Majority of the respondents (69.8%) were married. Marriage comes with childbearing process, which is expected to influence the ability of women to productively engage in agricultural activities. Therefore family planning decisions of rural

women is expected to influence their agricultural productivity. As regards education, 19.8% of the respondents had no formal education, 23.0% had primary education, 32.5% completed secondary education and 24.6% attended post secondary schools. The fact that majority (75.5%) of the respondents did not have more than secondary education implies low level of education. Low level of education may influence the capacity of the respondents to seek and utilize information as well as taking decisions relating to family planning. According to Sarah (2007) use of family planning may be affected by education. Result on household size reveals that majority of the respondents (72.8%) had more than five family members. This suggests women farmers with fairly large family size. Although large family size favours agricultural production, the attendant negative health and economic implications of raising large families may influence respondents' decisions about family planning issues. Based on involvement in social group activities, 50.8% of the respondents were involved in cooperative and thrift society, 12.7% were engaged in peer group activities, 10.3% were part of social club, while 26.2% belonged to trade society. This result implies that the respondents in the study area had opportunities to avenues through which information on family planning could be shared. This is expected to influence their decisions on family planning based on the premise that solidarity of women in rural African communities is one of their greatest source of strength (Ulin, 1992). This has implications on farmers' productivity. On cosmopoliteness, 64.3% of the respondents travelled regularly. The result suggests that majority of the women farmers had opportunities to improve their knowledge on family planning related issues in towns and cities. This is expected to influence their decions on family planning and consequently their agricultural productivity.

Respondents' awareness of family planning methods.

Table 2 presents results on respondents' awareness of family planning methods. Results reveal that majority of the respondents were aware of a wide range of methods of family planning. Specifically, methods that recorded outstanding awareness among the respondents included abstinence (100.0%), barrier (98.4%), natural (95.2%), systemic (93.7%) and behavioural (86.5%). This may be due to the fact that these methods do not require high technical competence to understand. They are more or less what an average individual, irrespective of level of education or cultural background could understand and possibly practice. This result provides a good platform for extension agents to activate linkage support with appropriate reproductive health practitioners with a view to assisting the women farmers in taking well informed reproductive health decisions

Table 1: Distribution of respondents bsed on socio-economic characteristics (n=126).

Socio economic characteristics	Freq.	Percent
Age		
≤20	4	3.2
21-30	27	21.5
31-40	52	41.2
41-50	25	20.0
> 50	18	14.3
Religion		
Christianity	80	63.5
Islam	34	27.0
Traditional	12	9.5
Marital Status		
Single	15	11.9
Married	88	69.8
Divorced	12	9.5
Widowed	11	8.7
Educational Level Attained		
No formal education	25	19.8
Primary education	29	23.0
Secondary education	41	32.5
Tertiary education	31	24.5
Household Size		
1-4	33	26.2
5-8	77	61.1
9-12	16	12.7
Social Group		
Cooperative & Thrift Society	64	50.8
Peer group	16	12.7
Social club	13	10.3
Trade society	33	26.2
Frequency of Travel		
Regularly	81	64.3
Occasionally	39	31.0
Never	6	4.6

Table 2: Distribution of respondents based on awareness on family planning methods (n=126)

	Awareness (Yes)	
Family Planning Method	**Freq**	**Percent**
Abstinence	126	100
Barrier	124	98.4
Systemic	118	93.7
Intrauterine	90	71.4
Behavioral	109	86.5
Natural	120	95.2
Sterilization	98	77.8
Rhythmic & Sympto Thermal	79	62.7

Respondents' sources of information on family planning.

Table 3 presents results on respondents' sources of information on family planning. Result reveals that majority of the respondents got information through the radio (86.5%), television (74.6%) and home video (72.2%). The result confirms the mass media, especially the radio as an important source of information in rural communities. This is also in line with the submission of Feyisetan et al, (2003) and Sarah (2007) that the availability of radio and television is essential in increasing exposure to family planning, public service messages and awareness of their availability. However 13.5% and 33.3% claimed internet and newspaper sources respectively. This could be due to low level of education of majority of the women farmers. Meanwhile it is important to note that 69.3% and 77.8% of the respondents got to know about family planning through hospitals and health agents respectively. This is a fall out of the fact that family planning talk is usually a part of prenatal care. This is in line with WHO (2004) which noted that global strategies have used prenatal care as an entry point in the delivery of core reproductive health services, including family planning. Likewise, 80.2% and 67.5% of the respondents were aware of family planning methods through friends and neighbours respectively. This is an indication of viable social capital among women in rural communities. This confirms the submission of Ulin (1992) that the solidarity of women in rural African communities is one of their greatest sources of strength. It is also significant to observe that one half (50.8%) of the respondents were aware of the methods through extension agents. This implies a wide gap in view of the fact that extension agents are very close to the grassroots. This gap may be due to inadequate extension agents and that perhaps extension was yet to incorporate family planning messages in their packages to farmers.

Table 3: Distribution of respondents based on source of information

	YES	**Often**	**Occasional**
SOURCES	Frequency (%)	Frequency (%)	Frequency (%)
Radio	109 (86.5)	86 (68.3)	23 (18.3)
Television	94(74.6)	68 (54.0)	26 (20.6)
Internet	17 (13.5)	7 (5.6)	10 (7.9)
Home video	91 (72.2)	33 (27.8)	56 (44.4)
Newspaper	42 (33.3)	17 (13.5)	25 (19.8)
Pamphlet	66 (52.4)	38 (30.2)	28 (22.2)
Posters	60 (47.6)	21 (16.7)	39 (31.0)
Books	52 (41.3)	28 (22.2)	24 (19.0)
Hospitals	88 (69.3)	57 (45.2)	31 (24.6)
Health Agents	98 (77.8)	61 (48.4)	37 (29.4)
Friends	101 (80.2)	71(56.3)	30 (23.8)
Neighbour	85 (67.5)	43 (34.1)	42 (33.3)
Extension agent	64 (50.8)	21 (16.7)	43 (34.1)
Children	25 (19.8)	10 (7.9)	15 (11.9)

Multiple responses

Respondents' choice of family planning methods.

Table 4 presents results on respondents' choice of family planning methods. It is observed that 42.1% of the respondents used abstinence method. This low adoption could be as a result of it requiring cooperation and commitment of both the women farmers and their spouses.

Furthermore, 31.0% of the respondents adopted the systemic method. The low use of this method may be as a result of the commitment required, side effects, lack of supplies and cost. This is in line with the findings of Hotchkiss (1999) that the cost of using pills and or injectables affect contraceptive behavior. Similarly, 34.9% of the respondents adopted the natural method. This may be due to the fact that natural method could only be practised by nursing mothers. In addition, 7.9% of the respondents adopted the sterilization method. Low adoption of this method could be attributed to the complex nature of its procedure, cost of surgery and the irreversibility of the operation in case adopters intend to have more children. More so, 30.2% of the respondents adopted the rhythmic and symptom thermal method. This could be a consequence of high understanding and commitment required for beneficial result, which may be beyond the capacity of not so educated women farmers. Lastly, only 8.7% of the respondents adopted abortion method. This may be due to the fear of its side effect and procedure involved. This agrees with the findings of Oye-Adeniran et al (2002) that because abortion is illegal in Nigeria except to save a woman's life, many procedures are conducted under unsafe condition and carry a substantial risk of maternal morbidity and mortality. However, 50.8% and 52.4% of the respondents adopted the barrier and behavioural methods respectively. Explanation for this could be found in the fact that condom for barrier method is readily available and cheap and does not require consulting a health care provider before use. Also behavioural method has no cost attached to its use. Non utilisation of many of the family planning methods by majority of the respondents has implication for possibility of unwanted pregnancies among the women farmers. The attendant health implications of pregnancies will have negative impact on productivity of women farmers in the study area.

Table 4: Distribution of respondents based on choice of methods.

		FREQUENCY OF USE	
	IN USE	**Regular**	**Occasional**
METHODS	Frequency (%)	Frequency (%)	Frequency (%)
Abstinence	53 (42.1)	23 (18.3)	29 (23.0)
Barrier	64 (50.8)	34 (27.0)	28 (22.2)
Systemic	39 (31.0)	21 (16.7)	21 (16.7)
Intrauterine	24 (19.0)	18 (14.3)	4 (3.2)
Behavioural	66 (52.4)	49 (38.9)	15 (11.9)
Natural	44 (34.9)	25 (19.8)	24 (19.0)
Sterilization	10 (7.9)	7 (5.6)	2 (1.6)
Rhythm& Sympto Thermal	38 (30.2)	23 (8.3)	16 (12.7)
Abortion	11 (8.7)	1 (0.8)	11 (8.7)

Multiple responses

Factors determining choice of family planning methods.

Table 5 presents results on factors determining choice of family planning methods. It is noted that a few of the factors influenced respondents' choice of family planning methods. Specifically, results reveal factors influencing choice of family planning methods of most of the respondents to include age for abstinence (27.8%) and sterilization (5.6%) methods, ease of use for behavioural (37.3%), barrier (34.9%) and rhythm (26.2%) methods. Other factors included culture for natural method (28.4%) and family size for systemic (20.6%) and intrauterine (16.7%) methods. It is important to note that education as a factor did not really influence the respondents in their choice of method. This may be due to the fact that many of the respondents might have been exposed to a lot of awareness and reproductive health education programmes on the radio and in their engagement with health agents, especially in various hospitals and clinics.

Table 5: Distribution of respondents based on factors determining choice of family planning methods.

Factors	Abstinence	Barrier	Systemic	Intra uterine	Behavioral	Natural	Sterilization	Rhythm & Sympto Thermal
Culture	29(23.0)	10(7.9)	2(1.6)	0(0.0)	34(2.7)	32(28.4)	0(0.0)	6(4.8)
Religion	12(9.5)	14(11.1)	7(5.6)	0(0.0)	17(13.5)	8(6.3)	0(0.0)	3(2.4)
Cost	7(5.6)	30(23.8)	19(15.1)	8(6.4)	38(30.2)	16(12.7)	2(1.6)	17(13.5)
Age	35(27.8)	36(28.6)	23(18.3)	12(9.5)	16(12.7)	0(0.0)	7(5.6)	8(6.3)
Educational background	3(6.3)	9(7.1)	12(9.5)	16(12.5)	6(4.8)	6(4.8)	3(2.4)	1(0.8)
Occupation	23(18.3)	9(7.1)	13(10.3)	5(4.0)	13(10.3)	19(15.1)	0(0.0)	2(1.6)
Location	12(6.5)	13(10.3)	20(15.9)	7(5.6)	16(12.7)	14(11.1)	0(0.0)	3(2.4)
Family size	8(6.3)	35(27.8)	26(20.6)	21(16.7)	35(27.8)	6(4.8)	5(4.0)	13(10.3)
Cosmopoliteness	7(5.6)	21(16.7)	16(12.7)	10(7.9)	11(8.7)	1(0.8)	5(4.0)	12(9.5)
Ease of use	16(12.7)	44(34.9)	22(17.5)	15(11.9)	47(37.3)	22(17.5)	5(4.0)	33(26.2)

Attitude of respondents towards family planning.

Table 6 presents results on respondents' attitude to the use of family planning. It is noted that majority of women farmers (79.4%) exhibited favourable disposition to using family planning devices. However it is important to note that the unfavourable attitude of 20.6% of the women was largely accounted for by the statements that the concept was for the rich and elite ($\bar{x}$ =2.87) and that it was not 100% effective ($\bar{x}$ =2.64). Other statements that informed the negative attitude of the women included uncooperative attitudes of their husbands and the fact that some family planning methods increases weight gain and religious objection to the practice of family planning. ($\bar{x}$ =2.86). Favourable attitude of the women farmers implies an opportunity that should be harnessed for improved reproductive health status of women farmers and consequently their agricultural productivity.

Constraints associated with respondents' use of family planning.

Table 7 presents results on constraints to the use of family planning methods. As indicated in the table, notable constraints faced by most women farmers in the study area included low level of exposure for rhythm method (51.6%) and spouse support for abstinence (46.8%). Other constraints were high cost for systemic method (32.5%) and non availability for intrauterine method (38.1%). The result is indicative of existence some hinderances to maximization of the potential benefits of family planning by women farmers in the study area. This implies that maximisation of the benefits of family planning for improved agricultural productivity requires that efforts be made to address the identified obstacles.

CONCLUSION

The study concluded that majority of women farmers utilized a wide range of family planning methods and principally sourced information through the electronic media (radio and television), friends and health agents. Extension agents were yet to play a significant role in this direction. In spite of the constraints posed by culture, religious beliefs and availability of materials for some of the family planning methods, most women farmers were favourably disposed to using family planning.

RECOMMENDATION

Based on findings of this study and conclusion drawn above, it is recommended that:

Women in agriculture component of agricultural development programme should address the issue of family planning as part of their rural development programme for improved agricultural productivity of women farmers.

Extension service should build on the positive disposition of the women farmers to work with health care providers to maximize the productivity enhancing potentials of family planning adoption by women farmers.

Table 6; Respondents' attitudes towards family planning.

STATEMENT	SA	A	U	D	SD	SUM	MEAN
Family planning promotes good health	410	152	6	6	0	576	4.57
Family planning is against law of procreation	100	276	48	30	6	460	3.65
Family planning promotes promiscuity	100	232	84	18	8	442	3.59
Family planning allows proper care of children	200	216	33	42	0	491	3.90
Some family planning has side effect, so it is a risk	170	172	57	30	14	443	3.54
Family planning can affect future fertility	155	112	84	60	9	420	3.33
Family planning is affordable	105	232	51	40	9	437	3.50
Family planning is for the rich and elites only	80	136	72	42	31	361	2.87
Family planning is for young and old	140	152	39	44	25	400	3.17
Family planning is not 100% effective	19	110	51	80	70	330	2.64
Some family planning alters menstrual cycle	120	168	72	60	6	426	3.38
My husband does not support family planning	13	72	102	120	65	372	2.95
Family planning prevents unwanted pregnancy	180	232	42	26	5	485	3.85
Family planning encourages good standard of living	135	216	57	30	6	447	3.69
Family planning is very effective	120	236	81	22	3	462	3.73
Family planning encourages mutual relationship	140	196	78	42	2	458	3.63
Some family planning can cause increase in weight	105	252	60	44	0	231	1.83
Some family planning can cause ectopic pregnancy	80	180	117	44	4	425	3.37
My religion is against family planning	105	112	60	50	31	358	2.86

Mean score=3.00 < 3.00 = Unfavourable attitude= (20.6%); ≥ 3.00 = Favourable attitude (79.4%)

Table 7: Constraints to the use of family planning method

METHOD CONSTRAINTS	Abstinence Frequency (%)	Barrier Frequency (%)	Systemic Frequency (%)	Intrauterine Frequency (%)	Behavioral Frequency (%)	Natural Frequency (%)	Sterilization Frequency (%)	Rhythm S.T. Frequency (%)
Culture	21(16.9)	12(9.5)	5(4.0)	6(4.8)	5(4.0)	4(3.2)	21(16.7)	4(3.4)
Religion	9(7.1)	12(9.5)	7(5.6)	8(6.3)	9(7.1)	1(0.8)	11(8.7)	0(0)
Cost	2(1.6)	21(16.7)	41(32.5)	17(13.5)	3(2.4)	2(1.6)	6(4.8)	0(0)
Belief	21(16.7)	24(19.0)	30(23.8)	22(17.5)	15(11.9)	4(3.2)	49(38.9)	2(1.6)
Spouses support	59(46.8)	21(16.7)	13(10.3)	7(5.6)	34(27.0)	2(1.6)	21(16.7)	5(4.0)
Availability	1(0.8)	8(6.3)	20(15.9)	48(38.1)	5(4.0)	26(20.6)	2(1.6)	0(0)
Level of Exposure	3(2.4)	14(11.1)	18(14.3)	52(41.3)	15(11.9)	6(4.8)	9(7.1)	65(51.6)

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Operation Simplicity And Capital Prudency As Antidote For Failure Of Recirculating Aquaculture System: A Case Study Of Selected Facilities In Ibadan

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ABSTRACT

The operation of some troubled and unsuccessful recirculating aquaculture system (RAS) production facilities was evaluated to gain a better perceptive of the technical and economic aspects of operational problems that must be addressed for successful RAS business. Interview schedule was utilized to obtain data on the general operation and system characteristics for the facilities. Water flow rates in system components were estimated using a calibrated cylinder and a stopwatch. Fish culture tank, sedimentation tank and biological filter were monitored for water quality assessment. With the exception of one facility, all the farms were engaged in production of table size Clarias gariepinus. Water treatment component design in most of the farms did not match fish culture requirement. Wastes solids removal and dissolved oxygen delivery rate were not adequate and thus affect production capacity of the systems. Poor water quality led to elevated level of nitrite causing fish mortality. Flash rainfall on facilities located outdoors aggravates system operation and water quality problems. The improvisation of the water treatment components media coupled with outdoor operation culminated into a system that apparently could not accommodate the production demand of intensive culture in a recirculating fish production system. Systems with complex design run at low level of management, increased capital expenditure and eventual lower profit. Conscious effort to minimize system complexity and sufficient cash flow is recommended to ensure success of recirculating fish production ventures.

Keywords: Recirculation, Prudence, Design, Aquaculture, Venture

INTRODUCTION

The use of recirculating systems to hold or culture fish has been in operation since the 1970's (Masser e*t. al*. 1999). Though initially limited to researchers, over the last three decade years, the use was has been extended to commercial food fish production. Recirculating aquaculture system (RAS) has gained awareness within the food fish production sub sector in Nigeria due to its associated advantages over other conventional production technologies. RAS ensure high control of the land and water resources, reduced input requirements and overall production cost with expected high harvest. Despite these advantages, much is still unknown about the technology in terms of its adaptability to the Nigerian climate. An investment in commercial RAS has the same general risk and uncertainty as other livestock enterprises, uncertain market prices, uncertain and risky operational characteristics and uncertain input costs. Some of the techniques used in RAS setup are relatively new, and less is known about its technical performance. Investment in such ventures in Nigeria calls for a rigorous analysis and a logical framework within which to make investment decision. The pursuance of a twin track approach of government participation with private smallholder commercial aquaculture development must be encouraged. This could be enhanced through the collation and dissemination of already existing research results as well as initiating research into emerging technologies in the field of aquaculture. This would ensure that project failures are kept to a minimum thus encouraging new entrants (especially small-holder individual and corporate bodies) into aquaculture. This is because project design and conceptions would be based on solid economics and technical facts not wishful over-enthusiastic projections. Findings in a survey reported by Akinwole and Faturoti (2005) on the operation of some commercial RAS based fish production facilities in Oyo State, Nigeria shows that many (55% of the sampled facilities) farms experience a lot of problems within few months of operation. This

paper report findings of a follow-up assessment carried out to appraise the operation of the reported problematic and failed RAS production facilities to gain a better understanding of the technical and economic aspects thereby accentuating problems that must be addressed or at least recognized for successful RAS operation. Possible antidotes to guide against, totally eliminate or at best ameliorate the identified failure factors are also discussed.

METHODOLOGY

Interview schedule was utilized to obtain data on the general operation and system characteristics for the facilities. Physical inspection, observation and measurement of system components and operations were done to validate information given in the collected interview schedule .All qualification measurements, both scalar and vector, were done in line with American Society of Civil Engineers, ASCE (1990) and Denn (1980). Water flow rates in system components were estimated using a calibrated cylinder and a stopwatch. Recorded flow rates were averages of at least three readings.

Water flow in fish culture tank, sedimentation tank and biological filter were monitored for water quality assessment. Water sampling quality records and analysis were done for pH,dissolved oxygen, ammonia-nitrogen (NH_3-N), nitrite-nitrogen, (NO_2) and suspended solids (SS). All analyses were done in line with standard methods (APHA 1995) pH was determined using Jenway® pH meter, dissolved oxygen (DO) using Winkler's method, NH_3-N was determined using the Kjeldahl digestion method. Hach® water analysis kit was used to determine nitrite concentration. SS was determined gravimetrically by weight.

Most of the operators were initially reluctant to give information or allow evaluation of their facilities. They thought the study was a clandestine government sponsored operation to assess their facilities for taxation. When finally convinced that the study is mainly an academic exercise, the farms consented to facilities' inspection and evaluation with a proviso that their identity be protected as much as possible. The actual names of the facilities under study are protected and thus represented by acronyms.

RESULTS AND DISCUSSION

The system characteristics and operation summary of all the facilities are as shown in Table 1. The facilities located indoors were 33.0% while 67.0% were outdoor. With the exception of MJF facility, all others were engaged in grow-out RAS facilities for production of table size *Clarias gariepinus*.

All the facilities, with the exception of MJF, were from the start, beset with a lot of technical problems, which ultimately had negative impact on their operation. Water treatment component design did not match fish culture requirement in respect of the holding capacity of the rearing tank. Treatment media for sedimentation and biofilter were composed of improvised materials (Table 1) whose suitability to support commercial RAS operation, in terms of successful and repeated profitable culture of fish, have not been proven. The exposure of culture components to the vagaries of weather elements, in outdoor facilities, places avoidable stress on the systems. Thus operators do not have enough control on the culture environment, as expected in RAS operation. This resulted in poor water quality as evident in the typical mean values of the water quality parameters (Table 1), which most times, are outside the acceptable range recommended by Masser *et. al.* (1999) for RAS operation as depicted in Table 2, and in some instance, outside acceptable range for *Clarias gariepinus* culture (Boyd, 1990). The water quality problems affect fish health, lead to slow growth rates and general reduction in the overall carrying capacity of the facilities thus negating the capacity to produce economic quantity of fish within the projected culture duration. These systems could not effectively remove solid wastes and maintain dissolved oxygen level at safe limit; the overall system production is thus negatively affected. Ridha and Cruz (2001), and Summerfelt *et.al.* (2004) noted that wastes solids removal and oxygen delivery rate are major factors that affect production capacity of RAS operations. The relatively low hydraulic exchanges through the rearing tanks, 1347 minutes in the best case, for grow-out system, does not represent a good oxygen delivery rate. The 1347 minutes, which translate to just one tank volume exchange per day, for the system concerned is not enough to ensure maintenance of safe dissolved oxygen level as against one rearing tank volume exchange per hour recommended for stable RAS by Malone (2002) and Summerfelt *et.al.* (2004). As culture duration progresses, the fish biomass to be supported by the system increases, poor water quality leads to elevated level of nitrite in culture water causing fish mortality. In some cases, flash rainfall which otherwise might be thought of as a relief to the water quality problem, aggravates system operations. Increased volume of water

places extra duty demand on the water pumps and causes inundations of the facility location with water of doubtful quality and possible septic potential. This, apart from leading to problems in maintaining flow conditions in the system components, increases the health risk of cultured fish and staff, who have to spend a disproportionate amount of time and energy troubleshooting and managing the system.

A review of the evolution and establishment of these facilities show that they are, in virtually all the cases, modified copied version of system layout of older RAS-based fish farms, but which are usually operated indoors and with proven water treatment components' media in use. The improvisation of the water treatment components media coupled with outdoor operation culminate into a system that apparently could not accommodate the production demand of intensive culture in a recirculating fish production venture.

The inability of these facilities to produce table size fish economically does not necessarily imply that grow-out stage culturing of *Clarias gariepinus* in recirculating systems with these improvised sedimentation and biofilter media options (gravel, lava stones, baffle wall barriers) would lack merit. The fact that *Clarias gariepinus* were held for up to 5 months, in such poor water quality condition, is, on one hand, a testimony to the tenacity *Clarias gariepinus* for culture in RAS, and on the other hand , an indication of the potential of the use of these water treatment media in commercial RAS operation in a tropical climate. These media are in themselves not the problems, Malone (2002) and Timmons (2000) report the use of these media in successful RAS in the United States.

TABLE 1: System Characteristics of the RAS production facilities assessed

	Facilities					
	EPF	**FTD**	**MJF**	**MOA**	**MOH**	**OPF**
Type of System	Grow-out	Grow-out	Fingerlings	Grow-out	Grow-out	Grow-out
Location	Outdoor	Outdoor	Indoor	Outdoor	Indoor	Outdoor
No. of RAS modules	1	2	1	1	1	3
Water source(s)	Stream	Borehole	Deep well	Deep Well	Deep Well	Borehole
No. of Rearing tanks per module	2	3	4	2	2	2
Volume of each Rearing tank, m^3	13.2	12.0	1.8	11.9	17.3	12.0
Rearing tank volume exchange (minutes)	1347	1579	720	1988	2408	1714
Rearing tanks material	Solid blockwall, Rectangular	Concrete, Rectangular	Solid blockwall, Rectangular	Concrete, Rectangular	Solid blockwall, Rectangular	Concrete Rectangular
Sedimentation tank details, volume, media (all Rectangular Shape)	3.17 m^3, Solid blockwall, plastic crates with gravel stones	9.36 m^3, Concrete, Plastic crates with gravel stone	2.19 m^3, Solid blockwall, polypropylene media	5.48 m^3, Concrete, Plastic crates with macadam	1.76 m^3, Blockwall, Baffle walls with plastic netting frame barriers	3.6 m^3, Concrete, with baffle walls barriers
Biofilter details (volume, media,types	3.44 m^3, plastic crates with larva stones media, Trickling	4.50 m^3, Plastic crates with larva stone media, Trickling	1.93 m^3, Polypropylene media, Trickling	1.44 m^3; Polypropylene media, Trickling	0.89 m^3, Plastic crates with larva stone media, Trickling	13.84 m^3, Coarse sand filter media, submerged bed
Average stocking						

density, fish/ m^3	210	175	6660	180	160	195
No. of feeding per day	4	5	11	5	5	4
Duration of effective system operation (Months)	9	8	8	5	6	5
Typical mean SS (mg/l)	≥35.1	≥38.6	≤6.3	N.A.	≥29.4	≥46.3
NO_2-N(mg/l)	≥1.5	≥1.4	≤0.3	N.A.	≥1.63	≥1.4
$NH_{3\ -N}$(mg/l)	≥12.4	≥45.8	≤1.8	N.A.	≥73.4	≥67.5
DO (mg/l)	≤3.6	≤2.3	≥4.5	N.A.	≤1.9	≤1.6

N.A. not available for verification, facility has been abandoned totally

TABLE 2: General optimal water quality requirements for Recirculating Aquaculture System and Ranges recorded in this study

Parameter	Recommended range *	Ranges recorded in the facilities studied
Suspended solids	Less than 25 mg/l	6.2 - 46.4 mg/l
Dissolved oxygen	5mg/l or more for warm water fish and greater than 2 mg/l in biofilter effluent	1.5 – 4.6 mg/l
pH	7.0 to 8.0	6.0 – 9.0
Un –ionized NH_3-N	Less than 3 mg/l	1.7 – 73.5 mg/l
Nitrite-Nitrogen	Less than 0.5mg/	0.2 – 1.65 mg/l

*adapted from Masser et.al. (1999); Eding and Kamstra (2001)

EPF facilities, with stream water as source of freshwater exhibits a comparatively better water quality than others . This lends credence to the advantage of surface water over groundwater sources for fish culture, if its associated problems of upstream pollution, conjunctive use law, can be controlled. The operation experience at MJF brings to the fore, the problems of fish pathogens and disease outbreak on one hand and under capitalization and expertise in intensive aquaculture on the other. The farm closed down operation when problems of disease outbreak that brings catastrophic fish mortality, owing to the sensitive nature of Clarias *gariepinus* at the fingerling stage. The high fish kill experienced as a result of diseases lead to low yield and consequently low returns. The owner could not raise enough funds to expand facility to other stage of culture, the operation thus collapsed as fund to keep it going were not available. Repeated production of fish at an economically viable level would be difficult if disease problems persist, and sufficient cash flow is not ensured to carry the operation through trouble period like components breakdown and disease outbreak. These problems do occur more often than not in recirculating fish production ventures.

Lessons and possible solutions

The antecedent of over 90 percent of the farms shows that their RAS components are either entirely packaged from Europe or are typical version of system layout of "older" RAS- based farms who themselves have major components imported from Europe. This gives room for a lot of unknown about the technology. There is much to learn about nutrition, water quality, species genetics, aeration and their concomitant interaction with disease outbreak in RAS production facilities. Many of these facilities that have failed have not done so, solely because of the unknowns about the technology but majorly due to failure to adhere to basic concepts of operation simplicity and capital prudency as expected for a venture into an emerging in new field.

System Simplicity

When the level of production intensity is considered, commercial RAS would ordinarily defy the term simplicity. Though RAS is an

inherently complex system, a deliberate effort should be made to minimize the complexity right from inception. As with any technology, for a well designed system, the relationship between simplicity, operating cost and management is mutually dependent. System simplicity in fact represents the point on which production cost and operations management is balanced. Increases in design simplicity will translate to a concomitant increase in system management for the same level of capital input. Systems with complex design run at low level of management, increased capital expenditure and eventual lower profit.

Conscious effort to minimize system complexity for recirculating fish production facilities can be made by adhering to the following ;

Make realistic critical assessment of target and resources.

The rule, though simple, is the most crucial step in developing a successful aquaculture venture. Most RAS facilities have failed because a realistic assessment of expectation (goals) and resources were not made. It is important that absolute honesty is ensured in doing this, else, the investment is doomed from the onset. A would-be investors in RAS may have a goal of producing 30 metric tonnes catfish per year with facilities at his backyard. Thus would be unrealistic if his resources, (say water and capital) are at most 120 litres per minute and a total investment of 4 million naira (by 2011 economic standard in Nigeria). The resources are okay, but they cannot realistically match the 30 tonnes per year expected harvest in a recirculating system.

Once investor's goals and resources are known, system design to match them can then be done. Higher goals may imply large complex system for a relatively inexperienced aquaculturist, this would in turn means increase in room for errors in system operations and management.

Identify and quantify system production parameters.

Using chosen goals and available resources, a quantification of the important system operating/ production parameters should be done to span the proposed complete culture cycle. Table 3 gives essential parameters that should be defined before RAS design is embarked upon. The parameters in the Table 3 do not represent an all inclusive list but are provided to serve as a general guideline.

Table 3: Common operating parameters for recirculating aquaculture system.

- Stocking density
- Total daily feed required
- Number of feeding per day
- Feed amount per tank per day
- Waste loading per day
- Waste load variation per day
- Culture tank size
- Total water volume
- Water flow rates
- Tank volume exchanges
- Percentage makeup water
- Monthly feed requirement
- Water quality limits/range for chosen fish species

Choose the simplest design layout and components.

There is always more than one way to achieve any process objective in RAS. Available technologies or components options for essential RAS processes are given in Table 4 as adapted from Malone (2002) and Timmons(2000).. Choose the simplest available options in terms of operation and management. The underlying reason here is that every location, owners goals and available resources introduce peculiarity that make the system concerned different in itself compared to the other systems even of the same yield/ capacity.

Table 4: Essential operation in recirculating aquaculture system and available option/technologies.

Essential Process	Goal	Available options
Species containment	To hold the cultured organisms	Tanks of various size, shapes and materials(PVC,Concrete,Sandcrete blocks, fibreglass)
Solids removal	To remove uneaten food,faeces, settleable solids	Sedimentation tanks of various barriers(lamella,walls,granular media); Microscreening; Granular filtration
Biofiltration	To remove toxic nitrogenous compounds	Granular biofilters; Submerged filters(upflow or downflow); Trickling filters; Rotating bio-contactors
Aeration	To replenish dissolved oxygen used by fish and nitrifying bacteria	Air stone; Cascade columns,Surface agitators;U-Tubes.

System simplicity and operation management could be further improved by avoiding machines where manual labour would suffice. Equipments and machines are reportedly designed to save labour and time. Caution is needed in choice of machines over manual labour as the machine might turn out not to be as beneficial as it first appears. Incorporating a machine one can do without only lead to problems like increased cost, mechanical breakdown, operators error, non flexibility in operations. Cases where this can occur includes; the use of automatic feeders as opposed to manual feed administration, use of vacuum pump to dislodge sludge in a settling tank compared to intermittent use of two tanks to give room for manual cleaning of one; the use of probes, sensors linked to computer screen to monitor water quality or possible problem situations in some components. Apart from increased investment cost, computer monitoring system are not infallible. They can only react when a problem exist and can, most times, not warn that a problem is developing, a situation which can easily be detected by an experienced fish culturist on routine manual system monitoring check.

Opt for small size modules

Though system size will depend on owners goals and resources, the size should be large and enough to conserve the economy of scale but not to the detriment of efficient operation. Large rearing tank may increase tank production but should not be too large and too deep to hinder feeding, cleaning, grading and harvesting operations. System should be designed such that when operational, perturbations should be at the barest minimum while resources are maximized.

Though the buffering capacity of systems are increased as system becomes large, it also makes it difficult to effect changes when alleviating a problem. Size should relate more to available managerial resources. Management needs for reviving three separate RAS modules with 1hp capacity pump for water circulation is quite different from that required to run a single RAS module with one 3hp pump. For small holder individuals fresh in aquaculture, low head designs are appropriate.

Compartmentalize system layout.

Design configuration should have a built-in ability to isolate components of the system at any time. This need becomes evident when failure of a component (especially the water treatment components) occurs and it becomes necessary to carry out maintenance. Effecting biofilter cleaning can pose difficult problems if no provision for shutting down the component for maintenance exists in the initial design and layout. Additionally, provision of make-up fresh water to keep system running in flow- through configuration is a crucial fall back arrangement for water treatment component maintenance and disease outbreak.

Capital prudency

As with any commercial venture, a strong financial base is a key to success. Though it is not a guarantee of success, the wise utilization of available funds could make or mar the success of RAS. A starting point for prudency is to resist the tendency to over capitalize the system with too many machines or equipments which may not be necessary. Capital prudency as a precaution against failure in RAS could be implemented by adhering to the following;

Ensure sufficient cash flow

Over enthusiastic projection in terms of culture duration can lead to cash problem. Contrary to what most 'RAS sales men' claim while product- marketing, culture cycles in intensive systems like RAS do extends beyond predicted harvest date. Rarely do fish perform at idealistic projection. An investor who expect to have the first sale of produced fish after four months of culture would run into cash problem if at the end of four months, average fish size is not marketable. Maintaining cash flow to allow for possibility of extended culture duration is a good antidote to being cash- stranded mid- way. Sufficient cash flow provision from onset is also needed to carry the venture through period of system or components failure. Like pumps or electricity generator breakdown, disease outbreak and total stock loss in some tanks. These problems do occur more often than not. Some investors (like MJF and MOA farms in this study) have had to pack up operation entirely due to insufficient cash to push through period like those mentioned . Opportunity of learning from such incidence and starting over again is obviously out of suggestion for such cash strapped investors.

Start small, expand slowly.

RAS as a fish production technology in Nigeria is still at its infancy and its operation is faced with a lot of unknown but can be phased not in implementation. A 10-tonnes facility could be phased out into five and developed by starting and running a 2-tonnes module for some time before expanding further. This would allow investors the time to get used to operation and financial intricacies involved. Expanding too quickly after just one successful production cycle may lead to management and cash flow crisis when erstwhile hidden system problems arises. Viewed another way, it would be relatively easier to source for funds to expand a small successful RAS than to raise money to keep a large troubled facility from going under.

CONCLUSION

With increasing fish demand and available market for aquaculture products in Nigeria, the attention given to RAS adoption will not fade away. While some farms report success some RAS based facilities have failed. Complex system layout and design of water quality conditioning components not matching fish culture requirement in respect of the holding capacity of the rearing tank is responsible for collapse of some facilities while others failed due to insufficient funds to run system through the duration of culture. The unknowns about technology notwithstanding, success could be improved if facilities are designed to operate as simple and as manageable as possible without bearing unnecessarily over capitalized.

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Growth Performance and Nutrient Utilization of African Catfish (*Clarias gariepinus*) fingerlings Fed Diets With Differently Fermented Sesame Seed (*Sesame indicus*)

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ABSTRACT

An experiment was conducted to assess the Growth Response (GR) and Nutrient Utilization (NU) of differently processed fermented sesame seed (Sesame inducum) in the diets of Clarias gariepinus fingerlings. Three categories of Sesame Seeds (SS) (undehulled, dehulled and prepressed) were fermented at room temperature. Their phytic acid and tannin content were determined pre and post fermentation. Four diets were then formulated at 40%, Crude Protein level; Diet 1 (control with 0% SS inclusion); Diet 2, Undehulled Fermented SS 25% inclusioin); Diet 3 Dehulled fermented SS 25% (Dehulled fermented SS 25% inclusion), and diet 4 (Prepressed fermented SS 25% inclusion). These diets were fed to the fish at 3% of their body weight, two times daily, for 8 weeks. Each treatment had three (3) replicates, with 10 individual fish average initial weight of 1.62g. At the end of the experiment, fish carcass (whole body) were analysed for proximate composition. Result showed that fish fed Diet 1 which is the control had the best growth performance and nutrient utilization values while fish fed Diet 2 had the poorest values for these parameters. Among the differently fermented sesame seeds diets, Diet 4 had the best Growth Performance (GP) and Nutrient Utilization (NU) indices. The Specific Growth rate and the Food Conversion Ratio of Diet 1 were better and significantly ($p < 0.05$) different from the fermented sesame seed based diets while the protein intake of all the diets were not significantly ($P < 0.05$) different from each other. The dehulled and prepressed based diets showed appreciable increase in GP and NU values when compared to other sesame seed fermented based diets. This observation was adjudged to be due to the reduction of tannin content from 0.066% (initial) to 0.056, 0.035 and 0.024% respectively and for phytic acid from 0.248% (initial) to 0.236, 0.216 and 0.187% in undehulled, dehulled and Prepressed Sesame Seed (PSS) based diets respectively. Fermented (PSS) based diet performed significantly ($P < 0.05$) best when compared with other fermented sesame seed based diets, due to the fact that prepressing of the seed further reduced the concentration of the antinutritional factor.

Keywords: Fermented *Sesame seeds, Clarias gariepinus*, nutrient utilization.

INTRODUCTION

Replacement of fish meal with plant proteins challenge, the quality and concentration of proteins from plant sources which are generally lesser in their amino acid composition and palatability. However, plant protein is cheaper and more available than fish meal. This cost advantage of plant proteins encourage the processing of crops to improve their nutritive value to finfish (Drew *et al*., 2007). In order to reduce the high cost of fish feed without adversely affecting its quality, some animal by product, bone meal and some plant proteins are good alternatives to use as ingredients in fish diets (Ofojukwu and Kigbu, 2002). Plant oilseeds and their by-products usually constitute a major source of dietary protein within aqua feeds for warm water omnivorous, and herbivorous fish species.

Some of the factors which limit incorporation of these plant ingredients at high levels in fish feeds are low protein content, amino acid imbalance and presence of anti-nutritional factors (Wee, 1991). The presence of anti-nutritional factors had always been some of the reasons for the observed retarded growth (Olukunle, 1996). The inclusion of plant proteins have also been noted to suppress growth in fish species like carp (Hossain and Jauncey, 1990), blue catfish (Carl *et al*., 1992), tilapia (Shiau *et al*., 1987) and *C. gariepinus* (Balogun and Ologhobo, 1989).

Sesame Seed (SS) contains anti-nutritional factor such as phytic acid which either forms complex protein or binds with metal ions such as calcium and magnesium inhibiting the absorption of these important minerals (Gobi, 1981). Phytic acid in SS is the main anti-nutritional factor which has a great influence on mineral availability in teleost fish (Mukhopadhyay and Ray, 1999). However, reduction in toxicity of such feedstuffs may be reduced through processing (e.g. water extraction, heat treatment) which inactivate enzyme, (Hossain and Jauncey, 1989) significantly ($P < 0.05$) decrease in phytate content was observed when soybean was soaked in water for 24 hours at room temperature (Cheryan, 1980). Niha *et al*., (2009) summarized the advantages of fermenting feeds as reduction in the level of anti-nutrients within feed, improved bio-availability of minerals (e.g. P. Ca, Mg, & Cu), increase in protein content of lysine, histidine and methionine), and the breakdown of indigestible carbohydrates.

The fermentation resulted in complete elimination of phytic acid in sesame seed (Mukhopadhyay, 2001). It would therefore be economical and beneficial to fish farmer if fermented sesame seed meal is incorporated into the fish feeds without compromising growth and conversion efficiencies.

MATERIALS AND METHODS

Experimental diets preparation

Feed ingredients were purchased from a reputable feed mill Adom (Nig) Enterprises, Orogun, Ojo Road, Ibadan. The sesame seed (*Sesamum indicum*) which is the test ingredient of interest were purchased from Bodija market, Bodija, Ibadan.

Preparation of Dehulled Sesame Seed (DSS)

One kilogram of raw sesame seeds was washed, soaked and de-bittered in hot water for 7 mins (Olukunle, 1996). The soaked seeds were dehulled by pounding in a mortar. The hull was separated from the dehulled seeds through floatation.

Preparation of the Pre-pressed Sesame Seed Cake (PSS)

Four kilogram of the raw sesame seed was thoroughly cleaned before dehulling manually by pounding in mortal. The dehulled seed was dried to 4% moisture, and cooked with steam at 95^0C in a litre of water in an aluminium pot for 1 hour. The seed were allowed to cool and was milled in a grinding mill. The ground mash was steamed for another 30 mins to a temperature of – 98^0C and loaded into the screw press while hot and pre-processed through a central cage lined with cloth for 30 mins as described by Olukunle (1996).

Fermentation of the sesame seeds

Three categories of seeds were fermented at room temperature using the method described by Soetan and Oyewole (2009). The first category is the dehulled sesame seed, the second is the Prepressed sesame seed, while the third is the raw undehulled sesame seed. 500g of each category were placed in different containers and soaked with water for 3 days.

Fermentation diets

Four diets were fermented. All the diets were formulated to contain 40% crude protein as appropriate for fingerlings of *Clarias gariepinus* (Faturoti *et al*., 1986). Diet 1 as Control with no Sesame seed inclusion, while diets 2, 3 and 4 contained 25% inclusion level of Fermented Undehulled (FUSS), Fermented Dehulled SS (FDSS), and Fermented Prepressed SS (FPSS) respectively. Table 1 shows the ingredients composition of the experiment diets containing 40% crude protein.

Experimental procedures

Each treatment had three replicates, 10 fish per replicate, with a mean initial weight of 1.60g. The experiment was conducted for 8 weeks. Fish were acclimatized to the experimental system for 2 week before the start of the experiment. Fish were fed 3% of their body weight. At the start of the experiment fish were bulk weighed to the nearest 0.01g. For intermediate weighing, fish were bulk weighed every 7 days. The quantity of feed fed were adjusted after each weekly weighing and fed for the subsequent week.

Table 1: Ingredient composition of the experiment diets containing 40% crude protein

Ingredient	Diet 1	Diet 2	Diet 3	Diet 4
Fishmeal	15.28	16.06	16.11	16.14
Groundnut Cake Meal	30.56	32.11	32.20	32.30
Soyabean Meal	30.56	24.08	24.15	24.22
FUSS	-	8.03	-	-
FDSS	-	-	8.03	-
FPSS	-	-	-	8.03
Maize	15.08	12.17	11.99	11.82
Wheat Offal	5.02	4.05	4.00	3.94
Vitamin premix	1.00	1.00	1.00	1.00
Mineral premix	1.00	1.00	1.00	1.00
Palm Oil	1.00	1.00	1.00	1.00
Salt	0.5	0.5	0.5	0.5
Total	**100.00**	**100.00**	**99.98**	**99.95**

Note: FUSS = Fermented Undehulled Sesame Seed, FDSS = Fermented Dehulled Sessame Seed, FPSS = Fermented Prepressed Sesame Seed.

RESULTS

The result of the proximate analysis of the raw and the differently fermented processed sesame seed is presented in Table 2. The lowest crude protein was observed in FPSS while highest was recorded in the raw seeds. The values of fat range from 48.96% FUSS to 43.77% in FPSS. Crude fibre ranged from 11.10% RAW to 7.0% in FDSS, while Moisture content ranged from 9.62 in FPSS to 5.33% in FUSS. Table 3 shows the details of the proximate composition of the experimental diets. The ether extracts varied from 5.67% to 5.42% with the highest in diet 4 and the lowest in diet 1. The values of the crude protein ranged from 44.62% in diet 3 to 43.89% in diet 2. Crude fibre ranged between 3.40% and 3.17% in diets 2 and 3 respectively. Ash varied between 13.5% and 14%. The result of the proximate composition of the fish before and after the experiment was presented in Table 4. Crude protein content of the fish before the experiment was 42.08%. At the end of the trials, fish samples fed diet 1 (0% sesame inclusion), has the highest crude protein content of 62.73% and lowest in diet 2 (FUSS inclusion) of 49.82%. A comparison of the proximate composition of experimental fish at the beginning and at the end of the experiment showed an increase in crude protein, fat content, crude fiber, and ash content. However, there was a decrease in nitrogen free extractives of all the treatments. Table 5 shows the parameters observed and recorded in the growth performance and nutrients utilization of *Clarias gariepinus* fingerlings fed with differently fermented sesame seeds based diets and the control. The weekly changes were observed and recorded. Treatment 1 (0% Sesame inclusion) with initial weight of 1.63g and final weight of 6.43g with the highest mean weight gain of 6.43g had the highest mean weight gain of 0.66. This was closely followed by treatment 4 (0.4%), treatment 3 (0.3%) in that order. The highest specific growth rate was obtained in fish fed diet 1 (0% Sesame inclusion) with the value of 2.57 and lowest in treatment 2 (1.65). There were significant differences in the treatments ($P > 0.05$). The Feed Conversion Ratio (FCR) recorded for fish fed diet 3 (2.67) was higher than those of diet 2 (2.50), 4 (1.78), and 1 (1.19). This high FCR may be due to the fact that catfish being an omnivore was able to utilize the FUSS at inclusion level of 25%. The Gross Feed Conversion Efficiency was highest in treatment 1 (30.51) followed by treatment 4 (18.89) then 3 (15.31) and 2 (13.89). The reason for this observation may be attributed to the inability of *Clarias gariepinus* to efficiently utilize the plant protein contained in sesame based diets. The Protein Efficiency Ratio recorded for fish fed diet 1 (0.69) was highest and closely followed by diet 4 (0.43), then diet 3 (0.35) and diet 2 (0.32). The disparity in the level of PER recorded could be attributed to the quality of protein in the diets because of the differently processed sesame seed inclusion. Gross Food Conversion Efficiency (GCFE) ranges from 30.51 in the treatment 1 to 13.89 in treatment 2. Protein intake was highest in treatment 3 (8.90) and lowest in treatment 4 (7.91). There was no significance difference from the means ($P > 0.05$) between treatments 1, 2, 3, and 4. The protein efficiency ratio (PER) ranged from 0.69 in diet 1 to 0.32 in diets 2. However,

there was no significant deviation from the means ($P < 0.05$) in treatment 4 and treatments 2 and 3, however treatment 1 was significantly (P 0.05) from the other sesame seed based diets.

Table 2: Proximate composition of the raw and differently fermented Sesame seeds

Parameters (%)	RAW	FUSS	FDSS	FPSS
Crude Protein	23.92	23.72	22.84	21.77
Fat	48.25	48.96	46.93	43.77
Crude fibre	11.10	10.30	7.0	8.70
Ash	6.20	5.70	4.4	4.95
Moisture	6.69	5.33	5.71	9.62
NFE	3.84	5.99	13.12	11.98
Tannin	0.066	0.056	0.035	0.024
Phytic acid	0.248	0.236	0.216	0.187 .

N/B: FUSS = Fermented Undehulled Sesame Seed, FDSS = Fermented Dehulled Sessame Seed, FPSS = Fermented Prepressed Sesame Seed.

Table 3: Proximate Composition of experimental diets (% Dry Weight)

Parameters (%)	1	2	3	4
Crude Protein	44.32	43.89	44.62	44.04
Fat	5.42	5.56	5.48	5.67
Crude fibre	3.25	3.17	3.40	3.33
Ash	15.00	15.16	14.86	15.24
Moisture	5.79	5.47	5.22	5.54
NFE	26.22	26.75	26.42	26.18

Table 4: Carcass Composition of experimental Fish before and after the feeding trials

Parameters (%)	Initial	1	2	3	4
Crude Protein	42.06	63.48	49.82	61.93	62.73
Fat	4.71	8.94	6.31	9.80	8.73
Crude fibre	1.00	1.10	1.27	1.16	1.12
Ash	9.14	13.28	11.1	13.07	12.97
Moisture	3.82	2.89	3.78	3.44	3.33
NFE	39.27	10.31	27.65	10.60	11.12

Table 5: Growth Performance and Nutrients Utilization of *Clarias gariepinus* fed with differently fermented sesame seed (*Sesame indicum*)

PARAMETER	1	2	3	4	Mean	SE±
Experiment periods (days)	56	56	56	56		
Number of fish stocked	10	10	10	10		
Mortality (%)	7	23	20	10		
Survive rate (%)	93	77	80	90		
Initial weight (g)	1.63^{a}	1.64^{a}	1.62	1.63^{a}	1.63	0.01
Final weight (g)	6.43^{c}	3.80^{b}	4.35^{a}	4.83^{a}	4.85	0.92
Mean weight gain	0.66^{c}	0.31^{a}	0.39^{a}	0.48^{b}	0.46	0.11
Mean weight gain per Day (g/day)	0.09^{c}	0.04^{b}	0.06^{ab}	0.07^{ac}	0.07	0.02
Total % weight gain (g)	333.94^{a}	153.54^{b}	189.06^{c}	232.87^{d}	224.86	56.8
Specific Growth rate	2.57^{d}	1.65^{b}	1.81^{c}	2.14^{a}	2.04	0.31
Feed Intake	2.61^{c}	1.52^{b}	1.87^{b}	2.09^{b}	2.02	0.11
Food Conversion Ratio	1.19^{a}	2.50^{b}	2.67^{c}	1.78^{d}	2.04	0.21
Gross Food Conversion Efficiency	30.51^{b}	13.89^{a}	15.31^{a}	18.89^{a}	19.65	4.35
Protein Intake	7.91^{a}	8.04^{a}	8.90^{a}	8.83^{a}	8.42	0.53
Protein Efficiency Ratio	0.69^{a}	0.32^{b}	0.35^{b}	0.43^{c}	0.45	0.14

Note: Values in the same row showing the same superscript are not significantly ($P > 0.05$) different.

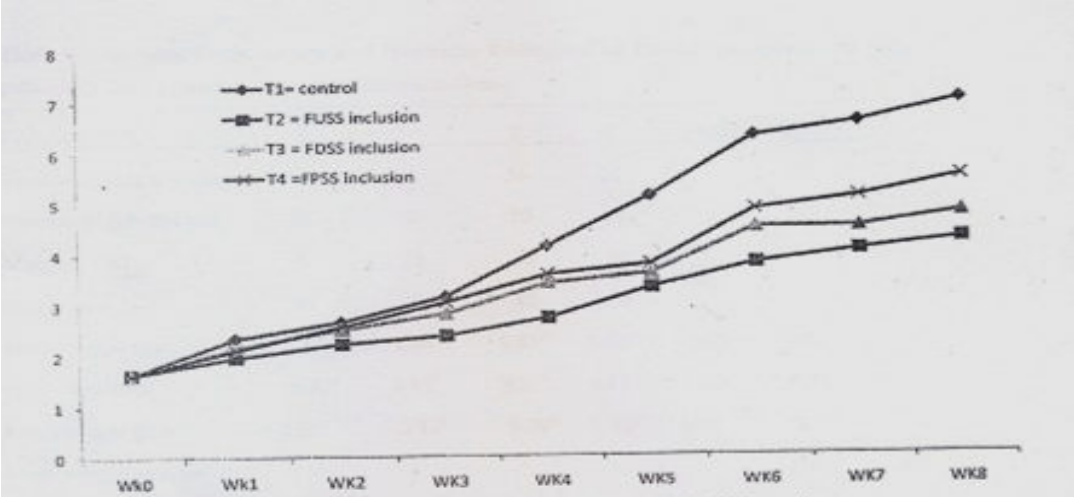

Figure 1: feed consumption of *Clarias gariepinus* fingerlings fed with different diets.

DISCUSSION

Removal of undesirable composition is essential for the enhancement and effective utilization of plant protein in animal feeds. Sesame seeds used for diet fermentation in this study were subjected to different types of processing methods to remove the detrimental components such as antinutritional factors. The anti-nutritional factor, tannin from sesame seeds was reduced in concentration from 0.006% to 0.056. 0.035, and 0.024% in FUSS, FDSS and FPSS respectively. Fermentation of the different processed raw sesame seeds included the Undehulled, Dehulled and Prepressed which resulted in the reduction of the phytic acid level from 0.248 (Raw) to 0.236, 0.216 and 0.187 respectively in the processed.

The carcass composition of experimental fish before and after the experiment showed generally, an increase in body protein, crude fat and ash content of fish at the end of the experiment. This study further revealed that experimental diets significantly influenced protein carcass composition. Fish fed diet 1 (0% sesame seed inclusion) had the highest protein content of 63.48% followed by those fed diet 4 (62.73%), diet 3 (61.93%) and diet 2 (49.82%). This is a reflection of the quality of protein in the diet in terms of amino acid composition and its availability to the fish as a result of the presence of the antinutritional factors.

Diet 1 with (0% sesame seed) had the optimum performance in terms of percentage weight gain, specific growth rate, food conversion and protein efficiency ratio, compared to FUSS, FDSS and FPSS diets when fed to *C. gariepinus* fingerlings. The inclusion of plant proteins has been noted to suppress growth in fish species like *C. gariepinus* (Balogun and Ologhobo, 1989 and Olukunle, 1996). Fish-fed diets containing FUSS exhibited low feed acceptance. The reason for low acceptance and consumption results from poor flavour and palatability of raw sesame seed meal (Olukunle, 1996). In addition, the poor performance of fish fed these diets was due to increasing level of anti-nutritional factor arising from the 25% inclusion level of the differently fermented sesame seeds. This is corroborated by the significant decrease and increase in fish SGR and FCR respectively observed in this experiment.

CONCLUSION AND RECOMMENDATION

The Growth Performance (GP) and Nutrient Unitilization (NU) of *C. gariepinus* fed with differently fermented sesame seeds were established in this study. Fermentation process using the local, traditional method was adopted to reduce the antinutritional factor present in the differently treated sesame seeds. The results of the fermentation process showed a significant decrease in tannin and phytic acid content in the treated seeds. It was evident at the end of 8 weeks feeding trial that inclusion of fermented undehulled sesame seeds (FUSS) caused poor GP and NU in the fish fed. However, the fermentation of further processed sesame seeds (Dehulled and Prepressed (FPSS) performed better when compared with other fermented seeds, due to the fact that pre-pressing of the seed further

reduced the concentration of the anti-nutritional factors present in these diets.

This study also provides basis for further research into a better processing method of removing the antinutritional factors by fermentation. Besides, the digestibility of the differently fermented seeds by omnivore like *Clarias gariepinus* should also be investigated while histopathology, serum biochemistry and haematology analyses should be carried out to investigate the assimilation of the nutrients contained in the fermented sesame seed. And also more feeding trial needs to be carried to determine the optimum inclusion level of the Fermented Prepressed Sesame seeds.

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