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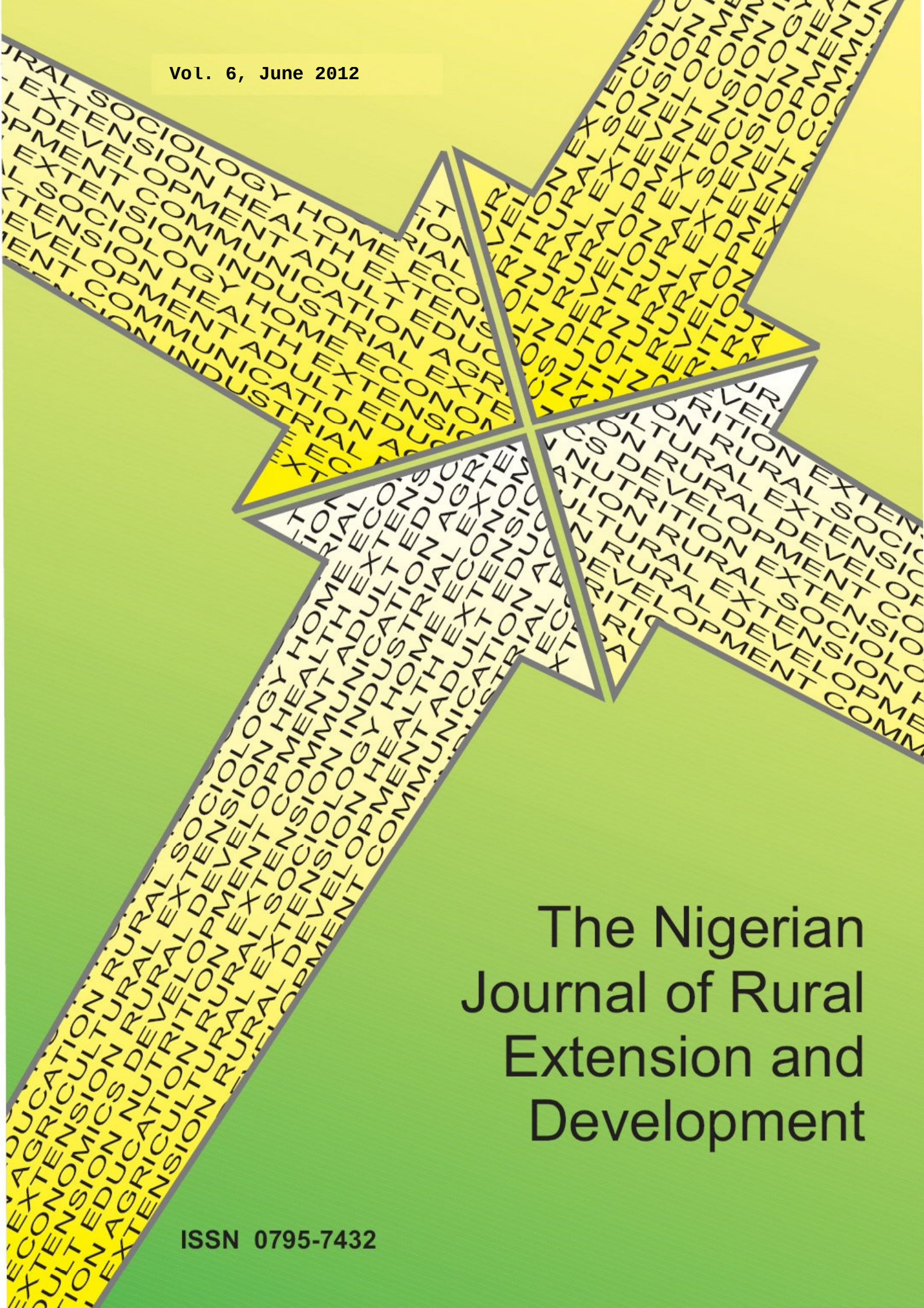

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Aims and Scope

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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Enhancing Stakeholders' Participation (Co-Management) Towards Achieving Ecosystem-Based Fisheries Management in The Nigerian Coastal Fisheries

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ABSTRACT

This paper highlights the importance of ecosystem-based fisheries management, importance of participatory fisheries management and discusses opportunities for the enhancement of participatory management towards achieving ecosystem-based fisheries management in the Nigerian coastal fisheries. The desire to move towards Ecosystem-Based Fisheries Management (EBFM) has been a common theme in fisheries policy and management discourse worldwide. Ecosystem Based Management (EBM) is a form of natural resource management that has grown consistently over the last two decades. It has emerged from the widespread feeling that traditional types of natural resource management have failed and that a new, more holistic way of understanding how ecosystems work is needed. Co-management systems have emerged over the years as a partnership arrangement using the capacities and interests of local resource users and complemented by the ability of government to provide enabling legislation, enforcement and conflict resolution mechanisms. The Nigerian coastal environment consists of rich and diverse ecosystems, natural resources and large human populations. Fishing is a major activity especially in the coastal areas where important resources such as fish, shellfish, such as shrimps, lobsters, crabs and molluscs are obtained. Successful implementation of Ecosystem approach to fisheries management will be highly beneficial to the economy and social well-being of the nation.

Keywords: *Ecosystem-based management, Co-management, Stakeholders, Fisheries management, Coastal fisheries.*

INTRODUCTION

Coastal communities especially in rural communities of Nigeria are highly dependent on natural resources for their livelihoods and well-being, making them highly vulnerable to the impacts of ecosystem degradation and natural resource depletion. This degradation is emphasized by population growth, urbanization, habitat degradation by spills and sand mining etc., fisheries depletion, public health and sanitation, lack of land use planning and coastal erosion.

The Ecosystem Approach to Fisheries (EAF) recommended by the Conference on Responsible Fisheries in the marine ecosystem held in Reykjavik in 2002 was adopted by the Food and Agriculture Organization (FAO) Committee on Fisheries in early 2003 (DOALOS, 2008). Ecosystem-Based Fishery Management (EBFM) is area-based, holistic, loosely cross-sectoral, focusing on habitats and ecosystem integrity as opposed to fisheries management that is sector-based, vertically integrated, focusing on target resource and people. Ecosystem-based management is an environmental management approach that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation.

The desire to move towards EBFM has been a common theme in fisheries policy and management discussions worldwide. Ecosystem based management is a form of natural resource management that has grown consistently over the last number of decades. It has emerged from the widespread feeling that traditional types of natural resource management have failed and that a new, more holistic way of understanding how ecosystems work is needed.

The basic concept of co-management recognizes that a natural resource can only be managed effectively with the co-operation and participation of the resource users in making laws and engaging in regulation work. Co-management or community based resource management is a "way of activating social processes at the community level in resource management"

(Pomeroy and Berkes, 1997). Co-management systems have emerged over the years as a partnership arrangement using the capacities and interests of local resource users and complemented by the ability of government to provide enabling legislation, enforcement and conflict resolution mechanisms. From the foregoing, the basic ingredients of co-management therefore, comprise the capacity and interests of the resource users and the capacity of government to provide legislative support for such action or intervention. "It takes two to tango" in a co-management arrangement (Pomeroy and Berkes, 1997). It is a game of two -largely between formal and informal institutions. Researchers have acknowledged that "failure of fisheries development policy can be attributed to a failure to recognise the range of stakeholders in fisheries, their characteristics and possible contributions to policy-making and implementation" . If co-management initiatives are to be successful while trying to achieve ecosystem based management of a nation's fisheries, basic issues of government legislation and policy to establish supportive legal rights and authority must be deliberately addressed.

The objectives of this paper are to; highlight the importance of ecosystem-based fisheries management; highlight the importance of stakeholder's participation in EAF and discuss opportunities for the enhancement of participatory management towards achieving ecosystem-based fisheries management in the Nigerian coastal fisheries.

Coastal Area of Nigeria

There are thirty six states in Nigeria and the coastal zone sprawls nine, namely, Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Lagos, Ogun, Ondo and Rivers. The coastal states are estimated to account for 25% of the national population. The coastal areas stretch inland for a distance of about 15km in Lagos in the west to about 150km in the Niger Delta and about 25km east of the Niger Delta. The coastline stretches for about 853km comprising inshore waters, coastal lagoons, estuaries and mangrove especially in the Niger Delta.

The Nigerian coastal environment consists of rich and diverse ecosystems, natural resources, and large human populations. The Nigerian coastal and marine area is a narrow strip of land bordered by the gulf of Guinea of the Central Eastern Atlantic in the South. The zone lies within the Atlantic Ocean with its continental shelf, the Exclusive Economic Zone and the coastal fresh water and brackish wet lands ramified by an atomising network of rivers and creeks. These water bodies are characterised by periodic tidal variations and ranges along water channels and the differences depend on the hydrological properties and slopes of the various channels (CEDA 1997). Fishing is a major activity especially in the coastal areas, important resources found in the areas are various species of fish, shellfish, such as shrimps, lobsters, crabs and molluscs.

In recent years the need for co-management in fisheries administration has been more widely recognized. Acknowledgement and the desirability for fisheries stakeholder groups to take part in the fisheries management process are evident in Nigeria through provision for a National Fisheries Advisory Council, but the fisheries resource-management process has been based on a centralized approach.

The Governments have formulated fisheries-development policy goals to maximize fish production at sustainable levels. These policies have always neglected existence of traditional fishing methods, probably because they are regarded as primitive and not able to meet demand for fish. The current situation is that there is no framework or structure for the co-management process in the country's fisheries management plan. No doubt, success in fisheries development and management would depend on the extent to which stakeholders have participated in the design and implementation of policies.

Equity in participation is therefore very weak in Nigeria's fisheries as many stakeholders are excluded from the various management and development processes. Ovie et al (2006) identified and characterized a host of stakeholders in the Nigerian inland fisheries (which is a typology of the coastal fisheries of Nigeria) and came with the following categories.

a) The primary stakeholders who comprises-fishers, processors, buyers and sellers.
b) The secondary stakeholders who comprises-transporters, retailers, ancillary actors and
c) The Tertiary stakeholders comprising the Department of Fisheries(DoF), National Planning Commission(NPC), Micro-finance Institutions(MFI), NGOs and traditional institutions.

Table 1 illustrates the fisheries policy development processes and stakeholder participation. The table reveals low level of

participation (high level of exclusion) for many key stakeholders in the fisheries especially those in the primary and secondary stakeholder groups. Evidences indicate that the FDF is the dominant actor and most times monopolise the processes to the exclusion of the other groups. Primary and secondary stakeholders are largely excluded except for the traditional institutions that have 'seized power' and carved a very strong niche for themselves in the areas of implementation and enforcement of fisheries rules and regulations at the community levels. The fishers also perform similar roles as the through their Community-Based Organisation (CBOs) or professional organisations (PO). The fisheries research institutions such as NIFFR (National Institute for Freshwater Fisheries Research) and NIOMR (Nigerian Institute of Ocean and Marine Research) are sometimes invited to participate in planning and design by the Federal Department of Fisheries (FDF) which is the apex fisheries policy-making government agency in Nigeria. The institutes participate in extension services as part of their mandates.

The primary and secondary stakeholders that represent primary users and whose livelihoods depend directly on the fisheries resources are almost totally excluded. Also, the bulk of the tertiary stakeholders such as the National planning, Commission (NPC), Micro-Finance Institutions (MFI) and very importantly the Traditional Institutions (TI) are excluded from participation. The reasons for inclusion, exclusion or marginalisation were, however, not due to gender, ethnicity, social or political considerations but by a share bureaucracy and long -time arrangement of government. The main actors are, therefore, restricted to staff of FDF but Federal Government Fisheries Research Institutions (eg. NIFFR NIOMR), one or two of Professors of fisheries from a University with a Fisheries Department and an NGO such as the Fisheries Society of Nigeria (FISON), are sometimes consulted to be part of the processes(Ovie and Raji, 2006).

It is in the interest of the resource and of all parties that there is establishment of clear, strong effort to develop co-management protocols that will give local stakeholders and their communities a genuine sense of proprietary interest and participation in setting management objectives, fishing plans and regulatory measures. For example in the Niger-delta area of Nigeria in particular the proactive energies of the youth could be turned to good use. Effective stewardship efforts by local communities in respect of fishing will have considerable impact on fisheries conservation.

TABLE 1
Fisheries Policy Development Processes and Stakeholder Participation in Nigeria

Stakeholders /Actors	Planning	Design	Implemen-Tation	Enforce-Ment	Evalua-Tion	Licensin g	Credit Deliver	Ext. Service
FDF	++	++	++	++	++	++	++	++
Fish. Inst.e.g. NIOMR	+	+	+ -	_	+ -	_	_	+
NGO e.g. FISON, NPC	+	+	-	_	+	_	_	+
MFI	-	-	-	-	-	-	+	-
Fishers and Fisher groups	-	-	+ -	+ -	-	_	+	_
Processors-	-	-	-	-	-	-	-	-
Fish Traders	-	-	-	-	-	-	-	-
Commission Agents	-	-	-	-	-	-	-	-
Transporters	-	-	-	-	-	-	-	-
Ancillary actors	-	-	-	-	-	-	-	-

++ = V. High participation; + = High participation; +- = Weak participation; - = No participation
Source: Adapted from Ovie et al ,2006

Importance of ecosystem approach to fisheries management

In the last two decades, all key international agreements adopted stress the need for the adoption of Ecosystem Approaches to Fisheries (EAF) particularly the 1995 FAO Code of Conduct for Responsible Fisheries. In 2001, political commitment formally materialized at the Reykjavik conference as 57 participating countries issued the Declaration on Responsible

Fisheries in the Marine Ecosystem which included a declaration of their intention to work on incorporating ecosystem considerations into fisheries management. The FAO Technical Guidelines (Garcia *et al*, 2003) on the ecosystem approach to fisheries define EAF as follows:

"An ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries."

The statement above addresses the need to cater both for human as well as ecosystem well-being. This implies conservation of ecosystem structures, processes and interactions through sustainable use. Inevitably, this will require considering a range of frequently conflicting objectives where the needed consensus may not be readily attained without equitable distribution of benefits. In general, the tools and techniques of EAF remain the same as those used in traditional fisheries management, but they will need to be applied in a manner that addresses the wider interactions between fisheries and the whole ecosystem. For example, catch and effort quotas, or gear design and restrictions, will be based not just on sustainable use of the target resources, but on their impacts on and implications for the whole ecosystem.

Benefits of ecosystem-based fisheries management

Establishing EBFM in the coastal fisheries of Nigeria will lead to healthier ecosystems which will invariably contribute improvement in fish stock abundance thereby increasing production of goods and services from aquatic ecosystems. There will be less habitat damage as there will be improved understanding of aquatic system as more attention will be given to fishing impacts on the environment. This will also reduce impact on threatened, endangered species and lower risk of stock or ecosystem collapse.

There will also be increase in benefits to fishers per fish caught as bigger fish from healthier environment will be caught. In the long term, catches will increase and increase contribution of fishery to the overall economy. In the long run there will be positive impacts on food supply in the country. EAF encourages better integration in management across fisheries, and with other aquatic uses. It brings about clear expression of management objectives leading to more efficient achievement of societal benefits. There will be better balancing of multiple objectives (due to a broadening of management attention) and better balancing of multiple uses leading to increased net societal benefits. More robust management due to broadening from conventional single-species tools to more integrated management approaches and improved compliance due to more 'buy-in' management, through better participation.

Other benefits include; reduced fishing costs (as EAF results in reduction of unwanted by-catch); increased net economic returns (EAF reduces fishing effort toward maximum economic yield); higher- value fishery (if increased availability of food to top predators increases stock sizes); greater livelihood opportunities for fishers (e.g. in tourism, if charismatic species abundances increase through EAF).

The synergistic positive effect of coordinated EAF across fisheries and/or nations will reduce conflicts as EAF processes deals effectively with inter-fishery and multiple sectoral issues.

The importance of stakeholders' participation in EAF

According to Garcia (2008), participation of stakeholders is used for their information and education, consultation and decision making. It has been generally agreed by several researches that without community participation, socio-ecological problems and their solutions cannot be defined in human relevant ways. This tends to reduce the relevance and legitimacy of policy initiatives (Chopra *et al*, 1989, Jentoft 2000, 2005, Hisschememoller *et al*, 2001; Guimaraes and Funtowocz, 2003; Wilson and Delaney, 2005 and UNU-IAS, 2006). Participation is promoted on the basis that it can improve stakeholders' ownership of the EAF process; relevance and legitimacy of politically and socio-economically difficult decisions, moral force and political influence of the actors; consensus and mobilization; knowledge of the functioning of sector and expectations, problems formulation and identification of solutions

Opportunities in the Nigerian coastal fisheries

Generally in fisheries science, stakeholders' participation, particularly in the scientific advisory process is limited. The participatory processes involve the use of instruments such as citizen panels, in depth groups, focus groups, actors' platforms, citizen juries, stakeholder analysis, participatory analysis, electronic public conferences and other modes of interaction

(Funtowicz, 2002, Engels, 2005), the difference between which are not always clear. In the fisheries arena, participation in decision making is usually agreed as necessary with degrees in stakeholders' decisional power depending on local culture and political system. Participation of stakeholders in the fishery advisory process takes many forms. These forms are opportunities to be enhanced in achieving ecosystem-based fisheries management in the Nigerian coastal fisheries. They include the following (adapted from Nauen and Hempel, 2011, Gracia, 2008);

- Promotion of integrated, interdisciplinary modes of pursuit of knowledge on aquatic ecosystems, their sustainability and balancing drivers, such as international trade, local employment, food security, wealth generation and distribution.
- Promotion of social awareness, including gender awareness and responsibility and connecting research to education, social and technological innovation.
- Promoting communication skills and novel ways of conducting research that connect social groups, citizen organizations with research process, thus increasing mutual understanding and chances research result uptake. Recent development of cheap communication technologies can enable voluntary collaboration of experts and non-experts in accumulating and validating information and has made global information within the reach of all.
- Promotion of policy dialogue among a wide range of actors to explore realistic transitions towards sustainable use and an enabling societal framework for science and general knowledge-intensive and locally contextualized approaches, including strengthening the capacity to take action.
- Promotion of transparency and accountability will be enhanced as all stakeholders were involved in decision making. These also ensure that actions and activities are implemented in a timely fashion.
- Appropriate and effective monitoring, control and surveillance regime will be promoted.
- Effective dispute resolution mechanisms will evolve naturally as stakeholders will tend to understand issues and action of other stakeholders.
- Contribution of raw data on the fishery without which fishery science would have probably never developed. Nigerian fisheries are probably by far the economic sector most hard-pressed for operational data, improvement are necessary and possible by involving stakeholders to willing contribute and not by compulsion.
- Contribution of informal knowledge on the fishery system, the ecosystem and the resources obtained by fishers through personal experience, intra-generational exchange of information, transmission by elders; etc. The aim of collecting such knowledge is the co-production of better strategic and operational knowledge that can be validated and integrated in 'best scientific evidence'. The difficulties are in: (1) obtaining, usually for free, knowledge which, most often, is part of the fishers' assets; and (ii) separating beliefs from facts and facts from empirical interpretation. In rapidly changing situations, e.g. in reaction to economic or climatic evolution, informal knowledge might be timely responses.
- Contribution of perceptions, values and expectations which may appear as more problematic to the hard scientist. They are evidently relevant in the decision making process in helping to identify the multiple interests (and objectives), perspectives and expectations to be accounted for in the decisions.
- Participation in modeling and scenario-building: through this, as well as through targeted interaction, stakeholders can contribute to the process of knowledge representation, issue-framing. Option identification and scenario building with the view to create common grounds for decisions, ex ante.
- Quality assurance: The concept, developed by social scientists is that of a process to ensure that the knowledge used to take decisions affecting livelihood in the coastal communities is both scientifically sound (through disciplinary peer review) understood and accepted, increasing decisions legitimacy and people's trust.

CONCLUSION

Evidence from various researches indicate that the concept of EAF and participatory planning, design and implementation of fisheries management systems is yet to be captured by government line ministries and Departments that assume primary responsibilities for developing and managing the Nigerian coastal fisheries.

EAF is as much about people and policy as it is about ecosystems. It is therefore essential that, from the outset planning for EAF is conducted in a consultative and transparent manner that allows interaction between stakeholders, managers and those providing scientific and other information. Involvement of stakeholders is very essential if EAF management plans are to be realistic, include the best available information and be likely to enjoy widespread support and credibility.

As the EAF recognizes the principles of sustainability and equity and through co-management/participatory management equity and social justice is sought. Equity and social justice is achieved through empowerment and active participation in planning and implementation of co-management.

The EAF is not a completely new start; it is a way of integrating what is being done under international and national obligations and commitment coherently and comprehensively.

Effective implementation of EAF will result in benefits, which may be ecological, economic, social and for it EAF to be sustained, it is essential that in planning and implementation phases, decision makers and all stakeholders are well aware of the benefits and costs of the management action proposed.

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Consumers' Perception and Willingness to Pay For Organic Leafy Vegetables in Akinyele Local Government Area of Oyo State

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ABSTRACT

The harmful effects of the use of agrochemicals and inorganic fertilizers on livestock, human beings among others have made developing countries including Nigeria to gradually move towards organic agriculture. Furthermore, food safety is steadily becoming an important issue the reason being that people desire to consume food free of chemical residues. This study was carried out to determine consumers' perception of organic leafy vegetables and their willingness to pay a premium for the organic leafy vegetables in Akinyele Local Government Area of Oyo State. Primary data was collected using a multistage sampling technique to collect data from 120 respondents using a structured questionnaire containing Contingency Valuation (CV) questions and other relevant variables. The Data were analyzed using descriptive statistics and logistic regression model. Result shows that 55 percent of the respondents were single, 43.3 percent were married. Most (83%) of the respondents were in their active working age. Logit model result showed that Bid price (1%) and household size (5%) significantly influence willingness to pay (WTP) for organic vegetable based on environmental benefit. Likewise, Bid price (1%), age (1%), years of formal education (5%), monthly income (5%) and being an artisan have significant effect on WTP for organic leafy vegetable based on health benefit. The estimates of mean WTP were ₦58.64 and ₦77.74 based on environmental and health benefits respectively. It was recommended that respondents' human capacity development should be enhanced while enlightenment programme to create proper awareness about organic leafy vegetables should be put in place.

Keywords: *Organic vegetables, Willingness to pay, Environmental benefit, Health benefit*

INTRODUCTION AND PROBLEM STATEMENT

Organic agriculture is a production system that sustains the health of soils, ecosystems and people. Organic agriculture relies on ecological processes, biodiversity and cycles adapted to local conditions to promote fair relationships and a good quality of life for all involved, rather than the use of inputs with adverse effects (IFOAM, 2009). Organic agriculture combines tradition, innovation and science to benefit the shared environment and recognition (Van Elzakker *et al.,* 2007). Organic farming is the form of agriculture that relies on methods such as crop rotation, green manures, animal manures, legumes, compost, biological pest control, crop residues, off farm organic wastes and a host of others that helps to maintain soil fertility and productivity, sustain ecosystems and reduce environmental pollution (Paull, 2011).

In Nigeria, about 70% of the population practices organic agriculture. A large number of small scale farmers in Nigeria practice organic agriculture by default because of the prohibitive costs of chemical fertilisers and other agrochemicals. These farmers are not touched by government policies on input supply and other incentives to optimize agricultural productivity (Adeoye, 2011). Organic agriculture can contribute to meaningful socioeconomic and ecologically sustainable development. It is therefore an advantage for the country to fully embrace the practice of organic agriculture to maximize profits of its agricultural exports in the world market.

Vegetables are edible plants or parts of a plant, but usually exclude seeds and are mostly sweet. This typically means the leaves, stems, fruits, bulbs or root of a plant. Leaf vegetables, also called potherbs, greens, vegetable greens, leafy greens or salad greens, are plant leaves eaten as a vegetable, sometimes accompanied by tender petioles and shoots. Some vegetables can be consumed raw, some may be eaten cooked, and some must be cooked in order to be edible. In essence, vegetables are crop plants that requires

little processing before they are eaten. Leafy vegetables are typically low in calories, low in fat, high in protein per calorie, high in dietary fibre, high in iron and calcium, vitamin A, vitamin B6 and very high in phyto-chemicals such as vitamin C, carotenoids, lutein, folate as well as vitamin K (Gruda, 2005). Organic leafy vegetables include vegetables like celosia, corchorus, amaranthus and telfaria amongst others.

According to Stanlake and Grant (1999), leafy vegetables have a high content of water and abundance of cellulose. The cellulose though not digested serves as a useful purpose in the intestine as roughage, thus promoting normal elimination of waste products. Vegetables are very important amongst the different foods produced and consumed because of their contribution to good health by providing inexpensive sources of minerals and vitamins needed to supplement people's diet which are mainly carbohydrates (Adedoyin *et al*, 1996).

Willingness to Pay (WTP) for a commodity is the amount of money a person would be willing to pay for higher level of quality. Willingness to pay is a measure of the resources individuals are willing and able to give up (for example) for a reduction in the probability of encountering a hazard that compromises their health (Golan and Kuchler, 1999). Alternatively, it can also be stated that WTP is the maximum amount of money an individual is willing to pay for a commodity; as such, WTP is an indicator of the value of the commodity to that individual. A theoretically correct measure of the value individuals attach to improvements in food safety is their 'WTP' for safer foods (Spencer, 1996). Willingness to pay (WTP) can also imply the maximum amount a person would be willing to pay, sacrifice or exchange in order to receive a good or to avoid something undesired, such as pollution, food contamination etc.

There is a growing demand for organic foods and more farmers are engaging in organic farming so as to meet the ever increasing demand. The growing demand may be because of consumer's belief that organic products are safe, superior in quality; taste better, has no harmful effects and a lot of other benefit unlike conventional products. However, in developing countries like Nigeria, consumers are less informed on the benefits of organic food as compared to other countries. Organic products can be said to be just emerging in the Nigerian market since only a few farmers are beginning to practice organic farming in Nigeria (Dipeolu *et al.,* 2009). On the other hand, there are still a considerable number of farmers involved in the local production of leafy vegetables which is widely known for its excessive use of agro chemicals. Demand for organic food products in the United States, Europe, and in other countries is growing rapidly, yet market shares remain quite small (Piyasiri and Ariyawardana 2002).

People generally demand for leafy vegetables because of consumer's belief of the potential nutritional and health benefits of vegetables. According to Dipeolu and Akinbode (2005), only very few farmers in Nigeria practice organic farming which means that many farmers make use of agro-chemicals for their production. This has posed food safety concerns to Nigerians and people residing in Oyo State are not left out because the use of agro-chemicals acts as a major source of health risk and a cause of extensive environmental damage. According to Lumpkin (2005), food safety is a major concern as vegetable farmers inappropriately use toxic pesticides at pre and post-harvest stages which threatens the health of the farmer and consumers as well as contaminates the environment. The study further asserted that pesticides are toxic pollutants that can and are spread by water, air and the food chain all over the world. Some can get in the blood and skin up to a point where a mother's breast milk will contain toxic compounds, which then weakens the immune system of the baby and consequently affects health negatively. In addition, given today's extensive use of pesticides, it is almost impossible for an individual to avoid daily exposure to low levels of several different pesticide residues. Researchers have found that there are possible adverse effects on human health arising from continuous long-term, low-level pesticide exposure or chronic exposure (Piyasiri *et al.,* 2002). The London Food Commission conducted a toxicological survey on active ingredients currently permitted for use by the United Kingdom pesticide manufacturers. The result of the survey showed that out of the 426 chemicals listed, 68 were carcinogenic, 61 were mutagenic and 35 have various reproductive effects, ranging from impotency to a variety of birth defects. In total, 40 per cent of the pesticides currently in use were linked with at least one adverse effect which is hazardous to human beings (Agrochemical, 2001). Also, the environmental damage that can be caused by agro-chemicals includes; Soil damage which results from the use of synthetic fertilizers in soils without a balanced addition of

organic materials to help with the formation of humus leading to soil compaction, soil erosion, degradation of soil quality, reduction in soil biological activities etc.

According to Barkley (2002), the production, distribution, and marketing of organic products are more expensive than conventional products because of the costs incurred in the segregation of organic products. Also, there are no visual distinctions between organic and conventionally produced food. Any product that is labelled and sold as "organic" must firstly, adhere to the regulations and meet the standards for the term "organic". Secondly, be kept separate from conventionally-produced food, and lastly, be "Certified" by a regulatory agency to ensure "truth in advertising." Each of these three processes (steps) of certification is expensive, leading to higher production costs and higher retail prices for organic food and consequently, final consumers may not have the financial ability to purchase them. In addition, Barkley (2002) argued that organic produce is characterized by low yield (and consequently) more expensive than the conventional ones due to avoidance of pesticides, chemical fertilizers and other inorganic inputs that would have enhanced the output. In essence, the cost of organic leafy vegetable will be higher than that of conventional food. It is thus important to determine if consumers are willing to pay an extra amount of money for organic leafy vegetables. Similarly, Belicka and Bleidere (2005) also reported that the cost of organic food is usually higher than conventional ones. Prices for organic food include costs of growing, harvesting, transportation and storage. They further asserted that the intensive management and labour used in organic production are frequently (though not always) more expensive than the chemicals routinely used on conventional farms.

Indiscriminate use of chemicals by local farmers in vegetable production has been a source of decline in food safety in Nigeria (Dipeolu *et al*., 2009). Most of the farmers do this so as to increase their income but this is usually at the detriment of consumers' health. Thus, to improve food safety in the country, farmers are being encouraged to participate in organic farming of leafy vegetables. Despite the efforts to improve food safety in the country through participation in organic farming of leafy vegetables, there is still a low perception about organic farming and its benefits amongst consumers, it is therefore imperative to find out consumer's perception and willingness to pay for these organic leafy vegetables.

The objective of this study is in two folds: first, to determine consumers' level of awareness of the benefits of organic vegetables; and second, to determine the factors that influences consumers' willingness to pay for organic leafy vegetables and estimate consumers mean willingness to pay.

METHODOLOGY

The study was carried out in Akinyele Local Government Area of Oyo state. Akinyele Local Government Area has its administrative headquarters located at Moniya, Ibadan.A multi-stage sampling technique was employed in selecting the respondents from the study area. The first stage involved the purposive selection of Akinyele Local Government based on high concentration of vegetable farmers who supply major markets and make use of organic farming techniques coupled with highly diversified consumers living in the local government. The second stage involved the use of random sampling technique to select three wards out of the total twelve wards in the local government area which represent the high, middle and low income groups. Respondents varied from government worker, trader, artisans, housewives, retiree to students. For the third stage, simple random sampling technique was used to select 120 respondents from the three selected wards. A structured questionnaire was used to collect the data from the respondents.

Contingent valuation question format proposed by Hanemann and Kanninen (1999) was adopted in this study. The respondents were asked if they were willing to pay a specific amount for the quality attributes of organic leafy vegetables. According to their answers, a follow up question was asked.

TECHNIQUES OF DATA ANALYSIS

Descriptive statistics such as percentages, mean, frequency distribution tables, standard deviations, minimum and maximum value were used to analyse socioeconomic characteristics and awareness of the benefits of organic leafy vegetables of the respondents. Likewise, contingent valuation method analyzed using logit model was used to determine the factors that influence consumers' willingness to pay for organic leafy vegetables. The logit model postulates the probability (Pi) that a consumer is either aware / willing to pay or not by predicting a

binary outcome (YES or NO). In this model, willingness to pay (the dependent variable) was specified as 1 if willing and 0 otherwise.

The logit model is specified following the one used to estimate willingness to pay for improved conservation of environmental species (Branka and Kelly, 2001). The coefficients estimated from this model were used to calculate the mean willingness to pay. Hence, the cumulative logistic distribution function is given by:

$$P_i = E(Y = 1 / X_i) = \frac{1}{1 + \ell^{-Z}} \quad \ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where Pi is a probability that Yi = 1. Its value ranges from 0 to 1, and it is assumed to be non-linearly related to Z.

Z which is assumed has values from - ∞ to + ∞, include linearly specified independent variables given by:

$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots\ldots\ldots \beta n Xn + Ut$ ……. 2

Yis dependent variable –Willingness to pay by respondents.

$X_i$is a set of independent variables

$ß_0$is the intercept which is a constant.

$ß_1, ß_2, ß_3 \ldots\ldots\ldots\ldots ßn,$is the coefficient of the selected variables that affects willingness to pay for organic leafy vegetables.

Ut is the error or disturbance term.

Where:

Y = Responses of consumers' willingness to pay (WTP) which is either "YES" or "NO"

X_1 = Bid (₦50, ₦80 and ₦100)

X_2 = Age of respondent (Years)

X_3 = Sex of respondent (Male = 1, Female = 0)

X_4 = Marital Status of respondents (Married =1, otherwise = 0)

X_5 = Household size of respondent (Headcount)

X_6 = Members of Family Working (Headcount)

X_7 = Number of years of Formal Education

X_8 = Monthly Income of respondents (₦)

X_9 = Amount Spent on Vegetables Monthly (₦)

X_{10} = Major occupation of respondents (Artisan = 1, otherwise =0)

X_{11} = Major occupation of respondents (Government Worker =1, otherwise = 0)

X_{12} = Major occupation of respondents (Trader = 1, otherwise = 0)

X_{13} = Major occupation of respondent (Unemployed = 1, otherwise = 0).

X_{14} = Perception about organic leafy vegetables (Yes =1, otherwise = 0)

RESULT AND DISCUSSION

The socioeconomic characteristics give the background information on the sampled respondents. The distribution of age of the respondents as shown in Table 1 reveals that most of the respondents (60%) were less than or equal to the age 30 years, 23.3 percent were between the age range of 31 – 45 years, 13.3 percent were within the age range of 46 – 60 years, while the remaining 3.3 percent were above or equal to 61 years of age. The mean age was 32.17 years. Similarly, Dipeolu *et al*., (2009) study also showed the mean age of the respondents to be 40 years. The implication of these findings is that majority of the respondents are in their active working age.

More than half of the respondents (62.5%) were male, whereas 37.5 percent were female. About 75.8 percent of the respondents were native of Oyo State while 24.2 percent werenon-native. This implies that majority of the respondents dwelling in the study area are indigenes of Oyo State. This is in line with the study of Dipeolu *et al.,* (2009) where majority of the respondents are mainly indigenes.

Moreover, 55 percent of the respondents were single, 43.3 percent were married, and 1.7 percent of the respondents were divorced. The result implies that both single and married are highly represented in the sample. This is contrary to the study of Dipeolu *et al.,* (2009) where 90.8 percent of the respondents were married. About 44.2 percent of the respondents had a household size of 5 or less, 50.8 percent had a household size within the range of 6 – 9, and 5percent of the respondents had at least or more than 10 members in their households. The average household size is approximately 6 persons per household.

TABLE 1
Socioeconomic Profile of the Respondents

		Frequency	Percentage	Others
Age	≤ 30 years	72	60.0	
	31- 45 years	28	23.3	
	46 – 60 years	16	13.3	
	≥ 61 years	4	3.3	
	Average			32.2
	Standard Deviation			13.7
Sex	Male	75	62.5	
	Female	45	37.5	
Nativity	Native	91	75.8	
	Non native	29	24.2	
Marital Status	Single	66	55.0	
	Married	52	43.3	
	Divorced	2	1.7	
Household size	≤ 5	53	44.2	
	6 to 9	61	50.8	
	≥10	6	5.0	
	Average			5.9
	Standard Deviation			2.1
Years in School	≤ 6	2	1.7	
	07 to 12	40	33.3	
	13 to 16	61	50.8	
	17 and Above	17	14.2	
	Average			13.8
	Standard Deviation			3.2
Primary Occupation	Artisan	12	10.0	
	Government Worker	30	25.0	
	Trader	20	16.7	
	Student	29	24.2	
	Private Worker	10	8.3	
	Retiree	8	6.7	
	House wife	11	9.2	

Source: Field Survey, 2012.

Findings as shown in Table 1 reveals that majority (65 percent) of the respondents had more than secondary education. The occupation distribution shows that majority(25%) of the sampled respondents were government workers. More so, that the sample was largely encompassing with respect to occupation.

Consumption and awareness about the health and environmental benefits of organic leafy vegetables

The average household consumption expenditure on vegetables per month was ₦811.50, while the minimum and maximum amounts were ₦50 and ₦500 respectively. Likewise, majority, 40 percent, of the respondent preferred to eat *cochorus* (*ewedu*),while fluted pumpkin (*Ugwu*)(11.7%) was least consumed leafy vegetable among the sampled respondents. This shows that majority of the respondents relish *cochorus* (*ewedu*) above other leafy vegetables.

TABLE 2
Consumption and Awareness Profile of Organic Vegetables

		Frequency	Percentage	Others
Amount (₦)	≤ 400	50	41.7	
	401 – 800	41	34.2	
	801 – 1200	12	10.0	
	≥ 1201	17	14.1	
	Total	120	100.0	
	Mean			811.5
	Standard Deviation			432.0
Leafy Vegetables	Celosia	35	29.2	
	Amaranthus/Tete	16	13.3	
	Cochorus/Ewedu	48	40.0	
	Fluted pumpkin/Ugwu	14	11.7	
	Others	7	5.8	
	Total	120	100	
Awareness of Health Benefit	Yes	98	81.7	
	No	22	18.3	
	Total	120	100	
Awareness of Environmental Benefit	Yes	89	74.2	
	No	31	25.8	
	Total	120	100.0	

Source: Field Survey, 2012.

From Table 2, it is evident that 81.7 percent of the respondents sampled were aware of the health benefits of consuming organic leafy vegetables while the remaining 18.3 percent were not aware of the health benefits of organic leafy vegetables. Basically, this means that majority of the respondents were aware of the health benefits associated with consuming organic leafy vegetables, however, there is a gap to fill as regards creating awareness in this regard. Furthermore, 74.2 percent of the respondents were aware of the environmental benefits of producing organic leafy vegetables while the remaining 25.8 percent were not aware at all. Comparatively, the respondents had more awareness of the health benefits of organic leafy vegetables than the environmental benefits.

Determinants of consumers' willingness to pay for organic leafy vegetables

Table 3 clearly presents the results of logit model for determinants of willingness to pay for organic leafy vegetables considering the environmental and health benefit attributes. The result of the diagnostic statistics of the two equations shows that with log likelihood ratio of 31.94 and 32.61 for health benefit and environmental benefit equations respectively, the model is significant and fit the economic situation under analysis.

Particularly, the result of the Logit model reveals that two and five coefficient estimates out of fourteen significantly influence respondents' willingness to pay for health and environmental benefit respectively. Specifically, Bids is significant at 1% and has a negative influence on the willingness to pay for organic leafy vegetables with respect to both benefits. That is as offer price for organic vegetable increases consumers' WTP decreases, hence their utility for organic leafy vegetables. However, the marginal estimate of the bids reveals that at the margin, likelihood of consumers' WTP decreases more for environmental benefit (1.3%) compared to health benefit (1%) with ₦1 increase in offer price of organic vegetable.

Household size is significant at 5% level and has a negative influence on WTP for environmental benefit provided by organic leafy vegetable production system. This shows that as household size increases, their WTP for organic leafy vegetables at the premium decreases as well.

Hence, a large household size does not encourage respondents' willingness to pay for organic leafy vegetables.

Also, age is significant at 1% and has a positive effect on willingness to pay for health benefit provided by organic leafy vegetables. This shows that an increase in the age of consumers encourage their willingness to pay for organic leafy vegetables and that the older the consumers are the more conscious they are of their health, hence their utility for organic leafy vegetables.

Years of formal education is significant at 5% and has a positive influence on the respondents' willingness to pay for health benefit in organic leafy vegetables. This implies that the more educated a respondent is, the more their willingness to pay for organic leafy vegetables because they easily understand the health benefits of organic leafy vegetables.

Monthly income is significant at 5% and has a negative relationship with WTP for organic leafy vegetables. This indicates that respondent's willingness to pay for organic leafy vegetables decreases as monthly income increases.

Lastly, having artisan as occupation is significant at 1% and has a positive relationship with willingness to pay for organic leafy vegetables. This implies that being an artisan encourages their WTP for organic leafy vegetables.

Following Krinsky and Robb (1986) procedure with 10,000 draw, we estimated mean willingness to pay (WTP) with respect to environmental and health benefits as shown in Table 3. The table reveals that consumers are willing to pay on the average ₦58.64 per kg of organic vegetable because of the environmental benefits and they are willing to pay on the average ₦77.74 per kg of organic vegetable because of the health benefits to be enjoyed. This implies that consumers have more preference for health benefit of organic vegetable than for environmental benefits.

TABLE 3
Logit model of respondents' willingness to pay for organic leafy vegetables

	Environmental Benefit			Health Benefit		
Variables	Coefficient	Std. Error	Marginal Effect	Coefficient	Std. Error	Marginal Effect
Bids (₦100 per Kg)	- 0.0443***	0.0132	-0.0109	- 0.0556***	0.0153	-0.0131
Age of Respondents	- 0.0244	0.0313	-0.0006	0.1040***	0.0369	0.0247
Sex	0.4660	0.5037	0.1128	- 0.7506	0.5126	-0.1724
Marital Status (Married)	- 0.5769	0.7509	-0.1397	-1.0995	0.7327	-0.2591
Household Size	- 0.3120**	0.1566	0.0765	0.07197	0.1526	0.0171
Members of Family Working	- 0.2966	0.2037	-0.0727	- 0.0739	0.2033	-0.0175
Years of formal education	0.0225	0.0838	0.0055	0.1762**	0.0949	0.0418
Monthly Income (₦'000)	- 0.0047	0.0100	- 0.0012	- 0.0401**	0.0158	- 0.0095
Expenditure on vegetables monthly (₦'000)	- 0.0200	0.2400	- 0.0061	0.2373	0.2518	0.0563
Artisan	0.6726	0.7913	0.1666	2.9401***	1.0561	0.4159
Government Worker	0.6849	0.7413	0.1691	- 0.1810	0.7761	-0.0433
Trader	0.9126	0.6752	0.2242	- 0.3951	0.6511	-0.0959
Unemployed	- 0.1353	0.8950	-0.0326	1.1292	0.8413	0.2264
Perception	- 0.0892	0.0582	-0.0219	- 0.0598	0.0580	-0.0142
Constant	2.6810	1.9708		0.9775	1.9939	
Mean WTP (₦)	58.64			77.74		
Number of Observations	120			120		
LR Chi^2 (14)	32.610			40.460		
Prob. > Chi^2	0.003			0.000		
Pseudo R^2	0.199			0.244		
Log Likelihood	- 65.516			- 62.799		

CONCLUSION

The results emanating from this study make two key contributions to economics of organic leafy vegetable marketing. First, it identifies that offer price, age, household size, years of formal education, monthly income and occupation of consumers are key determinants of consumers' willingness to pay for organic vegetables. Second, estimates of mean willingness to pay from the contingent valuation show that consumers are

willing to pay and are willing to pay as much as ₦77.74 per kg for the health benefits and ₦58.64 per kg for the environmental benefits. It can be adduced from the study therefore that there is a need to promote technology for organic vegetable production that will reduce its average cost of production per unit output. This is necessary since findings shows that the higher the price of organic leafy vegetables the lower the willingness to pay for it on the part of the respondents.

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Appraisal of the Involvement of Rural Women in Selected Food Crop Production in Umuahia North Local Government Area, Abia State, Nigeria

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ABSTRACT

This paper examines the involvement of rural women in selected food-crops production in Umuahia North Local Government area, Abia State, Nigeria. Data were raised with pre-tested questionnaire administered to 150 women farmers using multistage random sampling technique. Data generated were analyzed with descriptive (frequency count, percentages and means) and inferential (regression) statistical tools. The study revealed that 50.0% of the women farmers were within the age range of 41-50 years old; majority (68.0%) were married, 46.7% had basic education while 42.7% had household size of between 10-14 persons. Majority (60.0%) had over 10 years farming experience and over 90% had less than 3 hectares of farm-land. Specifically, they were small-scale farmers. The result also showed that majority of the women farmers cultivated selected food-crops (Cassava 98.7%; maize, 96.7% and cocoyam 80%). The farming activities the women were mostly involved in were processing, harvesting, weeding, storage, stumping, and planning. The women farmers were constrained with inadequate capital (98%); access to land (92.0%); inadequate extension services (88.)%); poor road network (72.0%); lack of storage facilities (66.0%) and incidence of pest and disease (60.0%). The result of the regression analysis shows household size, farm size and level of education were significantly related with the level of women involvement in food-crop production activities. It was recommended that provision of adequate capital, good road network, and farm land will increase women involvement in food-crop production.

Keywords: *Involvement, Rural women, Food-crop, Production*

INTRODUCTION

Over the years, international agencies have made efforts to internalize gender concerns in all development issues. The issue of women and food which has also received similar attention failed to bring expected results. The realization that the root of the problem lies in the gender discrimination prevalent in most developing countries is only now gaining credence (Ramachandran, 2008).

In Africa, women occupy two-third of the agricultural labour force and are actively involved in food-crop production (Spore, 2007). They bear near total responsibility for food processing and distribution, family health, nutrition and sanitation (Anaeto *et al,* 2008). They undertake the supervision of other economic activities such as vegetable gardening, raising chickens which are designed to increase their families' income and food resources (Ozo-Eson, 2002). Yet women are not given adequate support that will increase their agricultural productivity (Gladwin, 2000).

Notwithstanding their significant contributions in agriculture, women remained the least to benefit from agricultural extension services, credit, fertilizers, seeds and other input supplies while men control land, cash and decision-making remain their birth-right (IFPRI, 2000). Equally, rural women are wrongly classified as economically "inactive" in agricultural operations hence agricultural extension services do not attach much importance in reaching women farmers and are thus rejected. This neglect of women could be viewed from the fact that most extension agents are men and lack basic understanding of women's position in the rural area (Edoka, 2008).

Furthermore, increasing migration by men from rural to urban areas has left a growing number of de-facto women household heads who are struggling to eke out a living and ensure food

security for their families without access to credit, farm technology and extension services (FAO, 2002). In general, African Conventional wisdom believes that men make key farm production decision not women; hence women's neglect (Ezike *et al,* 2008). Moreover, women's limited access to production resources and insufficient credit are products of inter-related social economic and cultural factor that forced them into a subordinate role, to the detriment of their own development and that of the society (Ramachandran, 2008).

Efforts have been made by successive administration to revitalize agriculture in Nigeria. Such efforts include the National Accelerated Food Production Programme launched in 1975; Operation Feed the Nation of 1976 and the Green Revolution of 1979 to mention but a few. It is worthy of mentioning that these efforts were designed such that only the male farmers were at advantage in terms of resource allocation and contact with extension agents.

The study therefore was designed to determine the socio-economic factors that affected women involvement in food-crop farming, the specific food crops grown by women farmers and the constraints encountered by women farmers in food-crop production.

Objectives of the study

The general objectives of the study was to appraise the involvement of rural women in selected food crops production in Umuahia north L.G.A. in Abia State.

Specifically, the study was designed to:

i. describe the socio-economic characteristics of women involved in selected food-crop production in the study area.
ii. determine specific food crops cultivated by women in the area
iii. ascertain the level of women involvement in some selected food-crops (cassava, cocoyam and maize) production activities
iv. ascertain constraints facing rural women in food-crop farming.

METHODOLOGY

The study was carried out in Umuahia North Local Government Area, Abia State. It lies between latitude 5^0 30^1 and 5^0 40^1 north of the equator and latitude 7^0 25^1 and 7^0 32^1 East of Greenwich Meridian. The LGA has a total land area of about 432,290 sq km with a land mass of about 220,660 people (National Population Census, 2006).

It has a total annual rainfall range of between 2000-2500 mm, an average annual temperature of 27^0Cand Relative humidity range from between 80-90% in the wet season (National Root Crop Research Institute, 2002).

The choice of Umuahia north L.G.A. was because of its intensive agricultural activities clearly noticeable within the communities. This is induced by the rich soil which span through the LGA. The agricultural activities carried out are mostly in semi-subsistence level. The farmers cultivate both food crops and cash crops. They also keep livestock such as poultry, goat and sheep.

The major food crops grown are cassava; maize, cocoyam; yam; three-leafed yam; groundnut and vegetables. Cash crops cultivated include oil palm, cocoa and rubber. Fruit-trees include citrus; breadfruit and so on. There exists network of tarred and untarred roads that link the communities with the Local Government Headquarters and so make accessibility very easy.

Multistage random sampling technique was employed in the selection of the respondents (women) for this study. Firstly, the population was divided into two zones, namely Ohuhu Clan, zone (A) and Ibeku Clan, zone (B). In each clan, five (5) blocks representing five communities were randomly selected, giving a total of ten blocks (10 blocks) which represents ten communities. The second stage involved random selection of fifteen (15) women farmers from each block. This gave a sample size of one hundred and fifty (150) respondents used for the study. Data for the study were collected from the respondents through the use of pre-tested structured interview schedule. Data were analyzed using frequency counts, percentages, means and multiple regressions.

RESULTS AND DISCUSSION

Demographic characteristics of women farmers

Table 1 reveals that 50% of the women farmers were within the age range 41 -50 years old while 26.7% of them were between 31 – 40 years of age. Those that fell within 51 and above years, and 21 – 30 years accounted for 16.7% and 6.7% respectively. Thus the farmers are old and should be able to make rational decision with respect to food crop production. This finding corroborates the expression of Onumadu (2009) that an average woman farmer in Umuahia north L.G.A is old. Also, 68.0% were married, 20.0% were widowed while 6.7% and 5.4% were single

and divorced respectively. This implies that married women are more involved in food crop production and this could be as a result of more responsibilities they are saddled with as married women who have responsibility for the provision of household needs for their families. About 46.7% of the respondents were literate with secondary education while 20.0% had no formal education. Since many have basic education it might help the farmers to understand the need to adopt improved agronomic practices. According to Ebii (2000) with education, the age-long conservative attitudes of farmers are easily broken. Table 1 further shows that 42.7% of the respondents had household size of between 10 to 14 persons, while 2.7% had between 15 members and above. Household composition constitutes an important variable in agricultural activities. This is because the available labour force is directly obtained from it. The household members might be ready source of labour for farm work (Chinaka, 2004). This may be explained by the simple reason that larger households sizes have readily available labour for agricultural activities than smaller household. The women that have larger household size, however, need to increase their agricultural productivity to meet up with the consumption need of the family.

Majority (60.0%) of the women had farming experience of 10 years and above while 3.3% had farming experience of between 1 to 3 years. Farmers who have stayed long in the system are better equipped to adopt changes and can process information better than beginners. Such farmers are cautious in trying out innovations especially when it has not been demonstrated convincingly. Anijah-Obi (2001) corroborated this in her study that longer year of farming experience helps the women farmers to make rational choices and decisions. Again, majority (94.0%) of the respondents had farm size less than 3 hectares. This is an indication that the women are small-scale land holders and consequently subsistent and resource-poor-farmers. This could be attributed to the fact that Nigerian cultures do not permit women free access to and control over land (Edoka, 2008). More so, Nigerian farmers generally have small holdings. The result merely confirmed the observation of Onumadu (2009) that farmers generally have small-holdings.

TABLE 1
Distribution of respondents according to demographic characteristics N=150

Characteristics	Frequency	Percentage
Age (Years)		
21-30	10	6.67
31-40	40	26.67
41-50	75	50.00
51 and above	25	16.67
Marital Status		
Single	10	6.67
Married	102	68.00
Divorced	8	5.38
Widowed	30	20.00
Education		
No formal education	30	20.00
Primary education	40	26.67
Secondary education	70	46.67
Tertiary education	10	6.67
Household Size		
1-4	30	20.00
5-9	52	34.67
10-14	64	42.67
15 and above	4	2.67
Farming Experience		
1-3	5	3.33
4-6	15	10.00
15 and above	90	60.0
Farm Size (hectares)		
Below 3	141	94.00
3-5	7	4.67
6-9	2	1.33
10 and above	0	0.00

Source: Field survey, 2009.

Food crops cultivated by women farmers

Table 2 shows that majority was involved in cassava (98.7%) and maize (96.75) production respectively. Also, majority were involved in Cocoyam (80.0%) and Vegetable (80.0%) farming while plantain, three-leafed yam and African beans were 73.3%, 65.3% and 53.3% respectively. The result conforms with the findings of Okafor *et al* (2006) that tagged some crops as "women crops" because of the level and preference exhibited in the cultivation of such crops by women. FAO (2002) attributed preferences of such crops by women to such factors as low-labour requirement and early maturity. This implies too that those food crops might have advantages over other crops. A common denominator is that each has added values. For example, cassava is processed into garri, tapioca, cakes, fufu and flour; maize is eaten by men in various forms (pap, flakes, boiled and eaten) and also fed to livestock. While cocoyam is used for food by man and livestock,

ornamental, commercial, export and industrial purposes (Onumadu, 2009).

TABLE 2
Percentage distribution of women farmers based on food crops cultivated

Food crops	Frequency	Percentage
Cassava	148	98.7
Cocoyam	120	80.0
Three-leafed yam	98	65.3
African beans	80	53.3
Sweet Potato	60	40.0
Yam	60	40.0
Maize	145	96.7
Plantain	110	75.3
Rice	54	36.0
Vegetables	120	80.0

Source: Field Survey, 2009.
** Multiple choice responses

Table 3 shows high level involvement of women in food-crop production activities. The farming activities the women were mostly involved were processing, 2.89 mean score; harvesting, 2.87 mean score; weeding, 2.83 mean score; storage, 2.62 mean score; stumping, 2.53 mean score and planting, 2.33 mean score. While farming activities the women are not too involved in ridging with mean score of 1.87; fertilizer application, 1.80 mean score and land clearing, 1.67 mean score. This agrees with Banji, *et al*, (2005) findings that African women are responsible for 100% of the work in food processing and 60% in marketing. In a related study, Edoka (2008) reported 94.4% women are involved in processing/marketing, while 55.6 are involved in harvesting. This study also observed very low scores for women involvement in such farm activities as land clearing, ridging and fertilizer application.

TABLE 3
Distribution of respondents based on level of involvement in crops production activities.

Activity	Always practiced	Occasionally practiced	Do not practice	RTRS	Mean (x)
Land clearing	90(20)	80(26.67)	80(53.33)	250	1.67
Stumping	270(60)	100(33.33)	10(6.67)	380	2.53
Ridging	120(26.67)	100(33.33)	60940.00)	280	1.87
Weeding	390(86.67)	30(10.00)	05(3.33)	425	2.83
Fertilizer application	114(25.330	90(30.00)	76(44.67)	271	1.80
Harvesting	405(90.00)	20(6.67)	05(3.33)	430	2.87
Processing	411(91.33)	20(6.67)	03(2.00)	434	2.89
Storage	327(72.67)	50(16.67)	16(10.67)	293	2.62
Marketing	330(73.330	60(20.00)	10(6.67)	400	2.67

Source: Field survey, 2009. Figures in parenthesis are percentages

RTRS – Respondents Total Raw Score

Information in table 4 highlights the constraints encountered by women farmers in food-crop production in the study area. Over (98%) complained of inadequate capital while 92.0%, 88.0% and 72.0% were constrained by free access to land, inadequate extension services and poor road network respectively. Other constraints prompted by women farmers include lack of storage facilities (66.0%) and incidence of pest and disease (60%). Chale (2001) reported that lack of access to credit, land and inadequate contact with extension agents constituted major constraints to agricultural production by women in Nigeria. While Adebayo (2003) implicated inadequate capital which made it difficult for women to engage extra-labour, purchase necessary farm inputs and tools for increased production. By and large, the above-mentioned constraints have been the bane of agricultural production in Nigeria.

TABLE 4
Constraints encountered by women in food-crop production

Constraints	Frequency	Percentage
No free access to land	138	92.0
Lack of storage/ preservation facilities	99	66.0
Inadequate capital	147	98.7
Poor social amenities like roads	108	72.0
Incidence of pest and disease	90	60.0
Inadequate extension services	132	88.0

Source: field Survey, 2009.
*Multiple Choice Responses Recorded

Data available in table 5 indicates that four functional forms were linear, semi-log, double-log and exponential function was chosen as the lead equation on the basis of having the highest values of coefficient of multiple determinations (R_2), highest F-ration and highest number of significant variables. The exponential result is therefore used for discussion.

The multiple determination (R_2) value as produced by the exponential function was 0.6300. this implies that about 63% of variation in the women's involvement in food-crop production activities is accounted for by joint actions of other variables not included. The F-ratio (4.48) was significant at p=0.01 indicating that the model gave a good fit to the data.

The coefficient of household size (X_2) was negative but significant at p=0.01. This implies an inverse relationship of household size to women involvement in food-crop production activities. This indicates that the more the household size, the less the involvement of women in food-crop activities. This may be attributed to the fact that as the household size increases, resources that would otherwise be used for farming activities are channeled to the upkeep and training of the young members of the family who may be in school or undergoing artisan training. The result is in disagreement with the expectation that larger household size have more readily available labor and hence positively relates to farming activities. This validated the work of Jiriko (2008) in which household size was found to be negative and significantly related to women and food crop production.

The coefficient of the farm size (X_3) was positive and significant at p=0.01. This showed a direct relationship with involvement of women in food-crop production. This means that the level of women involvement in food-crop activities increase too. Therefore, any adverse effect on farm size will also adversely affect the women's food production activities.

Coefficient of the level of education (X_3) was significant at p=0.01 and positively related to women involvement in food crop production. This implies that as level of education increased, the involvement of women in food-crop production activities increased. This could be attributed to the fact that education increases the level of human development and capacity (Ekumankama and Izuogu, 2008). The result agrees with the findings that higher literacy level increased the chances of adoption which enhances involvement in food-crop production (Abdulwahab, 2008).

The coefficient of age and farming experience were found to be non-significant at p=0.01 in the study. The implication is that the variables of age and farming experience have no influence or contributions towards the level of involvement of women in food-crop production activities.

In sum, the regression results showed that the variables: household size and level of education have significant relationship with the level of women involvement in food-crop production activities.

TABLE 5
Ordinary Least Square (OLS) regression analysis of the influences of socio-economic variables and women involvement in food-crop production activities

Variables	Linear	Exponential	Double log	Semi-log
Constant	27.468(23.56)***	3.326(64.11)***	3.5059(25.39)***	31.142(10.04)***
X_1 (Age)	0.0018(0.17)	.0000(0.09)	-.0263-(0.83)	-.5015(-1.189)
X_3 (Farm size)	0019(0019)	.3825(2.97)**	-.0006(-0.0.03)	.03940(0.09)
X_4 (Farming experience)	-.1010(-1.20)	-.0048(-1.31)	-.0256(-1.12)	-.5151(-1.00)
X_5 (Level of Education)	-.1541(2.76)***	.0069(2.80)***	-.0002(-.05)	-.8565(-2.95)***
R_2	0.4093	0.6300	0.2063	0.5344
Adj R_2	0.3377	0.5784	0.1749	0.4829
F – ratio	3.46***	4.48***	3.38***	3.31***

Source: Field Survey, 2009 The numbers in parenthesis are the t-ratios
***= significant at 1% level, ***=significant at 5% level

CONCLUSION

From the results of this study, it was concluded that the women farmers are old, majority are married, under half basic education, and household size of 10 to 14 persons. The study also found that majority of the women farmers have over 10 years farming experience and farm lands less than three hectares respectively.

Majority cultivated cassava, maize, cocoyam and vegetables. Farming activities the women were mostly involved in are processing, harvesting, weeding, marketing, storage, stumping and

planting. The women however, were not much involved in ridging, fertilizer application and land clearing.

Major constraints faced by the women in food-crop production include lack of access to land, lack of storage facilities, inadequate capital, poor social amenities, incidence of pest and disease and inadequate extension services.

The regression results showed that the variables: household and farm size as well as level of education correlated significantly with the level of women involvement in food-crop production activities. It was recommended that the removal of these constraints will drastically increase women involvement in food-crops production beyond the selected food-crops they cultivate presently.

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Training Needs of Youth Leaders in Egor, Ikpoba-Okha and Oredo Local Government Areas of Edo State, Nigeria

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ABSTRACT

The study examined training needs of youth leaders in Ikpoba-Okha, Egor and Oredo Local Government Areas of Edo State. One Hundred and twenty youth leaders randomly drawn from selected youth organizations were used as study respondents. Structured questionnaire and interview schedule were used to obtain data on respondents' personal characteristics, participation in and retraining in leadership skills. Data were analysed using frequency counts, percentages, mean, standard deviation, Pearson Product Moment Correlation (PPMC) at p= 0.05. Findings show that most of the youth leaders were males (56.7%), singles (68.3%) while 31.7% were within the age bracket 18 -25 years and holders of OND/NCE (30.0%). Training needs were expressed as highly required in motivating other youths ($\bar{x}$=3.25), promotion of community service ($\bar{x}$=3.05) and discussion of current issues ($\bar{x}$=3.18). Youths leadership training needs showed significant positive relationship with family size(r=0.23) and educational level (r=0.29). Capacity building for the youth leaders in identified areas should be done by relevant government youth development agencies. The need to develop youth leadership in income generating activities, agriculture and home management was also recommended.

Keywords: *Leadership, Training, Youths*

INTRODUCTION AND PROBLEM STATEMENT

Youths are assets to any society because of the need for continuity and self sustenance. About 25% of Nigerian population is youths within the age range of 19-40 years (Otor and Ejembi, 2005). The population of Nigerian youths from the 2006 population census using age bracket of 15-30 and going by the National Youth Service Corps (NYSC) limits is about 60 million. They are the agile, inquisitive, mobile and the potential resource for sustainable development of any nation. They develop interest in various careers and aspire to take over from the older generations. Oloruntoba,(2002) asserts that youths in all countries are both a major human resource for development and key agents for social change, economic development and technological innovations.

Various rural and urban youths organizations exist through which the youths are empowered by governmental and nongovernmental organizations (NGOs). Youth clubs or organizations also exist at community, local government, state and national levels. Leadership is provided among the members. This aids learning and their individual and corporate development by participating in club meetings, serving as officer, leaders of committee, appearing on programmes and competing in contests, hence preparing them for action in the society.

Leadership is the act of influencing people to cooperate towards the achievement of goals (Ekong, 2005). A leader is a harmonizer, planner, spokesman, educator, represent group ideals and also as described by Otor and Ejembi (2005) a "servant of the group''. This involves qualities/attributes such as boldness, initiative, empathy, knowledge, leadership skills among others. Aims of youth organizations according to Otor and Ejembi (2005) could be classified into educational, economic, social and recreational. These require good leaders to guide the process by which the aims are achieved.

In recognition of the importance of youths and their leadership in national development, relevant skills to improve their effectiveness need to be identified and improved upon to ensure they gain the interest and cooperation of members. The training and guidance of youths in various programmes in the community is vested in various leaders including school teachers, religious leaders, and extension workers and several others who should be in regular contact with the youths.

Leadership is one of these skills that must be practiced to be mastered. Good leadership involves planning ahead, and seeing what needs to be done. It

has to do with how to motivate others, helping others, to work as a team, and putting aside your own want in order to help the team to function properly. Any club will provide leadership opportunities, but having a good leader to watch and learn from requires leadership skill. A good leader will help others learn how to lead, and can give tips and skills that can be put into practice.

Training is the process of acquiring specific skills to perform a job better. It is an educational process for the provision of knowledge and skills to bring about desired changes in attitude in order to improve the competence of the trainee. The end product is the development of innate leadership and managerial ability, intellectual understanding of the technical know-how of the management situation (Okpere, 1990). Training helps people to become qualified and proficient in doing some jobs. An effective training demands that all stakeholders should be committed and supportive to the realization of the goal. It is expected to commence with the identification of training needs.

A need is defined as an inclusion term to embrace drives, impulses, goal set, urges, motives, cravings, desires, wants and wishes (Oladoja 1994). To make training relevant, the needs must be identified which is the gap between what is and what ought to be. Training need exists when there is a gap between what is required of a person to perform his job competently and what he actually knows. It is affirmed that training needs have to be determined before training programmes can be relevant, so that real needs of trainees can be met Oyedele (2001). The gap according to Oloruntoba (2002) include gaps in knowledge, skill, attitude and behaviour. Youth programmes are educational processes aimed at developing these.

Youth development programming involves youth leadership programmes that offers young people opportunities to participate actively in the planning, decision-making and implementation of the programme in which they participate. It focuses on experiential learning or learning by doing, it is also an important element of leadership development. This kind of learning blends participation in the experience with opportunities to share, discuss, process relevant thoughts and feelings and generalizes these into principles and guidelines for living and apply what has been learned to other situation (Boyd, 2001).

Certain knowledge, skills and attitudes are necessary for effective service as a volunteer youth leader in a rural youth programme. In most cases only few youth volunteer leader possess all the qualities of effective leadership. Leadership training can provide leaders with the opportunity to learn more about their roles and increase and capacity development or effective leadership. This study is therefore undertaken to analyse the form and content of leadership training programme needed by youth leaders in Egor, Ikpoba-Okha and Oredo Local Government Areas of Edo state.

Objectives of the study

The general objective of the study was to assess the training needs of youth organizational leaders in Egor, Ikpoba-Okha and Oredo Local government Areas of Edo state. The specific objectives were to:

i) examine the socio-economic characteristics of the respondents;
ii) identify the youth leadership activities implemented among the organizations;
iii) examine the level of participation of youths in the activities;
iv) identify the leadership training needs of the respondents

METHODOLOGY

The study was carried out in Egor, Oredo and Ikpoba-Okha Local Government Areas (LGAs) of Edo state all located in Edo south geopolitical zone. Edo state is made up of 18 LGAs. Oredo, Egor, Ikpoba-Okha local government areas comprised 12, 10 and 10 wards respectively. The main occupations of the people in these local government areas are farming, trading and civil service. The study focuses on leadership training needs of youth located in Egor, Ikpoba-Okha and Oredo LGAs. Two (2) wards were randomly selected from each local government area. From each ward, 20 youth leaders of various youth organizations under the umbrella of the National Youth Council of Nigeria (NYCN) which is the apex body of all youth organizations were selected by a simple random process for the study. This gives a total of 120 youth leaders who were respondents in this study. Primary data were collected using well structured questionnaire and interview schedule. Variables measured included respondents' socio-economic characteristics; youth leadership activities implemented among the organizations, level of participation of youth leaders in leadership activities and the leadership training needs of the respondents. A list of activities (24) was presented to respondents to select which of the activities youth leaders engaged themselves. Participation of youth leaders in leadership activities was measured as very low(1), low (2), high (3) and very high (4). A mean ≥ 2.5 implies high participation and mean < 2.5 is low participation. The leadership training needs of youth leaders was assessed by asking respondents to indicate leadership activities they require training in and was operationalised as highly needed (3), needed (2), just needed (1) not needed (0). Data

were analysed using frequency counts, percentages, mean, standard deviation and Pearson Product Moment Correlation (PPMC) at p=0.05.

RESULT AND DISCUSSION

Socio-economic characteristics of respondents

Data in Table 1 shows that most of the respondents were males (56.7%), single (68.3%) while about one third had OND/NCE (30.0 %) and were between the age group of 18-25 years (31.7%). Also, 56.7% were Christians and indigenes (21.7%) of the study areas. Only 11.7% were engaged in full time farming while civil servants, teachers and traders were 28.3%, 21.7% and 8.3% respectively. .

As shown in Table 1, youth leaders in the study area were males, single being very young in age and majority of them were holders of either OND or NCE certificates. Those married among them, had a modal family size of between 1 and 5 members per household. The youth leaders had low interest in agriculture as more than half (58.3%) of them were employed in non-agricultural occupations such as civil service (28.3%), teaching (21.7%) and trading (8.3%) and with only 11.7% of them engaged in full time farming.

Membership of youth organizations

As shown in Table 2, majority of the youths who were involved in leadership activities belonged to the Red Cross society (35.0%), followed by the Scout Association (20%) and least for the Girl's Brigade (1.7%). This is an indication that the female youths are not actively involved in leadership activities.

Participation of youths in leadership development activities implemented

Table 3 highlights the youth leadership activities and their level of participation. The youths were involved in all the leadership activities. However, their participation in communication, planning and implementation activities was generally low. On the other hand, youth leaders' participation in provision of support activities was high except the participation in attending monthly meetings to discuss current issues that affect youth ($\bar{x}$=2.28) and participation in community activities ($\bar{x}$=2.30). The highest level of youth leaders' participation was observed with motivating other youth ($\bar{x}$=3.00) and mobilizing other youths with mean score 3.0 and the lowest level of participation was in participation in agricultural extension trainings ($\bar{x}$ = 1.13).

TABLE 1
Frequency and percentage distribution of respondents by personal characteristics (n=120)

Personal characteristics	Freq	Percentage
Sex		
Male	68	56.7
Female	52	43.3
Marital Status		
No response	4	3.3
Single	82	68.3
Married	28	23.3
Divorced	6	5.0
Age		
< 20 yrs	36	30.0
18-25 yrs	39	31.7
26-33 yrs	26	21.7
34-40 yrs	18	15.0
No response	2	1.7
Educational level		
No formal education	6	5.0
Primary school	8	6.7
JSCE	12	10,0
SSCE	22	18.3
OND/NCE	36	30.0
HND/Degree	24	20.0
No response	12	10.0
Family size		
1-5	62	51.7
6-10	32	26.7
>10	12	10.0
No response	14	11.6
Occupation		
Full time farming	14	11.7
Civil Servant	34	28.3
Teaching	26	21.7
Trading	10	8.3
No response	36	30.0
Religion		
Islam	4	3.3
Christianity	26	21.7
Traditional	68	56.7
Religion	22	18.4

TABLE 2
Distribution of youth leaders according to membership of youth organizations

Youth organization	Freq.	Percentage
Red cross	42	35.0
Scout association	24	20.0
Man O' war	10	8.3
Anglican	8	6.7
Youth Catholic	4	3.4
Youth Baptize	6	5.0
Youth Christian Fellowship	10	8.3
Boys brigade of Nigeria	4	3.4
Girls brigade of Nigeria	2	1.7
Auxiliary youth	4	3.3
Regal ambassador youth	6	5.0
Total	120	100.0

TABLE 3
Mean distribution of youths' participation in leadership development activities.

Leadership activities	Mean	S.D	Remark
Communication activities			
Effectively Communicating decision to others	2.32	0.887	Low
Offering support to others	2.33	0.892	Low
Providing input and feedback to the community programme	2.33	0.889	Low
Openness in discussing current issues in the community one's action and attitude toward others	2.18	1.092	Low
Planning and implementation activities			
promoting community service	2.15	0.766	Low
Reviewing grant proposals	2.23	0.766	Low
Making funding decisions	2.13	0.900	Low
Display of specific skills	2.27	0.877	Low
Influencing and motivating one's peer	2.23	0.827	Low
Accessible to others youth and interest adults	2.35	0.868	Low
Making healthy choice for oneself and encouraging those choice in others	2.38	0.989	Low
Participation in agricultural extension trainings	1.13	1.031	Low
Provision of support services to local government administration			
Attending monthly meetings to discuss current issues that affect youth	2.28	0.972	Low
Observe local officials when performing their duties	2.57	1.027	High
Helping the less fortunate/privileged	2.67	1.079	High
Fund raising for charity for kids	2.67	1.079	High
Promoting other kinds of community service	2.67	1.125	High
Human Resource Development	2.75	1.045	High
Mobilizing other youths	3.00	1.130	High
Human relation	2.97	1.069	High
Motivating other youths	3.00	1.037	High
Participation in community activities	2.30	1.435	Low

However, on the basis of the standard deviation scores, there were fewer variations in the level of participation in communication, planning and implementation leadership activities than they were with provision of support services to local government administration. Generally, youth leaders engage more in community development and human relations and involving other youths in most of their programmes. However, in most cases youth participation in any activity has been reported to depend on the importance they attach to the activities**.**

Training needs of youths in leadership activities:

As shown in Table 4, training needs were expressed in virtually all the activities except agricultural extension training activities with mean score of 1.16. The most highly needed training was indicated for motivating other youths (mean=3.27)

while no desire for training was expressed for agricultural extension training activities. The standard deviation figures particularly express the fact that leadership skills gaps exist among the youth leaders in the study area. This ranking could be linked with the result on Table 3 in which youth leaders participated more in youth motivation activities. The training needs desired by the youth leaders reflect the fact that motivating other youth will require communication skills and competence that are needed to be developed through training. If the training needs are addressed, the leadership activities have the potential to bring about youth development, peer influence, socialization and change in youths in the study area.

Relationships between the socio-economic characteristics and training needs of respondents:

Correlation analysis results showing the relationship between the socio-economic characteristics of respondents and their training needs are as presented in Table 5. The results reveal that out of six independent variables studied, two variables exhibited positive significant relationship with desire for re-training in communication, planning, implementation and provision of support services leadership skills activities. The results show that education had positive and significant relationship with communication ($r=0.290$; $p<0.05$), planning and implementation ($r=0.259$; $p<0.01$) and provision of support services ($r=0.255$; $p< 0.05$) leadership skills activities. Family size had positive and significant relationship with communication leadership training needs of respondents. These findings imply that the more educated youth leaders in addition to ability to read and write, the greater the opportunities to actively participate in leadership activities in the community. Also, the youth leaders maintaining large families have higher leadership sense of responsibilities than those with small families.

TABLE 4
Mean distribution of youth leaders by training needs in leadership activities.

Leadership activities	Mean	S.D	Remark
Communication activities			
Effectively Communicating decision to others	2.97	0.879	Needed
Offering support to others	2.88	1.070	Needed
Providing input and feedback to the community programme	2.75	1.031	Needed
Openness in discussing current issues in the community one's action and attitude toward others	2.95	1.076	Needed
Planning and implementation activities			
promoting community service	3.05	0.924	Needed
Reviewing grant proposals	3.10	1.095	Needed
Making funding decisions	3.12	1.039	Needed
Display of specific skills	3.08	1.134	Needed
Influencing and motivating one's peer	2.95	0.942	Needed
Accessible to others youth and interest adults	2.85	1.050	Needed
Making healthy choice for oneself and encouraging those choice in others	2.95	0.942	Needed
Participation in agricultural extension trainings	1.16	0.913	Not needed
Provision of support services to local government administration			
Attending monthly meetings to discuss current issues that affect youth	3.18	0.900	Needed
Observe local officials when performing their duties	2.85	0.913	Needed
Helping the less fortunate/privileged	2.98	0.907	Needed
Fund raising for charity for kids	3.09	0.863	Needed
Promoting other kinds of community service	3.19	0.846	Needed
Human Resource Development	3.13	0.913	Needed
Mobilizing other youths	3.15	1.038	Needed
Human relation	3.15	1.038	Needed
Motivating other youths	3.27	0.900	Needed
Participation in community activities	2.97	0.879	Needed

Mean ≥ 2.5 training is needed and mean < 2.5 training is not needed.

TABLE 5
Correlation analysis results showing relationship between respondents' personal characteristics and leadership training needs.

Personal characteristics	Youth leadership activities		
	Communication skills (r)	Planning and implementation activities (r)	Provision of support services to local government administration (r)
Age	0.021	0.021	0.005
Education	0.290*	0.259**	0.255*
Family size	0.235*	0.137	0.248

*significant at 5% level; **significant at 1% level.

CONCLUSION AND RECOMMENDATIONS

The findings of the study show that youth leaders in the study area had low interest in agriculture. Majority of the youths who were involved in leadership activities belonged to the Red Cross Society. The youth leaders were more interested participating in leadership activities connected with community development activities than agriculture-related activities. Training needs were expressed by the youth leaders in virtually all the activities except agricultural extension training activities and they were willing to receive more training that will enhance their competences. Based on the study findings and conclusions, the following recommendations are made:

1. There is a compelling need to encourage youth leaders in the study area to take up leadership roles in agricultural production activities. This is necessitated by the fact that aging is setting in for the current crop of farmers, hence the need to transfer responsibilities to younger ones becomes imperative.
2. To fill the leadership skills gaps among the youth leaders in the study area, arrangements should be put in place by relevant youth development agencies to organize leadership training workshops and seminars on a regular basis for the general youth in the study area.

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Influence of Socio-Economic Characteristics on The Use of Information Communication Technologies (Icts) in Income Generation Among Small Ruminants' Farmers in Kaduna State

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ABSTRACT

The study was carried out to determine income generation among small ruminant farmers in Kaduna State. The data for the study was obtained through use of structured questionnaires administered to 141 small ruminant farmers in Kudan, Ikara and Giwa local government areas of Kaduna State. The Local Government Areas were purposively selected due to their involvement in small ruminants' production. Socio-economic characteristics of the small ruminants farmers were analyzed using descriptive statistics and the result showed that about 68% of the farmers were male with a mean age of 41 years and mean income of ₦33,534. Radio, television and mobile phone were the ICTs mostly used by farmers to source information. Regression analysis reveals that the factors which contributed significantly to income were household size and years of keeping small ruminants, while radio contributed negatively to the farmers' income. It is recommended that extension workers should intensify information dissemination on rabbit's production techniques to encourage farmers into production and marketing of rabbits. Funds should be provided for extension agencies to enable them air more radio and television programmes. Collaboration between agricultural extension agencies and education extension services should be established to promote adult education and computer education.

Keywords: *ICT, Small ruminant farmers, Income*

INTRODUCTION

Effective information delivery makes any extension organization achieve its objectives of reaching its clients with adequate information that can stimulate an increase in their productivity thereby leading to economic development through an increase in the nation's Gross Domestic Product (GDP).Information and Communication Technologies are technologies which facilitate communication and thus, the processing and transmission of information electronically (Technical Centre for Agricultural and Rural Cooperation (CTA), 2003).The Information and Communication Technology (ICT) has been evolving over time with new technologies of communicating information to the receiver. Different kinds of ICT technologies have been used to reach out to people e.g. megaphone, radio, television, telephone (land and mobile), projector, internet and satellite. The development process in the world today heavily relies on the use of the ICTs by all sectors of the economy. In agriculture, Information and Communication Technology (ICT) constitutes part of the medium through which information is delivered to farmers.

According to Lawal-Adebowale (2008), integration of the telephony system, particularly the mobile phone, is of high value for effecting prompt exchange of agricultural information and feedback on accessed information between the extension workers, farmers, and researchers. Arokoyo (2003) also observed that no matter how much extension is done by the Village Extension Agent, it is neither efficient nor cheaper for a

developing country like Nigeria having a population of about 150 million with 70-80% who are involved in agriculture and are illiterate to operate without the use of ICTs. The extension services therefore must be appropriately supported with the use of ICTs.

Small Ruminant farmers are those farmers who keep and produce any number of sheep, goats and rabbits. Small ruminant production as practiced in Nigeria is mostly on a small scale in both urban and rural areas where farmers engage in production for economic and meat purposes. Researchers and extension workers therefore have to rely on the use of ICTs in the process of disseminating information to small ruminant farmers. Most Nigeria farmers engaged in livestock farming keep a greater percentage of small ruminants as compared to large ruminant. Adesehinwa *et al.* (2004) stated in their study on socio-economic characteristics of ruminant livestock farmers and their production constraints in some parts of South-western Nigeriathat 40% of the farmers reared both sheep and goats while 29% reared only goats, 19% reared cattle, 7% only sheep but 3% reared cattle and goats while 2% had both cattle and sheep on their farm.Ajala (2004) also forwarded that small ruminants have been reported to form an integral part of the cultural life and farming system of Nigeria's peasantry. Nigeria has a high percentage of its population as farmers living in rural areas, yet farmers find it difficult to obtain information on agricultural development with the decreasing ratio between extension agent and farmers. The need to direct research to areas where information can be shared easily, cheaper and faster electronically in today's world being a global village through the use of ICTs has become acceptable. This study ascertained influence of socio-economic characteristics on the use of ICTs among small ruminant farmers in Kaduna state with the following objectives:

i. describe the socio-economic characteristics of small ruminant farmers in the study area;
ii. identify different ICT sources of information used by small ruminant farmers in the study area
iii. determine the socio-economic characteristics influencing the use of ICTs among small ruminant farmers in the study area.

METHODOLOGY

This study was conducted in Kaduna State A multi-stage sampling procedure was employed for this study. In the first stage, Maigana Zone, one of four Agricultural Development Project Zones in Kaduna State, was purposively selected for the study, the selection was based on its prominent position in small ruminant production. In the second stage, three Local Government Areas: Kudan, Ikara and Giwa were randomly selected from the seven Local Government Areas that make up Maigana zone of the ADP. In the third stage, three villages were purposively selected from each of the Local Government Areas based on their high involvement in small ruminants production. In Kudan, Kada-Kada, Kyaudai and Likoro villages were selected. In Ikara, Pala, Kurmi-Kogi and Gimbawa were the villages selected; while the villages selected in Giwa were Karau-karau, Shika and Mararaba-guga. The estimated population of farm families in the three selected villages in Giwa, Ikara and Kudan local government areas is 1413, (KADP, 2001). In all, a total of 141 small ruminant farmers were randomly selected for this study, representing 10% of the population size. In carrying out this study, primary and secondary data were used. The primary data were obtained by interview schedule method. Data were collected on the socio-economic characteristics of the small ruminant farmers such as age, marital status, sex, educational level, small ruminants keeping experience, number of extension contacts, access to credit and number of small ruminants kept. Data were also collected on which of the ICTs used and the number of times the ICTs are used in a week. The ICTs measured are radio, television, landline phone, mobile phone, computer, projector, video, television satellite and megaphone. Descriptive statistics such as frequency and mean were used to achieve objectives one and two while regression analysis was used to achieve objective three.

RESULT AND DISCUSSION

Small ruminant farmers' socioeconomic characteristics

The finding in table 1 indicates that 68.1% of the small ruminant farmers were males and about 32% of them were females. By implication therefore, there are more male involved in small ruminant keeping in the study area with a mean age of about 42 years. Information on table 1 also reveals that about 90.8% of the respondents were married while 63.1% of them were heads of households with majority (about 72%) of them having a household size of more than 6 persons. The small ruminant farmers had annual mean income of ₦33, 534

with 54.6% earning ₦25, 000.00 and below while 26.2% of the farmers earned between ₦25,001-₦50,000. The value of the mode income of the farmers is ₦20, 000. The result of the analysis shows that 35% of the farmers indicated that small ruminant farming is their major source of income. Analysis on table 1 indicates that 36.2% of the small ruminant farmers kept only sheep, 33.3% kept only goats, 29.8% keep mixed flock while 0.7% kept rabbit.

TABLE 1
Socio-economic characteristics of small ruminant farmers (n = 141)

Variable	Freq.	Percent	Mean
Sex			
Male	96	68.1	
Female	45	31.9	
Ages (Years)			
0 – 2	9	6.4	
21 – 40	53	37.6	
41 – 60	75	53.2	41.60
61 and above	4	2.8	
Size of Household			
1 – 5	39	27.7	
6 – 10	61	43.2	9.22
11 – 15	21	14.9	
16 – 20	16	11.4	
21 and above	4	2.8	
Income from Small Ruminant Farming in Naira			
0 – 25,000	77	54.6	
25,001 – 50,000	39	26.2	33,534
50,001 – 75,000	11	7.8	
75,001 – 100,000	11	7.8	
100,001 – 150,000	5	3.5	
Head of Household			
Yes	89	63.1	
No	52	36.9	
Small Ruminant Kept			
Sheep	51	36.2	
Goat	47	33.3	
Sheep and Goat	42	29.8	
Rabbit	1	0.7	

Ownership of ICTs by small ruminant farmers

The finding on table 2 reveals that radio was the ICT mostly owned (61.3%) by the small ruminant farmers. Radio showed a very high rate of ownership among the small ruminant farmers. This is followed by mobile phone(17.2%), television(16.1%) and video (4.4%). The finding agree with Mwakaje (2010) that out of 200 farmers, 84.5% owned radio as the major ICT, whereas 36% and 1.5% of the farmers owned phone and television respectively.

TABLE 2
Distribution of small ruminant farmers by ownership of ICTs

Variable	Frequency*	Percent
Radio	125	61.3
Television	33	16.1
Landline	0	0
Mobile phone	35	17.2
Computer	1	0.5
Projector	1	0.5
Video	9	4.4
Satellite	0	0
Megaphone	0	0

* Multiple responses. n> 141

Small ruminant farmers' usage of ICTs to acquire agricultural information

According to the information in table 3 about 32% of the small ruminant farmers used radio once a week, 33.3% of them used radio twice a week and 25.5% used radio thrice a week, while 5% of the farmers reported that they used their radio to listen to agricultural programmesfour times a week. This finding agrees with the World Bank (2004) report which indicated that radio ranked most used information technology in Nigeria. Table 3 also reveals that about 24% of the small ruminant farmers used television to watch agricultural programmes while 22.0% used television once a week and 2.1% of the farmers used television two times in a week. This may be due to the cost of purchase of a television set and the unavailability of electricity in the study area to power the television sets. The table further revealed that about 11% of the small ruminant farmers use mobile phone once a week, 0.7% of them use the mobile phone twice a week, 0.7% of them use the mobile phone thrice a week while 1.4% of the small ruminant farmers use the mobile phone four times a week to obtain information from the extension workers, fellow farmers on issues affecting production, health or marketing of small ruminants. A cursory look at the table shows that 0.7% farmers used video once a week and another 0.7% of the farmers used video twice a week. Analysis also showed that less than 1% the small ruminant farmers used computer and projector once a week. The small ruminant farmers do not use any of landline phone, television satellite and megaphone. This might be due to total lack of ownership of these ICTs by the small ruminant farmers as shown in Table 3. In a study of three agricultural zones in Benue State, Odiaka (2010) stated that 83.3% of the farmers in zone "A" use radio, about 81% in zone "B", 80% in zone "C". About 21.4% of the

farmers in zone "A" use television, 33.0% of the farmers in zone "B" and 39.7% in zone "C" and also mobile phone usage in zone "A" are used by 76.2%, in zone "B" 47.7% and 55.1% in zone "C"of the farmers use mobile telephone. The largest increase in the use of ICT has been in mobile telephone where subscriptions in developing countries increased from about 30% of the world total in 2000 to more than 50% in 2004 and to almost 70% in 2007 (Cieslikowsk *etal*., 2009). Kefela (2010) argued that 80% of the households in Africa use the mobile phones. Information on table 3 also shows that about 14% of the farmers use mobile phone to access information on small ruminants. This incidence of low level of use among small ruminant farmers does not agree with Odiaka (2010) that farmers' usage of mobile phone in Benue state Zone "A" was 76.2%, in Zone "B" 47.7% and 55.1% in Zone "C" who indicated that farmers have a good percent of usage.

TABLE 3
Distribution of small ruminant farmers according to usage of ICTs to acquire agricultural information (n = 141)

Weekly	Frequency	Percent
Radio		
Once	45	31.9
Twice	47	33.3
Thrice	36	25.5
Four	7	5.0
Don't use	6	4.3
Television		
Once	31	22.0
Twice	3	2.1
Don't use	107	75.9
Landline		
Don't use	141	100.0
Mobile phone		
Once	16	11.3
Twice	1	0.7
Thrice	1	0.7
Four	2	1.4
Don't use	121	85.9
Computer		
Once	1	0.7
Don't use	140	99.3
Projector		
Once	1	0.7
Don't use	140	99.3
Video		
Once	1	0.7
Twice	1	0.7
Don't use	139	98.6
Satellite		
Don't use	141	100.0
Megaphone		
Don't use	141	100.0

Socio-economic characteristics influencing the use of ICTs among small ruminant farmers

The third objective was to determine the socio-economic characteristics influencing the use of ICTs among small ruminant farmers. The regression result as shown in table 4reveals that R value is 0.68 with the R^2 value at 0.462 and adjusted R^2 of 0.42 indicating that all the independent variables considered for regression are significantly related to the dependent variable. R value indicates that 68% relationship existed between the dependent variable (income of small ruminant) and independent variables. The adjusted R^2 indicates that 42% of the independent variable contributes to the dependent variable (income of small ruminant). The semi log regression model:

$$Y = \text{Log } Y = \beta_o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \ldots\ldots\ldots + \beta_8XX_8 + U$$

which gave the best result was used for analysis. The result shown in table 4 indicates the eight independent variables used in the regression analysis as household size, small ruminant farmers years of keeping experience, age of small ruminant farmers, educational level of farmers, number of access to extension workers, number of use of radio in year, number of use of television in a year and number of yearly access to satellite. However, three variables (household size, years of keeping experience and number of use of radio) contribute significantly to income of the small ruminant farmers.

Household Size

The household size contributes significantly towards income of small ruminant farmers as shown in table 4 with 0.007 level of significance which is within the 0.01 (1%) level of significance with a positive coefficient of 0.250. This indicates that as household size increases the income increases as well. The socio-religious background of the indigenous people in the study area who are predominantly farmers allows one man to marry as many as four wives without limitation in the number of children he is expected to have. This desire for many children might be a factor that leads these farmers into keeping small ruminants as they require to sell these animals whenever the need arises.

Some farmers keep small ruminants for meat purpose or for use during festive period like Sallah or Christmas while others might be for income generation to supplement family income whenever there are emergencies within the family such as paying for medical bills when a family

member needs medical services, payment of school fees by parents who are from low socio-economic backgrounds or mothers who keep small ruminants, may decide to sell their animals rather than have their children stay at home instead of schooling. These further explained why the income (value) increases simultaneously because it is expected that the larger the family size the more the investment on small ruminant keeping. Ajala and Gefu (2003), asserted that larger households possess more readily labour supply for small ruminant production activities than smaller households. Adesehinwa *et al.* (2004), agreed in their study on small ruminant farmers that 38% of the farmers claimed that religious festivals and social ceremonies (e.g. marriages, naming ceremony) has an effect in motivating them to increase their production as they make more profit selling the animals during festive periods. Budak *et al.* (2005), found that 57% of the farmers keeping small ruminants indicated that their main reason of keeping small ruminants was for cash income to meet up the household demand. Ajala (2004) also agreed that "emergency cash source is the major factor motivating farmers into ruminant production" which serves as a savings to those who keep the animals.

Years of experience in keeping small ruminant

Small ruminant farmers keeping experience contributes significantly towards income generation in keeping small ruminants with 0.001 significance as shown in table 4 which is within the 0.01 (1%) level of significance with a positive coefficient of 0.355. As it is often said "experience is the best teacher", this also shows that with increase in small ruminant keeping experience, household income also increases. Another reason may be due to increase in live birth of the small ruminant over the years and the ability of the farmers to take care of the young animal to maturity stage, thereby reducing mortality rate, could also lead to increase in income to the farmers. Table 1 indicates a mean year of about 11 years of keeping small ruminants while the mean age of the farmers is about 42 years. This is an indication that small ruminant keepers are mainly adult.

Use of radio

Use of radio as shown in table 4 contributes significantly towards income of small ruminant farmers with 0.011 level of significance which is within the 0.01 (1%) level of significance with a negative coefficient of -0.196. This revealed that as radio is used the income reduces or the income increases with a decrease in the use of radio. This indicates that the negative relationships might be as a result of the long term effect on income as a result of the information used from radio or farmers might not find the immediate information derived from the use of radio on small ruminant farming very interesting or helpful.

Information obtained by the farmers might not be properly understood by them, hence, they cannot use the technology to keep their animals or increase their production which might result in the farmers loss of interest in the information obtained but rely on the experience they acquired over the years, despite the fact that Arokoyo (2011) stated that to date, radio has been one of the major ICTs used in agricultural extension delivery in Nigeria. The problem of frequent breakages in transmission during broadcast of agricultural programmes as stated by farmers during data collection from Radio Nigeria Kaduna which could lead to loss of vital technical information that can help farmers to improve their production. Maru (2005) asserted that radio is suitable for learning in rural communities provided the reception is not problematic.

The negative relationship that existed between income and radio as shown in the negative coefficient of -0.196 in table 4 might be due to the fact that communication through the radio is one-way and audio which does not give the farmers opportunity to see the demonstrations made by the Extension Worker, thereby limiting their understanding of the techniques involved in the new technology to be adopted. Maru (2005) agreed that radio lacks visuals and are usually used for one-way communication. Inadequate finance, might contribute greatly to the negative relationship that existed between income and radio since most of the farmers listen to radio programmes, they might not be financially capable to purchase items needed to adopt the technology.

Age of farmers

Age of the farmers did not significantly contribute to the income as shown in table 4 where age is at 0.282 level of significant which is not significant at either 1% or 5% level of significance with a positive coefficient of 0.106. This might be due to the fact that majority of the farmers about 97.2% are still in there active ages as shown in table 1 indicating that the farmers are active to engage in other energy demanding

activities or other occupation as their major occupations which demand their time.

Educational level

Educational background measured in years spent in schooling is not significant to income as shown in table 4 with a value of 0.170 of significance which is not significant at either 1% or 5% level of significance with a negative coefficient of -0.110. This might be due to the fact that 44% of the farmers lack western education and therefore their education does not contribute to income. The result shows that about 28% of the farmers attained primary education. The low rate of education among the farmers might result in lack of understanding of the technical issues discussed which will result in low productivity and thereby reduce income.

Extension visit

Extension visit did not contribute significantly to income of the small ruminant farmers as shown in table 4 with 0.647 of significance which is not significant at either 1% or 5% level of significance with a negative coefficient of -0.039. Most of the extension workers' visits to farmers might be to discuss crop agriculture rather than discuss animal agriculture. Findings shows that most of the small ruminant farmers do not take to small ruminant farming as a major occupation but rather take to crop farming and other occupations which do not need the service of extension workers visits like civil service, trading and artisans.

Use of television

The use of television did not contribute significantly to income of the small farmers as shown in table 4 with a value of 0.472 of significance which is not significant at either 1% or 5% level of significance with a positive coefficient of 0.064. This implies that a large proportion of small ruminant farmers are not using television. This might be as a result of the cost of purchase of the television set and the cost of purchasing generator and fuel to obtain electricity to power the television set. Most of the communities involved in the study are rural and without electricity and those with electricity are experiencing unstable power supply such as preventing them from participating or listening to agricultural programme aired at a particular time.

Use of mobile phone

Use of mobile phone did not contribute significantly to income of the small ruminant farmers as shown in table 4 with a value of 0.490 of significance which is not significant at either 1% or 5% level of significance with a negative coefficient of 0.051. Majority of the farmers are aware of mobile phone but only 14.1% of the small ruminant farmers make use of it to make enquiries about their animals. This might be as a result of weak coverage of mobile networks, server failures by mobile network providers, inadequate resources by the small ruminant farmers to buy the pre-paid recharge card to recharge their phones or to pay for fuel for their generators to charge the batteries of their phones whenever the power goes down.

TABLE 4
Effect of the use of ICT on income among small ruminant farmers

Variable	Unstandardized Coefficient		Standardized Co-efficient	T	Sig
	B	Standard Error	Beta		
Constant	4.491	0.076		59.306	0.000
Age	0.002	0.002	0.106	1.080	0.282
Household Size	0.012	0.004	0.250	2.729	0.007*
Education	-0.005	0.004	-0.110	-1.379	0.170
Years of keeping small ruminant	0.010	0.003	0.355	3.476	0.001*
Extension Visit	0.000	0.000	-0.039	-0.459	0.647
Use of Radio	0.000	0.000	-0.196	-2.577	0.011*
Use of Television	0.001	0.001	0.064	0.721	0.472
Use of Mobile phone	0.000	0.001	-0.051	-0.692	0.490
F = 14.187					0.000
R = 0.68					
R^2 = 0.462					
Adjusted R^2 = 0.42					

*Regression is significant at 0.01 (1%) Level

CONCLUSION AND RECOMMENDATION

Based on the findings from this study, the following conclusions have been reached:

In this study we conclude that majority of the farmers are above 40 years of age and most of the farmers earn ₦50,000 and below. Small ruminant farmers' low usage of mobile phone, internet, computer to source for information was due to their low level of education, income and their old ages. The independent variables are significantly related to the dependent variable and contribute 42% to the income of small ruminants. However, household size, years of keeping experience and number of yearly use of radio contribute significantly to the income of the small ruminant farmers.

Based on the findings from this study, the following recommendations are proffered:

1. Extension workers should intensify information dissemination on rabbits farming techniques to encourage farmers into production and marketing of rabbits.
2. Younger farmers should be encouraged into small ruminant farming.
3. Extension agency should collaborate with education extension services to promote adult education and computer educations to enable the farmers utilize the information from the modern ICTs.
4. Computers should be donated to the rural areas for the training of farmers. The farmers should be sensitized on the importance of using ICTs for sourcing current information on agriculture.

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Interrelationship of Temperature, pH, Dissolved Oxygen and Nitrogenous Wastes in Fish Culture Systems

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ABSTRACT

Frequent monitoring of water quality in fish culture systems is important to profitable operation of fish farming ventures. This study investigated how water quality parameters such as Temperature, pH, Ammonia, Nitrate and Dissolved Oxygen interrelate in fish culture systems. Water samples were collected from a concrete tank and an earthen fish pond in a commercial fish farm in Ibadan over a period of six weeks. Water source for fish culture, fish feeding rate and frequency were the same. Temperature, pH, Ammonia, Nitrate and Dissolved Oxygen (D.O.) were all analyzed in the water samples using standard methods. Relationships exist among the water quality parameters examined. There were variations of each water quality parameters among the weeks in the fish culture systems. The levels of the parameters determined were within the acceptable ranges for fish culture. Temperature had a negative correlation with pH and D.O. at r values of -0.61 and -0.53 respectively. Ammonia had a weak negative correlation with pH at -0.41 r value. Interrelationship between temperature and dissolved oxygen gave an equation which predicts D.O. as -0.911T + 32.57 with R^2 value of 0.373. A multiple relationship among ammonia, temperature and pH is such that at R^2 value of 0.58, ammonia can be estimated to be 7.42+0.31pH – 0.20T.

Keywords: *Physico- chemical parameters, Fish health, Test Kits. Water analysis*

INTRODUCTION

The aquaculture industry in Nigeria has grown tremendously in recent years with a reported production of farmed catfish of 143,207 metric tonnes (FDF, 2008) and 20% growth per year. This development has catalyzed a well developed value chain of many participants including an estimated 5,000 or more fish farmers, more than 100 small to medium hatcheries as well as four quality fish feeds of local manufacture, 12 imported quality fish feeds and an undocumented large number of small, artisanal fish feed producers. Equipment (fishing gears, laboratory needs) suppliers and consulting service providers have also grown with fairly wide coverage in the different regions of the country. Intensive fish culture ventures is a major avenue to close the present fish demand –supply gap in the country and satisfy the nutritional need of the populace with respect to provision of high quality protein in diets. The different forms of high density, intensive aquaculture systems comes with their peculiar challenges comprising the subject of water chemistry and its net result of the water quality of the culture environment.Water as a habitat for fish must carry dissolved useful gases, minerals and other substances of sorts and in such amounts that are not harmful to fish (Adeyemi and Ipinjolu 1999). Water quality criteria are scientific and technical information provided for a particular water quality constituent in the form of numerical data or narrative description of its effects on the suitability of water for a particular use or on the health of aquatic ecosystems. Water quality for the aquaculturists refers to the quality of water that enables successful propagation of the desired organisms (Boyd, 1995). Poor water chemistry leads to deterioration of water quality, which causes stress to the cultured organisms. Efficient feed conversion, growth and marketability of the final product cannot be guaranteed unless the culture system is balanced or in harmony with nature. Water quality parameters affect respiration, feeding, metabolism, reproduction, and waste removal from the environment. Maintenance of good water quality is essential for both survival and optimum growth of culture organisms. The levels of metabolites in pond water that can have an adverse effect on growth are generally an order of magnitude lower than those tolerated by fishes for survival. Water quality of the culture environment determines the ultimate success or failure of an aquaculture operation. The paramount concern of the fish farmer therefore is to maintain, equilibrium conditions with respect

to water chemistry thereby ensuring good water quality. The information gathered from monitoring activities is critical to protect the beneficial use of the water to support aquatic life.

The fish farmer is expected to measure, record, and manage the water quality all through the growing season. This serves as guide for managing the fish culture systems so that conditions that can adversely affect the growth of fish can be avoided. In cases where problems are encountered, these parameters can help in the diagnosis, so actions to remedy the situation can be taken. Parameters such as Dissolved Oxygen (D.O), Temperature, pH, Salinity, Turbidity, Nitrogenous wastes indices like Ammonia, Nitrite and Nitrate among others are considered basic to life within aquatic systems.. Individual parameters usually do not tell much, but several parameters put together can serve as indicators of the dynamic processes occurring in the culture medium. Monitoring of these physico –chemical parameters, involves a variety of methods including titrimetric procedures requiring chemical reagents, bottles and glassware like beakers, burette, pipette, conical flasks, D.O bottles ,calorimeters as well as the use of meters like digital thermometer, pH meter, D.O. meter, Spectrophotometer and portable test kits. Whichever method or equipment is employed, measurement of these physico–chemical parameters, are most times cumbersome and usually very expensive, especially for peasant farmers in the rural areas of Nigeria. Theoretical, empirical or numerical studies and analysis that may result in the use of easily measured parameters (e.g pH, temperature) to reveal the level of other water quality parameters would be welcome. Moderately trained poor peasant farmers can thus spend less time and money on water analysis procedures and test kits. The present study was considered to investigate the interrelationship and possibly develop predictive equations between temperature, pH, dissolved oxygen, ammonia and nitrate in fish culture systems.

MATERIALS AND METHODS

Water samples were collected from two fish holding structures, concrete tank and earthen pond in a commercial fish farm located at Olodo village, Ibadan, Oyo State. Water source to the farm is from a stream; the fish in the culture systems were twelve weeks at the onset of water sampling. The species stocked in both fish holding structure was *Clarias gariepinus*. The fish were fed with locally compounded feed pelleted on the farm and are fed twice daily.

Water samples were collected over six week duration at depth 10cm-15cm below the water surface and from two points (inlet and outlet) in each of the holding structure with a sampling bottle in the morning (9.00am-10:00am) and evening (6.00pm-7:00pm). Temperature and pH were determined at the site of water collection. Dissolved Oxygen (D.O.), Ammonia and Nitrate, were analyzed in the water samples taken to the laboratory. Temperature was determined with the use of simple mercury –in- glass thermometer; the thermometer was dipped into the water consistently at surface depth of 10cm-15cm throughout the period of the experiment. It is measured in ^{o}C .The pH was measured with an electric pH meter; the meter was dipped into water for few seconds and the reading was taken. Dissolved oxygen (DO), measured in mg/l., was determined using Winkler's method .Merck Ammonia -Nitrogen test kit was used to analyze the water sample to determine the level of ammonia. Nitrate was determined using the Kjeldahl digestion method. All analyses were done in line with standard methods (APHA 1995).

The data obtained were analyzed using descriptive statistics. Average values for each parameter was computed considering the values from the two culture systems. The significant difference in the mean values of each parameter was determined by one way ANOVA. Correlation analysis was carried out to determine the interdependence among the parameters and regression analysis was also carried out to determine the interrelationship among the parameters. The regression equation is expressed as; $Y = a + bX$ where Y = independent variable, X= independent variable, a = intercept and b= slope. . Temperature and pH are considered as independent variables because their measurement and determination are less cumbersome and least demanding relative to others (dissolved oxygen, ammonia and nitrate) which are thus treated a dependent variable.

RESULTS AND DISCUSSION

Temperature and pH

Mean temperature value obtained in concrete tank was 29.17±0.34^{o}C. The range of temperature value did not show wide deviation from the mean value which indicate that temperature obtained in the concrete tank are almost stable, while the mean temperature obtained in earthen pond was 30.06±0.30^{0}C(Table 1). Temperature obtained in both culture systems are in line with study of Boyd, (1995) that reported 26-32^{o}C for freshwater fish.

The pH value obtained in concrete tank during the study was 8.84±0.41, while value obtained in earthen pond was 8.08 ±0.28 (Table 1). The pH value obtained during the study in both culture systems was in line with study of Stone and Thomforde (2003), who obtained a desirable range for pond pH as 6.5 - 9.5 and acceptable range is 5.5 - 10.0 for good productivity and fish health .

Dissolved Oxygen, Ammonia and Nitrate

The mean D.O. value recorded in concrete tank is 6.08±0.63mg/l, while the mean dissolved oxygen obtained in earthen pond is 4.99 ±0.63 mg/l (Table 1).The mean values of D.O. measured in the two culture systems differs significantly (P<0.05).

TABLE 1
Mean values of selected quality parameters and ranges for fish culture.

Parameters and units	Concrete tank	Earthen pond	Optimum level for freshwater fish culture
Temperature, ^{o}C	29.17±0.34	30.06±0.30	26-32
pH	8.84±0.41	8.08 ±0.28	6.5- 8.5
Dissolved Oxygen, mg/l	6.08±0.63^{a}	4.99 ±0.63^{b}	>5.0 mg/l
Ammonia, mg/l	4.61±0.42^{c}	5.90±0.51^{d}	<8.0 mg/l
Nitrate, mg/l	2.30±0.08	2.60±0.11	< 250 mg/l

Means in the same row differently superscripted differ significantly (P<0.05)

The relatively low dissolved oxygen recorded in the earthen pond can be attributed to the slightly higher mean temperature .This is in agreement with the work of Fakayode, (2005), who observed that high temperature will cause decrease in the dissolved oxygen. The dissolved oxygen in the water body is at its lowest in the morning because of respiratory activities that occurs over the night and is at its peak in the evening when the sun is just set because of photosynthetic activities (King and Nkanta, 1991).Values obtained in this study follows this trend.

The mean values of ammonia obtained in concrete tank and earthen pond are 4.61±0.46 mg/l and 5.90±0.51 mg/l respectively. (Table 1). These mean values as measured in the two culture systems are significantly different (P<0.05). The ammonia obtained in both culture systems throughout the evaluation period are almost relatively stable .These values are however considered not healthy for a freshwater body meant for fish culture . A surface water body with ammonia of 2.7mg/l is defined as grossly polluted. This high ammonia levels can arise from overfeeding. Excess protein rich feed decays to liberate toxic ammonia gas, which in conjunction with the ammonia excreted by fishes, may accumulate to dangerously high levels under certain conditions as stated by Boyd and Tucker (1998). Fortunately, ammonia concentrations are partially buffered by conversion to non toxic nitrate by nitrifying bacteria. Mean nitrate values recorded in concrete tank and earthen pond are 2.30±0.08 mg/l and 2.60±0.11 mg/l respectively (Table 1). These values are low and do not portend danger to the cultured organisms. Nitrate concentrations from 0 to 200 mg/l are reported as tolerable and acceptable.

Interdependency and relationship among parameters

The interdependence among the water quality parameters measured in the two culture systems during the period of the study is as shown in Table 2. Tables 3 and 4 show the coefficient of determination and equations obtained from the regression relationship between the water quality parameters

The correlation coefficient indicates the relationship among the parameters. Temperature and dissolved oxygen were inversely related and were negatively correlated (r= -0.61). This is in agreement with the work of Fakayode, (2005), who observed that high temperature will cause decrease in the dissolved oxygen. The relationship

between the temperature and pH also shows a negative correlation (r= -0.53) and was significant. Temperature had a positive correlation(r= 0.55) with the concentration of ammonia. It can be deduced that increase in temperature will lead to increase in the level of ammonia. Correlation between temperature and Nitrate was positive (r= 0.78) and strongly significant.

TABLE 2
Interdependence among water quality parameters during the period of study.

Variables	Temperature	pH	D.O	Ammonia	Nitrate
Temperature	1.00	-0.53*	-0.61*	0.55*	0.78*
pH	-0.53*	1.00	0.74*	-0.41*	-0.69*
D.O	-0.61*	0.74*	1.00	-0.42*	-0.54
Ammonia	0.55*	-0.41*	-0.42	1.00	0.84*
Nitrate	0.78*	-0.69*	-0.54*	0.84*	1.00

*statistically significant ($P < 0.05$)

TABLE 3
Linear regression analysis of selected water quality parameters

Y	X	Prediction equation	Coefficient of determination (R^2)
Dissolved Oxygen, D.O. mg/l	Temperature, ^{O}C	D.O.= -0.911T + 32.54	0.373
Ammonia, mg/l	Temperature, ^{O}C	Ammonia.= 0.804T -18.57	0.298
Nitrate, mg/l	Temperature, ^{O}C	Nitrate = 0.542T - 13.81	0.604
Dissolved Oxygen, D.O. mg/l	pH	D.O.= 1.130pH - 4.023	0.513
Ammonia, mg/l	pH	Ammonia.= -0.639pH+10.66	0.168
Nitrate,mg/l	pH	Nitrate= -0.55pH+6.512	0.469

TABLE 4
Multiple Regression analysis of selected water quality parameters

Y	X	Prediction equation	Coefficient of determination (R^2)
Dissolved Oxygen, (D.O.) mg/l	Temperature ,^{O}C& pH	D.O=21.12+1.08pH -0.87 T	0.67
Ammonia, mg/l	Temperature, ^{O}C & pH	Ammonia=7.42+0.31pH -0.20 T	0.58
Nitrate, mg/l	Temperature, ^{O}C& pH	Nitrate =1.10-0.06 pH+0.03 T	0. 90

Dissolved oxygen also had a strongly significant positive correlation (r = 0.74) with pH. The correlation between dissolved oxygen and ammonia was negative and not significant. The dissolved oxygen also had a negative correlation (r = -0.54) with nitrate at a weakly significant level. The pH also had an insignificant negative correlation (r = -0.41) with ammonia and a strongly significant negative correlation (r = -0.69) with nitrate.

The relationship between the ammonia and nitrate was strongly significant and positive (r=0.84). This can be attributed to the fact that decomposition of ammonia lead to the formation of nitrate, therefore when there is suitable condition (i.e. oxygen and warmth) decrease in the ammonia will lead to increase in the nitrate level in the water body.

Linear regression and single parameters prediction relationship did not yield a dependable determination as R^2 values were relatively low (Table 3) compared to multiple regression among the parameters with fairly reliable R^2 values (Table 4). Predicting dissolved oxygen with temperature values alone gave D.O. = -0.911T + 32.54 with a coefficient of determination (R^2) of 0.373.The combined use of temperature and pH readings to predict dissolved oxygen gives the equation D.O=21.12+1.08pH -0.87 T with a coefficient of determination (R^2) value of 0.67.

CONCLUSION

Findings of this study show that no single water quality parameter can be considered as important with respect to fish growth and health. There exist strong interrelationships among the selected water quality parameters. Temperature and pH readings could be used to predict dissolved oxygen, ammonia and nitrate concentration. This could serve as preemptive purposes and should not be considered as a replacement of the standard analytical methods.

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Contribution of Shell Petroleum Development Company (SPDC) Agricultural Extension Programme to Farmers in Oil Producing Areas of Delta State, Nigeria

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ABSTRACT

The strained relationship between Shell Petroleum Development Company (SPDC) and host communities led SPDC to embark on agricultural extension services programme. Based on this, the study examined the contribution of this programme to farmers in the oil producing areas of Delta State. Simple random sampling technique was used to select four agricultural zones out of eleven zones based on SPDC structure. Proportionate sampling technique was used to select 122 respondents. Data collection was done through interview schedule which were subjected to descriptive and inferential statistics. Findings show that 53.3% of the respondents were within age range of 45 and 54 years, majority (76.7%) were male, 74.2% were married while 65.0% had one form of education or the other. All the farmers were aware of SPDC agricultural extension programme and 57.5% of the farmers participated in training and dissemination of information. Majority (85.8%) benefited from cassava stems, 85.8% pineapple suckers and 85.0% plantain suckers. Low benefit was recorded on tractor services (15.0%) and fishing net (21.7%). Farmers' attitude towards SPDC agricultural programme was generally favourable. There is a significant relationship between sex (χ^2; 27.928, $p \leq 0.000$), education (χ^2; 24.150; $p \leq 0.000$) and contribution of SPDC agricultural programme. There was also a significant relationship between awareness ($r = 0.268$; $p \leq 0.003$), participation ($r = 0.252$; $p \leq 0.005$) and the contribution of SPDC agricultural programme. Extension contact should be increased and farmers should be encouraged to form into groups in order to enhance their access to other inputs such as tractor.

Keywords: *SPDC, Farmers, Agricultural input activities, Awareness, Participation*

INTRODUCTION

The Shell Petroleum Development Company (SPDC) is the largest oil and gas exploration and production company in Nigeria. The SPDC main policy is to minimize the impact of operations on the environment and is sensitive to the needs and concern of host communities (SPDC, 1996). SPDC being the oldest company in the region with long years of experience in community development programmes revised its policy in 1998 to reflect the overall statement on health, safety, environment and communities (SPDC, 1999). Contrary to this main policy thrust, the SPDC business focus of exploratory activities and exploitation of hydrocarbon have brought the spillage of crude oil to host communities. The villagers are exposed to continuous gas flaring which results in air pollution with poisonous gas such as carbon monoxide, carbon dioxide and ozone depleting gases. Also Halons (oil waste) destroy both land and crops, thereby exposing the soil to constant erosion and loss of soil fertility. The oil spillage that gets into the streams and rivers kills aquatic creatures and hinders fish farming. According to Akpabibibo (2001) as a result of oil exploration activities, the agricultural land of the region has been devastated with no use for agricultural activities. These communities also, lack necessary infrastructural facilities and basic amenities such as pipe-borne water, good roads, electricity, schools, modern market etc. The neglect of these development programmes for the areas resulted in bitterness by the inhabitants Akpan (2005).

The resultant effect of this, spurred SPDC to shift attention from company's policy of community assistance to community development. Emphases have also been shifted from ad-hoc clustered projects in the communities to improved income generating and sustainable

projects. The promotion of enduring agricultural programmes have become one vital process of achieving these goals as 80% of the community inhabitants are involved in agricultural activities such as arable cropping, tree cropping such as rubber, oil palm etc, fishing and rearing of livestock. Therefore, emphasis was placed on agricultural extension services as a means of developing host communities through deliberate and articulated network of supplies of farming inputs and technical services. Nwuola (1999) stated that the essence of SPDC's Agricultural Extension Programme in the host communities was to build capacity through a more effective, enduring and sustainable agricultural technology transfer and an agricultural extension module that is expected to improve quality of life in these communities. The objectives of SPDC agricultural extension services include; improving farming techniques, developing and distributing disease resistance and high yielding varieties of crop (input distribution), encouraging crop diversification through the introduction of new ecologically and economically viable crops, training and dissemination of information on post harvest utilisation, stimulating the development of small agro-industries in the host communities etc. In achieving these objectives, certain strategies were put in place such as research and seed multiplication centres, input distribution, cooperative and socio-economic activities. Effectiveness of SPDC extension services according to Oyaide (1999) can be seen from the high rate of adoption of SPDC technical advice, increase in farm sizes and changes in standard of living of SPDC contact farmers. To ascertain this achievement, it is important to assess from the farmers perspective, the impact of SPDC agricultural extension services with input distribution acclaimed as a key method employed to help in alleviating the problems faced by host communities to enhance increased agricultural production and improved standard of living of the farmers.

METHODOLOGY

This study was carried out in the Agricultural zones of oil producing areas in Delta State. Delta state was created in August 27, 1991. The state is located within longitude 50^{θ} and 60^{θ} East and latitude 50^{θ} and 30^{θ} East. It is bounded in the north-west by Edo state, north east by Enugu and Anambra states, south-east by Rivers state, south and west by Atlantic Ocean (Bight of Benin). The land area is estimated at 22,159 square kilometers. The population of Delta state according to 1992 Census was put at 2,570,181. The state is one of the largest producers of crude oil in Nigeria. The major occupation of the people is farming other income generating activities they engage in are tailoring, hunting, trading and carpentry (Akpotor, 1992).

The population of the study is made up of contact farmers located in the SPDC areas of operation in Delta state. Simple random sampling technique was used to select four agricultural zones out of eleven agricultural zones in Delta state. The zones were Bomadi, Sapele, Oben and Ekakpamre with 24, 36, 34 and 28 contact farmers respectively using proportionate sampling technique to give a sample size of 122. However, only one hundred and twenty (120) interview guides were good for analysis resulting in a response rate of 98.4%. Data was collected through interview schedule on socio-economic characteristics of the respondents, awareness of SPDC programme and participation. Farmers attitude towards SPDC agricultural extension input distribution was measured on a five-point likert scale of strongly agree, agree, undecided, disagree and strongly disagree with a 5,4,3,2 and 1 respectively for positive statement and reverse order for negative statement. Respondents score was computed and mean was used to categorise their attitude into favourable and unfavourable. Both descriptive and inferential statistics were used to analyze the data.

RESULTS AND DISCUSSION

Respondents' personal characteristics

The results in Table 1 indicate that 76.7% of the respondents were males, while 23.3% were females. Thus majority were male capable of performing hard task associated with agriculture. The result however negates the popular belief that more women engaged in farming work than men in the area. Furthermore, it was found that 53.3% were between 45 and 54 years of age, 33.4% were between 55 and 64 years, 7.5% were between 35 and 44 years while 5.8% were older than 64 years. It could be said that a larger percentage fell within the active years as far as farm operations are concerned. The result also shows that 74.2% were married while about 25.8% were widowed, divorced or separated. None of the respondents was single. This implies that sex had influence on the impact of SPDC agricultural extension input distribution programme because majority were males who have lots of family and social responsibilities to meet. Education increases

individual's involvement in any organization as a criterion to decide level of participation in any programme that will be of benefit. Number of married respondents could be justified by values placed on marriage through religion, customs and tradition in the area. Large percentage (44.2%) of respondents maintained an average household size of 7-9 while few (10.0%) maintained a household size of 9 and above. Primary occupation of respondents may be the motivating factor towards having large household size in order to provide labour required for the activities. Respondents were predominantly Christians (85.8%) with 5.0% being Muslims and 9.2% Traditionalist, The few Muslims among the respondents were likely to be migrants.

Furthermore, result in Table 1 shows that 35.0% had no formal education while 61.7% had one form of education or the other ranging from primary, tertiary and adult literacy education. The high literacy level can enhance their participation in the programme and enhance a better understanding of the initiative programme. The result conforms to the study of Akpotor (1992) and Orhro (1995) that there is generally broad distribution of literate farmers in the Niger-Delta region. This finding would be an advantage for extension activities since level of education is a factor that affects level of adoption of technology (Okunlola and Alfred (1998). Majority (85.8%) of the respondents were into farming and fishing while 7.4% were into trading, tailoring and crafting. This result justified the study area as a predominantly agrarian community as also reported by Oyaide (1999) and the necessity for SPDC to embark on various programmes to develop agriculture in the area.

Also, Table 1, findings indicate that 65.8% of the respondents earns less than ₦36,000 per annum while 28.0% earns between ₦36,000 - ₦72,000, 6.7% earns between ₦72,001- ₦108,000 and 1.7% earns more than ₦108,000. The low income of majority of the respondents might be as a result of small farm size and pollution of the soil by gas flaring from SPDC. Also, the water bodies in these communities might have been polluted by oil spillage which may not enable them to produce above what is domestically consumed while the leftovers were offer for sale, thus depicting low earning.

TABLE 1
Distribution of respondents by their personal characteristics

Characteristics	frequency (n=120)	(%)
Sex		
Male	92	(76.7)
Female	28	(23.3)
Age		
35-44	9	(7.5)
45-54	64	(53.3)
55-64	40	(33.4)
65 and above	7	(5.8)
Marital status		
Single	-	(-)
Married	89	(74.2)
Widowed	17	(14.2)
Divorced	6	(5.0)
Separated	8	(6.7
Educational level		
No formal education	42	(35)
Primary education	19	(15.8)
Secondary education	8	(6.7)
Higher education	24	(20)
Adult literacy	23	(19.2)
Other	4	(3.3)
Religion		
Christianity	103	(85.8)
Islam	6	(5.0)
Traditional	11	(9.2)
Household		
1-3	25	(20.8)
4-6	29	(24.2)
7-9	53	(44.2)
9 and above	12	(10.0)
Primary occupation		
Farming/fishing	103	(85.8)
Trading	4	(3.3)
Tailoring	1	(0.8)
Crafting	4	(3.3)
Others	8	(6.7)
Income per annum		
Below 36,000 naira	79	(65.8)
36,000-72,000 naira	31	(25.8)
72,001-108,000	8	(6.7)
108,001 and above	2	(1.7)

Awareness of SPDC agricultural extension input distribution programme by farmers

Table 2 indicates that all respondents were aware of SPDC's agricultural extension input distribution programme. Meanwhile cassava stem had the highest level of awareness (86.0%) followed by pineapple suckers (83.3%). Others with high level of awareness include cowpea seed, oil palm seedling, fertilizer distribution as well as fishing net with each constituting 78.3%. However, seed yams had the lowest level of awareness (63.3%). Highest level of awareness of cassava stem among respondents could be due to the fact that *gaari*

which is a food derived from cassava is a major staple food in the area. Consistent with this result is the finding of Oyaide (1999) that revealed about 80% of the farmers grows cassava in Niger Delta area. Aside this, the area is a riverine and fishing is also a major occupation there hence the awareness of fish fingerlings and fishing net distribution among the respondents. More than awareness is the benefit which the respondents derived from the programme. The results reveal that 85.8% benefited from cassava stem, also 85.8% benefited from pineapple suckers distribution, the same percentage benefited from the technical advisory services rendered by the company while 85.0% got plantain suckers aside 72.5% that got maize grain, oil palm seedling (72.5%), seed yams (53.3%) and so on. The implication is that the input distribution programme of SPDC cut across many livelihood activities of the respondents which make it possible for respondents to benefit from the programme. Meanwhile, respondents did not derive much benefit from tractor services (15.0%), cowpea seed distribution (24.2%), fish net (21.7%) and fertilizer distribution (40%). The implication is that some of the essential inputs particularly fish net is lacking thus SPDC needs to intensify effort on the distribution of this material to enhance livelihood activities of the people in the area.

TABLE 2
Awareness of SPDC agricultural extension input distribution programme

Awareness on specific SPDC agricultural input distributed	Aware	Not aware	Benefit derived	
			Yes	No
Cassava stem	103 (85.8)	17 (14.2)	103(85.8	17 (14.2)
Seed yams	76 (63.3)	44 (36.7)	64 (53.3)	56(46.7)
Pine apple suckers	100 (83.3)	20 (16.7)	103(85.8)	17(14.2)
Plantain suckers	82 (68.2)	38 (31.7)	102(85.0)	18(15.0)
Maize grain	82 (68.3)	26 (21.7)	87(72.5)	33(27.5)
Cowpea seed	94(78.3	26(21.7	29(24.2)	91(75.8)
Oil palm seedlings	94 (78.3)	38 (31.7)	87(72.5)	33(27.5)
Fertilizers	94 (78.3)	26 (21.7)	48(40.0)	72(60.0)
Fish fingerlings	94 (78.3)	26 (21.7)	52(43.3)	68(56.7)
Fish net	94 (78.3)	26 (21.7)	26(21.7)	94(78.3)
Poultry birds	82 (68.8)	38 (31.7)	99(82.5)	21(17.5)
Rice grain	94 (78.3)	26 (21.7)	65(54.2)	55(45.8)
Technical advisory services	94 (78.3)	26 (21.7)	103(85.8)	17(14.2)
Tractor services	91 (75.8)	29 (24.2)	18(15.0)	102(85.0)
Agro chemicals	90 (75.0)	30 (25.0)	60(50.0)	60(50.0)

*Multiple responses

Respondents' participation in SDPC agricultural extension input distribution programme

Table 3 shows that respondents participate regularly in all activities except on harnessing resources which majority (55.8%) never participated. Respondents mostly participated in training and dissemination of information (66.7%), improved farming techniques (51.7%) and post harvest utilisation of farm produce (59.2%). This could be attributed to the value placed on these activities by the respondents. Low participation of respondents in some activities for example research and seed multiplication (32.5%), developing and distribution of improved varieties (33.3%) may be attributed to the submission of Ekong (1988) that participation depends mainly upon the nature of the task. More so, those activities with low participation were more of trained agricultural extension work and researchers than farmers.

TABLE 3
Extent of Farmers' Participation in SPDC Agricultural Extension Input Distribution Programme

Extension activities	Regularly	Occasionally	Rarely	Never
Training and dissemination of information	80 (66.7)	10 (8.3)	16 (13.3)	14 (11.7)
Handling of farm produce to enhance value	56 (46.7)	24 (20)	15 (12)	25 (20.9)
Post harvest utilization of Farm produce	71 (59.2)	15 (12.5)	20 (16.7)	14 (11.7)
Crop diversification	53 (44.2)	33 (27.5)	20 (16.7)	14 (11.7)
Improved farming techniques	62 (51.7)	13 (10.8)	31 (25.9)	14 (11.7)
Developing and distribution of improved varieties	40 (33.3)	35 (29.2)	20 (16.7)	25 (20.9)
Organizing farmers into Cooperatives	50 (41.7)	25 (20.8)	31 (25.9)	14 (11.7)
Development of small scale Agro-industries	62 (51.7)	24 (20.0)	20 (16.7)	14 (11.7)
Research and seed multiplication	39 (32.5)	36 (30)	20 (16.7)	25 (20.9)
Harnessing resources	14 (11.7)	19 (15.8)	20 (16.7)	67 (55.8)

*Figures in parentheses are percentages

Farmers' attitude to SPDC agricultural extension input distribution programme

Table 4 indicates that the farmers' attitude mean score was 3.3 and farmers were favourably disposed to adequacy of SPDC agricultural input ($\bar{x}$=3.97), crops early maturity ($\bar{x}$=3.95), the crops are labour intensive ($\bar{x}$=3.9) and increase income from inputs ($\bar{x}$=3.7). Farmers showed favourable but a weaker disposition to statements, that are marginally above the actual mean such as the inputs don't increase the farm size ($\bar{x}$=3.5), easy management of inputs ($\bar{x}$=3.43), while they showed unfavourable disposition to statements that are below the actual mean such as the inputs are disease and pest resistant ($\bar{x}$=2.72) and the inputs increase the farm size ($\bar{x}$=2.43). The result implies that the attitude of the farmers to innovations depends on their level of involvement at all stages of the programme. Meanwhile, since respondents had favourable attitude to most of SPDC's activities compared with those that they had unfavourable disposition; thus, their attitude can be generally described as being favourable. It implies that activities that promote peoples' welfare will elicit the enthusiasm and whole-hearted participation of the stakeholder as stated by Anyanwu (1992). Hence, people's participation in planning, execution, utilisation and assessment of the programme designed to improve their welfare play a significant role in people's attitude formation in order to pool we-feeling and favourable disposition from them.

Respondents' personal characteristics and contribution of SPDC agricultural extension input programme

The Chi-square analysis on Table 5 tested relationship between personal characteristics of the farmers and the contribution of SPDC agricultural extension input distribution programme. Results show that sex (χ^2 = 27.928, p = 0.000) and education (χ^2 = 24.150, p =0.000) of the respondents had significant relationship with contribution of SPDC agricultural extension input distribution programme. This implies that sex had influence on the contribution of SPDC agricultural extension input distribution programme because majority were males who have lots of family and social responsibilities to meet. Education increases individual's involvement in any organization as a criterion to decide level of participation in any programme that will be of benefit.

Pearson Product Moment Correlation result on Table 6 tested the relationship between age, income, farmers' awareness, farmers' participation and the impact of SPDC agricultural extension input distribution programme. Results reveal significant relationship between farmers' awareness (r = 0.268, p = 0.003), farmers' participation(r = 0.252, p = 0.005) and contribution of SPDC activities. Farmers' awareness is a great community entrance skill, determinant of the adoption and impact/contribution of any developmental

programme while farmers' participation is an essential, active solicitation and engagement in programme development and implementation thus the more the participation, the greater the contribution/impact. These findings validated Oladele (1998) submission that the ultimate end of farmers' participation in linkage services is to increase production, and the need to ensure food security.

TABLE 4
Distribution of respondents' attitudinal disposition to the contribution of SPDC agricultural extension input distribution Programme

	SA	A	U	D	SD	N R	Mean
SPDC agricultural inputs are Adequate	24 (20)	76 (63.3)	12 (10)	8 (6.7)	-	-	3.97
SPDC inputs increase your productivity	12 (10)	45 (37.5)	-	63 (52.5)	-	-	3.05
SPDC inputs increase your income	12 (10)	84 (70)	12 (10)	-	12 (10)	-	3.7
SPDC inputs are environmentally Friendly	12 (10)	62 (51.7)	12 (10)	22 (18.3)	-	12 (10)	3.23
The inputs are disease& pest Resistant	12 (10)	31 (25.8)	-	65 (54.2)	12 (10	-	2.72
The crops require less labour	12 (10)	90 (75)	-	6 (5)	12 (10)	-	3.7
The crops mature early	24 (20)	81 (67.5)	-	15 (12.5)	-	-	3.95
The inputs are easy to manage	-	80 (66.7)	12 (10)	28 (23.3)	-	-	3.43
The inputs increase your farm size	26 (21.7)	-	12 (10)	70 (58.3)	12 (10)	-	2.43
The crops are easier to plant	-	80 (66.7)	-	28 (23.3	12 (10)	-	2.23
The inputs are inadequate	12 (10)	65 (54.2)	-	19 (15.8)	24 (20)	-	3.18
The inputs do not increase Productivity	12 (10)	54 (45)	-	42 (35)	12 (10)	-	3.1
The inputs do not increase your income	12 (10)	55 (45.8)	-	53 (44.2)	-	-	3.22
Inputs are not environmentally Friendly	-	71 (59.2)	12 (10	37 (30.8	-	-	3.28
Inputs are not disease and pest resistant	12 (10)	76 (63.3)	-	20 (16.7)	12 (10)	-	3.47
The crops are labour intensive	24 (20)	72 (60)	12 (10)	12 (10)	-	-	3.9
The crops mature late	-	78 (65)	12 (10)	35 (25)	-	-	3.4
Inputs do not increase your farm size	-	78 (65)	24 (20)	18 (15.4)	-	-	3.5
The inputs are not easy to manage	12 (10)	63 (52.5)	-	45 (37.5	-	-	3.25
The crops are difficult to plant	12 (10)	50 (42.5)	-	45 (37.5)	12 (10	-	3.05

*Figures in parentheses are percentages.
SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly disagree

TABLE 5
Relationship between personal characteristics and contribution of SPDC agricultural extension input distribution programme

Variable	df	χ^2	Significant level	Decision on significance
Sex	1	27.928	0.000	Significant
Marital status	4	5.600	0.231	Not Significant
Religion	2	1.620	0.445	Not Significant
Education	5	24.150	0.000	Significant
House hold size	4	7.570	0.108	Not Significant

TABLE 6
Relationship between age, income, awareness, participation and the contribution of SPDC agricultural extension input distribution programme

Variable	r	p (Significant level)	Decision
Age	0.0375	0.684	Not Significant
Income	0.0189	0.838	Not Significant
Farmers awareness	0.268	0.003	Significant
Farmers participation	0.252	0.005	Significant

CONCLUSION AND RECOMMENDATIONS

The conclusion of the finding indicated that there was high level of awareness among farmers about Shell Petroleum Development Company agricultural activities and considerable awareness concerning various inputs distributed. While there was appreciable level of participation in some Shell's activities it was low in others. The farmers showed favourable attitude to inputs that were paramount which they felt could immediately alleviate their suffering. Hence, the contribution of SPDC extension programme could be said to be positive on the farmers. However, farmers still need an extension programme that would allow them take part in all the stages of any developmental programme. In view of this, it is recommended that;

- SPDC, other oil companies, NGOs and the government should intensify efforts in organizing seminars and trainings for farmers including the youth in the areas of agriculture and small scale agro-allied businesses in order to ensure more participation by the farmers.
- Developmental activities that will satisfy physiological and psychological needs of farmers should be given more attention so that they can have favourable attitude towards the programme.
- Female enterprises should also be targeted in order to encourage more female participation.
- In addition, provision of soft loans targeted to clienteles through registered associations on a continuous basis should be embarked upon in order to achieve self-help and curb restlessness in the study area.
- SPDC, other oil companies, NGOs and the government should adopt grass root approach in subsequent developmental programmes in order to achieve a supportive role from the clientele and desired results.

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Fish Composition of Oni River in Ogun Water Side Local Government Area, Ogun State

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ABSTRACT

Oni River in Ogun waterside Local Government area of Ogun State contributes immensely to the artisanal fishery of the state, fishing being the major means of livelihood of the people living along the river course. This study assessed the fish composition in order to obtain the fish species and harvest composition of the study area. The study was conducted by enumerating and identifying the fish species composition of the river through personal interview and direct assessment of fishermen's catches, fish length and weight were measured. Fish abundance and biomass were assessed and the length-weight relationships and the length–frequency of fishes determined. Twenty-eight fish species belonging to sixteen families were encountered in the study area, the mormyridae were the most abundant family with 25.0%, followed by Cichlidae with 10.71%. Tilapia zillii (11.82%), and Clarias spp. (8.28%) were the most abundant single species. Those with the least abundance in the study area were Sihiranodon anritus and Schilbe mystus each with 0.17% abundance. The Oni River is a highly productive river and should be managed on a sustainable level.

Key words: *Fish composition, Oni River, Fish abundance.*

INTRODUCTION

Africa is blessed with a large number of inland or freshwater lakes, rivers swamps and floodplains, of different sizes and forms. These, containing a wide variety of fish populations, have provided mankind with the opportunity to exploit fish for food, income and livelihoods in general for many centuries. Nigeria is blessed with a vast expanse of inland freshwater and brackish ecosystems. Their full extent cannot be accurately stated as it varies with season and from year to year depending on rainfall. However, these water resources are spread all over the country from the coastal region to the arid zone of the Lake Chad Basin (Ita, 1993).

Archaeological research has revealed that the local economy of Nigeria and other countries of the Lake Chad Basin over 2,000 years ago centred on an integrated system of farming and fishing on the influent rivers and floodplains. Today, the Lake Chad Basin produces over 100,000 tonnes of fish valued at US$50 million and contributes to the livelihoods of thousands of people (Neiland, 2005). It is estimated that the inland fisheries of Africa produce 2.1 million tonnes of fish, which represents 24% of the total global production from inland waters (FAO, 2004). In comparison to marine fisheries, inland fisheries production is relatively small, representing only 6% of global production. In Africa, marine fisheries production of 4.7 million tonnes is also much larger compared to inland fisheries production of 2.1 million tonnes. This simple comparison of gross production between marine and inland fisheries can be misleading, for it can be shown that inland fisheries in Africa generate a wide variety of benefits (such as income and food) and underpin the livelihoods of millions of people. This is the case in many countries because inland fisheries are diverse and widely distributed. They can be exploited quite easily using simple technologies, and are often well-integrated with farming and other economic activities. In other words, inland fisheries are a valuable and an integral component of the lives of many people throughout Africa. It has an important contribution to make to sustainable development, including economic growth and poverty reduction (Neiland *etal.* 2005). The annual yield potential of the inland and marine waters of Nigeria is estimated at 517 and 360 tonne per year respectively (Faturoti, 2000). However, there are concerns that inland fisheries in Africa are increasingly under threat from factors such as environmental change, both man-made and natural and overexploitation, due to over-fishing (Neiland *etal.*2005). There is also widespread recognition at all levels of society and government that measures need to be taken to

safeguard the flow of benefits from inland fisheries. An important first step must be for all stakeholders to build a common and strategic understanding of the importance of inland fisheries for Africa, one of which is to identify fish composition and abundance in the various water bodies, which will help in the formulation of management practices that will be specific to the water bodies.

Oni River is a tributary of Ogun River in Ogun state. It is a fresh water ecosystem which takes its source from Ile-Ife, Osun state and empties into the Lagos Lagoon. Ita (1993), reported that no major fisheries investigations have been carried out on this river systems. It supports various species of aquatic plants and animal such as fishes, water snails, shrimps, crabs, aquatic insects and amphibians (Arowomole 2000). This water body is therefore highly productive and is a major site for artisanal fisheries in the state. This paper reports the findings of a study carried out to examines the fish composition and abundance of Oni River with a view to providing a baseline data for the management of the fisheries of the water body.

MATERIALS AND METHODS

The study was carried out on the Ogun state section of Oni River which lies between latitude $6^0 30^1$ and $6^0 32^1$N and longitude $4^0 22^1$ and $4^0 25^1$E (FDI, 1987). It is a river that cuts across Osun, Ondo, Ogun and Lagos states. Four fishing camps namely Tabati, Igele, Sunmoge and Dakun communities located along the river bank were used in the study. Each of the camps had a fish landing site.

Primary data were collected direct assessment of fishermen's catches. Identification of fish to species level was done using Olaosebikan and Raji (2004). Fish were enumerated for length and weight measurements in line with guide and procedure of a metre rule graduated in centimeters for length and weighting scale graduated in grammes for the weight. Sampling and identification was carried out twice a month throughout the period of study. Identification was made to the lowest taxonomic level, fishes were counted, sorted and arranged into the different families and species. The study was carried out between January to March, 2008.

RESULTS AND DISCUSSION

Fish identification and abundance

A total of 592 fishes were assessed, making up twenty eight species belonging to sixteen families. Table 1 shows the list of identified fish by their families, genus and species. The mormyridae family was found to be the most abundant with a value of 27.5% by number. This is in contrast to the findings on other freshwater bodies by Akinyemi (1987) on Eleyele River and Asejire Lake and Olaniran (2000) on IITA Reservoir that recorded Cichlidae as the dominant family in their works. The mormyridae were closely followed by the cichlidae family with a percentage abundance of 27.2% while the least abundant family was the Schilbeidae with a percentage abundance of 0.34%. On the species level, *Tilapia zillii* had the highest abundance of 11.82%, followed by *Oreochromis niloticus* with 9.8%, *Clarias* spp. 8.28%, *Synodontis* 3.71%, and *Chrysichthys* 1.52%. These findings agree with the findings of Ita (1993) that *Tilapia* spp. dominated the Ogun and Oshun River basins. Those with the least abundance in the study area were *Siluranodon anritus* and *Schilbe mystus* each with 0.17% abundance. Fish families such as Distichodontidae, Gymnarchidae, Malapteruridae and Schilbeidae all with 3.57% were poorly represented in the study area, (Table 2).

Fish length and weight

The mean standard length of fish species sampled varied from 6.3cm to 47.8cm while the mean weight had a range of 16g to 3130g (Table 3). *Gymnarchus niloticus* had the highest value for total length measurement of 51.30 cm and of 812.50g by weight. *Heterotis niloticus* had a mean total length measurement of 51.16cm and a mean weight measurement of 3131.82g. The species with the lowest mean total length value of 7.50cm was *Schilbe mystus*. This is however higher than the value obtained by Olaosebikan and Raji (2004), who recorded 3.50cm maximum length for *S. mystus* in their identification guide to Nigerian Freshwater Fishes.

CONCLUSION

Oni River has a rich composition of fish species which is indicative of its high productivity. The presence of some priced ornamental fishes of export status such as *Gnathonemus abadii,* and *Pantodon buchholzi* highlight the export potential of the river. Fishing in this river is the source of income and livelihood for inhabitants of the area. It is imperative that effort should be made in exploiting the resources of the river on a sustainable level for the present and future generations. Properly management of the river, it would go a long way in boosting the economic status of the local community that depends on it, the State and the nation at large.

TABLE 1
Identified fish from Oni River by families, general and species

S/No.	FAMILY	GENUS	SPECIES
1	Anabantidae	*Ctenopoma*	*Ctenopoma kingsleyae*
2	Bagridae	*Chrysichthys*	*Chrysichthys nigrodigitatus*
3	Channidae	*Parachanna*	*Parachanna obscura*
4	Characidae	*Hydrocynus*	*Hydrocynus vittatus*
		Alestes	*Alestes spp*
5	Cichlidae	*Oreochromis*	*Oreochromis niloticus*
		Tilapia	*Tilapia zillii*
		Hemichromis	*Hemichromis fasciatus*
6	Clariidae	*Clarias*	*Clarias gariepinus*
7	Distichodontidae	*Ichthyborus*	*Ichthyborus monodi*
8	Gymarchidae	*Gymnarchus*	*Gymnarchus niloticus*
9	Malapteruridae	*Malapterurus*	*Malapterurus electricus*
10	Mochokidae	*Synodontis*	*Synodontis nigrita*
11	Mormyridae	*Hyperopisus*	*Hyperopisus bebe*
		Gnathonemus	*Gnathonemus petersii*
		Mormyrus	*Mormyrus rume*
		Mormyrops	*Mormyrops deliciosus*
		Petrocephalus	*Petrocephalus bane*
		Gnathonemus	*Gnathonemus abadii*
		Marcusenius	*Marcusenius psittacus*
12	Notopteridae	*Papyrocranus*	*Papyrocranus afer*
		Xenomystus	*Xenomystus nigri*
13	Osteoglossidae	*Heterotis*	*Heterotis niloticus*
14	Pantodontidae	*Pantodon*	*Pantodon buchholzi*
15	Polyteridae	*Erpetoichthys*	*Erpetoichthys calabaricus*
		Polypterus	*Polypterus senegalus*
16	Schilbeidae	*Siluranodon*	*Siluranodon auritus*
		Schilbe	*Schilbe mystus*

TABLE 2
Relative abundance of sampled fish in Oni river, Ogun state

S/N	FAMILY	SPECIES	Total No Sampled	% abundance of Species in relation to total no sampled	% abundance of families in relation to no of species	% species abundance within families
1	Anabantidae	*Ctenopoma kingsleyae*	8	1.35	3.57	100
2	Bagridae	*C. nigrodigitatus*	9	1.52	3.57	100
3	Channidae	*Parachanna obscura*	39	6.59	3.57	100
4	Characidae	*Hydrocynus vittatus*	11	1.86	3.57	68.75
		Alestes spp	5	0.84	3.57	31.25
		Sub Total	**16**	**2.70**	**7.14**	**100**
5	Cichlidae	*Oreochromis niloticus*	58	9.80	3.57	36.00
		Tilapia zillii	70	11.82	3.57	43.50
		Hemichromis fasciatus	33	5.57	3.57	20.50
		Sub Total	**161**	**27.20**	**10.71**	**100**
6	Clariidae	*Clarias gariepinus*	49	8.28	3.57	100
7	Distichodontidae	*Ichthyborus monodi*	3	0.51	3.57	100
8	Gymarchidae	*Gymnarchus niloticus*	8	1.35	3.57	100
9	Malapteruridae	*Malapterurus electricus*	7	1.18	3.57	100
10	Mochokidae	*Synodontis nigrita*	33	3.71	3.57	100
11	Mormyridae	*Hyperopisus bebe*	30	5.07	3.57	18.40
		Gnathonemus petersii	37	6.25	3.57	22.70
		Mormyrus rume	17	2.87	3.57	10.43
		Mormyrops deliciosus	4	0.67	3.57	2.45
		Petrocephalus bane	46	7.77	3.57	28.22
		Gnathonemus abadii	16	2.70	3.57	9.82
		Marcusenius psittacus	13	2.20	3.57	7.98
		Sub Total	**163**	**27.53**	**25.00**	**100**
12	Notopteridae	*Papyrocranus afer*	8	1.35	3.57	17.02
		Xenomystus nigri	39	6.59	3.57	82.98
		Sub Total	**47**	**7.94**	**7.14**	**100**
13	Osteoglossidae	*Heterotis niloticus*	11	1.86	3.57	100
14	Pantodontidae	*Pantodon buchholzi*	30	5.07	3.57	100
15	Polyteridae	*E. calabaricus*	12	2.03	3.57	70.60
		Polypterus senegalus	5	0.84	3.57	29.40
		Sub Total	**17**	**2.87**	**7.14**	**100**
16	Schilbeidae	*Siluranodon auritus*	1	0.17	3.57	50.00
		Schilbe mystus	1	0.17	3.57	50.00
		Sub Total	**2**	**0.34**	**7.14**	**100**
		TOTAL	**592**	**100.00**	**100**	

TABLE 3
The Length and weight measurement of sampled fish

S/No.	SPECIES	Mean Total length (cm)	Mean Standard length (cm)	Mean weight (g)
1	*Ctenopoma kingsleyae*	14.33	11.91	130.00
2	*Chrysichthys nigrodigitatus*	17.68	14.52	150.00
3	*Parachanna obscura*	30.39	25.88	574.36
4	*Hydrocynus vittatus*	3.57	25.38	368.18
5	*Alestes spp*	8.42	8.08	16.00
6	*Oreochromis niloticus*	22.29	17.93	543.81
7	*Tilapia zillii*	23.94	19.13	495.71
8	*Hemichromis fasciatus*	17,63	14.97	61.97
9	*Clarias gariepinus*	23.15	20.92	145.31
10	*Ichthyborus monodi*	12.63	10.57	26.67
11	*Gymnarchus niloticus*	51.30	47.75	812.50
12	*Malapterurus electricus*	14.29	12.17	82.86
13	*Synodontis nigrita*	20.60	16.00	180.00
14	*Hyperopisus bebe*	12.92	11.15	55.00
15	*Gnathonemus petersii*	17.60	15.44	57.35
16	*Mormyrus rume*	20.00	18.12	102.32
17	*Mormyrops deliciosus*	28.68	26.13	200.00
18	*Petrocephalus bane*	11.15	9.69	24.34
19	*Gnathonemus abadii*	18.64	16.25	133.12
20	*Marcusenius psittacus*	19.51	17.82	66.92
21	*Papyrocranus afer*	42.50	39.64	785.00
22	*Xenomystus nigri*	12.68	12.21	18.40
23	*Heterotis niloticus*	51.16	46.41	3131.82
24	*Pantodon buchholzi*	14.57	13.83	20.00
25	*Erpetoichthys calabaricus*	18.69	17.98	25.00
26	*Polypterus senegalus*	15.88	15.46	20.00
27	*Siluranodon auritus*	12.00	11.50	20.00
28	*Schilbe mystus*	7.50	6.30	60.00

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Awareness and Uptake of Antenatal Care Service Among Women in Iddo Local Government Area of Oyo State, Nigeria

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ABSTRACT

Various health challenges of neonatal death, still birth and maternal mortality are traceable to ineffective antenatal care programmes among others. The study therefore investigated awareness and uptake of antenatal care service content among women in Iddo local government area of Oyo State. Using snow ball research technique, 90 breast feeding mothers were selected from the study area and data was collected using structured questionnaire on their personal characteristics, awareness and uptake of Antenatal Care (ANC) service content, ANC service providers in the study area and constraints faced by mothers in accessing ANC services. Mean age of respondents was 36.3 and 78.8% had below secondary school education. Most of mothers were aware of each of the content of antenatal care services with highest awareness observed for urine test (83.3%) followed by blood test (82.2%). Uptake of ANC components was highest for tetanus toxoid ($\bar{x}$=2.2) followed by anti-malarial ($\bar{x}$=2.0) and blood test ($\bar{x}$=1.7). Religious centers ($\bar{x}$=2.31) received the highest patronage from mothers who attended antenatal care. Delay respondents faced at health centers before they received attention from service providers ranked as the highest constraint they faced in up-taking ANC services ($\bar{x}$=2.32). Significant relationship existed between respondents location (χ^2=15.89; p<0.05) and uptake of ANC. Efforts aimed at decreasing the existing wide gap between health workers and clientele ratio and to increase the number of health facilities providing antenatal services should be given urgent attention.

Key words: *Women, Maternal mortality, Antenatal care.*

BACKGROUND TO THE STUDY

Antenatal care (ANC) is an intensive care given to pregnant women at all stages of their gestation period. It is to monitor the mother and the feutus health condition to prevent any complication or risk of any infections. It is also done to discover any abnormality in the fetus for proper treatment. ANC offers excellent privilege for promoting maternal health. Antenatal care is a variable package of screening (through clinical evaluation and investigation) and treatments for pregnant women with the prime objective of prevention, early detection and treatment of complications in the mother and fetus, and the ultimate goal of optimizing maternal and prenatal health. It is also a clinical assessment of mother and fetus during pregnancy for the purpose of obtaining the best possible outcome for mother and child. To achieve this objective, medical history and examination are complemented by screening using combination of methods, including biochemical, hematological and ultrasound. Efforts are also made to maintain maternal, physical and mental wellbeing, prevent premature delivery, to anticipate difficulties and complications at delivery and to ensure the birth of live healthy infant. It assists couples in preparation for parenting.

Maternal deaths due to poor antenatal care services among rural women regularly go unreported and the burden is often underestimated. According to Seema Shah (2011), about 99% of the four million neonatal deaths and three million still births per year occur in developing countries. Out of the figure, Nigeria is adjudged to have the highest absolute number of newborn deaths among countries in Africa, accounting for 255,500 of the 912,000 neonates who die annually in Africa (The Nigeria Academy of Science, 2009). In addition to the heavy scourge of neonatal deaths and still births, about 55,000 of the estimated 500,000 of women who die each year from complications of pregnancy and childbirth come from Nigeria (NPC, 2003). Although, Oyo State is not the worst hit by these health problems, studies revealed that the state suffer the greatest set – back among others in the Southwest region of the country (Adegoke, Lawoyin, Ogundeji and Thomson, 2007).

The role of women in agricultural development is an important one. According to Odurukwe, Matthews-Njoku, and Ejiogu-Okereke (2006),

women produce a sizeable proportion of the food crops consumed in Nigeria, contribute a high proportion of the workforce and form an important link in the marketing chain. According to CTA (1993), women make up one third of the work force in Africa. They account for 70% of agricultural workers, 80% of food processors while; 60% - 90% of them are involved in marketing. According to Women in Development (Gbolagade, 1987), Nigerian women represent 70% of the agricultural labour force and thus produce much of the country's food. Women contribute mainly to subsistence agriculture in Nigeria and they constitute a great asset to peasant agriculture. Given the significant roles women play in agricultural production, the need to safeguard their health cannot be overemphasized.

The Nigerian Academy of Science (2009) argued that various health challenges of neonatal death, still birth and maternal mortality are traceable to ineffective antenatal care programmes among others. As a result of this scourge, Nigeria is confronted with the challenge of losing the major player in agricultural production. This is because women play active role in all levels of agricultural production and income generation for household survival. It is against the back-drop of the foregoing and the need to reverse the ugly trend that this study was carried out.

Objectives of the study

The general objective of the study is to determine the awareness and uptake of antenatal care services among women in Iddo Local Government Area of Oyo State. Specific Objectives include to:

1. determine the respondents' personal characteristics,
2. investigate respondents' level of awareness of ANC services in the study area,
3. identify the ANC service providers in the study area,
4. determine respondents' uptake of ANC services; and
5. ascertain constraints faced by women in accessing ANC services in the study area.

METHODOLOGY

The area of study is Iddo local government area of Oyo State. The major occupation of the people in this area is farming with cassava, maize, and yam as important staple crops cultivated. The population for the study comprised of all breast feeding mothers in Iddo local government area. This is because this group of respondents is anticipated to have a complete experience of ANC service and was adjudged as most appropriate in providing answers to the questions aimed at achieving the objectives of this study.

Iddo local government area comprises of fourteen communities out of which four communities were selected using simple random sampling technique. These include: Akufo, Ijokodo, Omi-adio and Awotan. In each of the selected communities, a list of all breast feeding mothers was generated using snow ball sampling technique. From the generated list, a representative proportion of the women were selected using simple random sampling technique to give a total sample size of ninety respondents. Primary data was used to fulfill the objective of this study. Data was collected with the aid of a structured questionnaire on respondents' personal characteristics, awareness and uptake of antenatal care service content, ANC service providers in the study area and constraints faced by mothers in accessing ANC services. Uptake of ANC contents was measured by asking respondents to indicate how frequently they received each of ANC service during their pregnancy period on a 3 point scale of never (1), sometimes (2) and always (3). Mean for each content was computed to determine extent of uptake. Respondents indicated the availability of ANC service providers in their area as yes and no. They further indicated extent of patronage for each provider as never (1), occasionally (2) and regularly (3). Data collected was summarized using descriptive statistics such as frequency counts, mean and percentages. Chi-square was used to test the hypothesis on relationship between respondents' personal characteristics and uptake of antenatal care services.

RESULTS AND DISCUSSION

Table 1 shows that an overwhelming proportion of the respondents (85.6%) were less than 40 years of age ($\bar{x}$=36.3) and majority were of the Islamic religious faith. The age distribution which showed that majority of respondents were young people is consistent with the report of Sule-Odu, Fakoya, Oluwole, Ogundahunsi, Olowu, Olanrewaju, Akesode, Dada and Sofekun (2008) that observe the mean age of mothers of child bearing age in Nigeria to be 27.5. About 78.8% had below secondary school education suggesting a poor level of education among the nursing mothers in the study area. This finding is consistent with the argument of Oniye (2009) that Nigerian women are educationally disadvantaged in terms of accessibility to formal education. Also, the findings implies that more efforts will be required to ensure adequate awareness and utilization of Antenatal care services among women given several studies which show a positive correlation between level of awareness and literacy (Nigerian Academy of Science, 2009;

Schillinger, 2002). For instance, Nigerian Academy of Science observed low attendance of Antenatal care among three-fifths of women with no education in their studies. More than half (55.6%) of mothers were traders and about 40.0% had a household size of between 4-6 members. This result implies that most of the mothers have had previous experience(s) of childbearing. This is expected to reflect in their awareness of antenatal care services and its benefits for both pregnant mothers and fetus.

TABLE 1
Personal characteristics of respondents

Variables	Freq.	Percent	Mean
Age (years): <30	26	28.9	
30-39	51	56.7	36.3
40-49	11	12.2	
≥50	2	2.2	
Religion : Christianity	35	38.9	
Islam	51	56.7	
Traditional worshippers	4	4.4	
Educational status			
Non-formal	12	13.3	
Adult literacy	21	23.3	
Primary education	38	42.2	
Secondary education	18	20.0	
Tertiary education	1	1.1	
Occupation			
Student	5	5.6	
Pensioner	2	2.2	
Full housewife	18	20.0	
Trader	50	55.6	
Others	15	16.7	
Household size: 1-3	49	54.4	
4 - 6	56	40.0	
Greater than 10	1	1.1	

Table 2a on respondents' awareness of antenatal care components shows that more than half of mothers were aware of each of the content of antenatal care services. Highest awareness was observed for urine test ($\bar{x}$=83.3%) followed by blood test ($\bar{x}$=82.2%), iron supplement, blood pressure check-up, health education/counseling and nutrition education ($\bar{x}$=81.1 respectively). Lowest awareness was observed for ultra sound ($\bar{x}$=63.3%). Table 2b on categorization of respondents based on their level of awareness however shows that majority (68.9%) had below the mean awareness score of 12.0. The result corroborates the argument of Ekabua and Njoku (2011) that awareness of antenatal care services is still poor among women of child bearing age in Nigeria. While the data on table 2a is impressive, the result on table 2b implies that more is still required to be done by various stakeholders of maternal and infant mortality issues in Nigeria to improve mothers' awareness of the various components of the antenatal service package.

TABLE 2a
Respondents' awareness of content of antenatal care services

S/N	Contents of ANC	Awareness
1.	Vaccines for pregnant women	72 (80.0%)
2.	Routine checkup (womb examination, position of the fetus)	72 (80.0%)
3.	Nutrition education	73 (81.1%)
4.	Scanning (ultra sound)	57(63.3%)
5.	Health Education/Counseling	73(81.1%)
6.	Blood pressure check up	73(81.1%)
7.	Urine test	75(83.3%)
8.	Blood test	74(82.2%)
9.	Iron supplement at the beginning of first attendance till date	73(81.1%)
10.	Anti-malaria treatment	62 (68.9%)

** Multiple responses*

TABLE 2b
Distribution of respondents based on their level of awareness

Level of awareness	Scores	Frequency	Percentage
High	12-20	28	31.1
Low	10-11	62	68.9

**Mean score =12*

Table 3a shows that uptake of antenatal care components was highest for tetanus toxoid ($\bar{x}$= 2.2) followed by anti-malarial ($\bar{x}$=2.0) and blood test ($\bar{x}$=1.7). Uptake was however lowest for information on signs of pregnancy complications ($\bar{x}$=1.4) and urine test ($\bar{x}$=1.5). This finding contradicts the report on similar study carried out by the Nigerian Academy of Science (2009) which indicates that 55.0% of mothers in the reviewed data received information about signs of pregnancy complications and that content of tetanus toxoid and anti-malarial were least up-taken by the mothers. Table 3b on respondents' categorization based on uptake of antenatal care contents reveals that majority (62.2%) fell below the average uptake level, an indication that uptake was generally low among the mothers in the study area.

TABLE 3a
Respondents uptake of antenatal care service content

S/N	Statements	Never (%)	Sometimes (%)	Always (%)	Mean
1	Information on signs of pregnancy complication	68(76.4)	8(8.9)	13(14.4)	1.4
2	BP check	52(57.8)	23(25.6)	15(16.7)	1.6
3	Urine Test	58(64.4)	17(18.9)	15(16.7)	1.5
4	Blood Test	47(52.2)	27(30.0)	16(17.8)	1.7
5	Iron supplement	57(63.3)	18(20.0)	14(15.6)	1.5
6	Anti-Malarial (IPT)	19(21.1)	50(55.6)	20(22.2)	2.0
7	Tetanus toxoid	9(10.0)	57(63.3)	24(26.7)	2.2

TABLE 3b
Distribution of respondents based on their uptake of ANC service content

Utilization	Scores	Freq	Percent
High	12-21	34	37.8
Low	7-11	56	62.2

** Mean score=11.8*

Figure 1 shows that religious centers ($\bar{x}$=2.31) received the highest patronage from mothers who attended antenatal care. This was followed by public health centers ($\bar{x}$=2.24). This finding show that antenatal care services rendered at religious centers has gained a wide popularity among mothers in the study area. This result gives credence to the assertion that most births in the developing world do not take place in hospitals (Wirawan and Linnan, 1994). The plausible reason for this may be explained by the traditional belief that pregnant women are prone to spiritual attacks arising from enemies and therefore need to be under constant spiritual watch in addition to the orthodox care which the antenatal care services offers. The considerable extent of patronage received by other alternatives to public health centers such as religious centers, traditional birth attendants and private midwives suggest the need for the relevant authority to evolve with a policy in order to integrate these alternative providers into the antennal care service framework through appropriate training and regulatory activities. This measure will ensure that the patrons of these alternatives also receive qualitative services like their counterparts who uptake the antenatal care services from government centers. This measure is also important against the backdrop of the inadequacy of public health workers (table 6) in the study area. Integrating the alternative providers within the service provision framework will thus provide the necessary backstopping for the few available hands in government health centers.

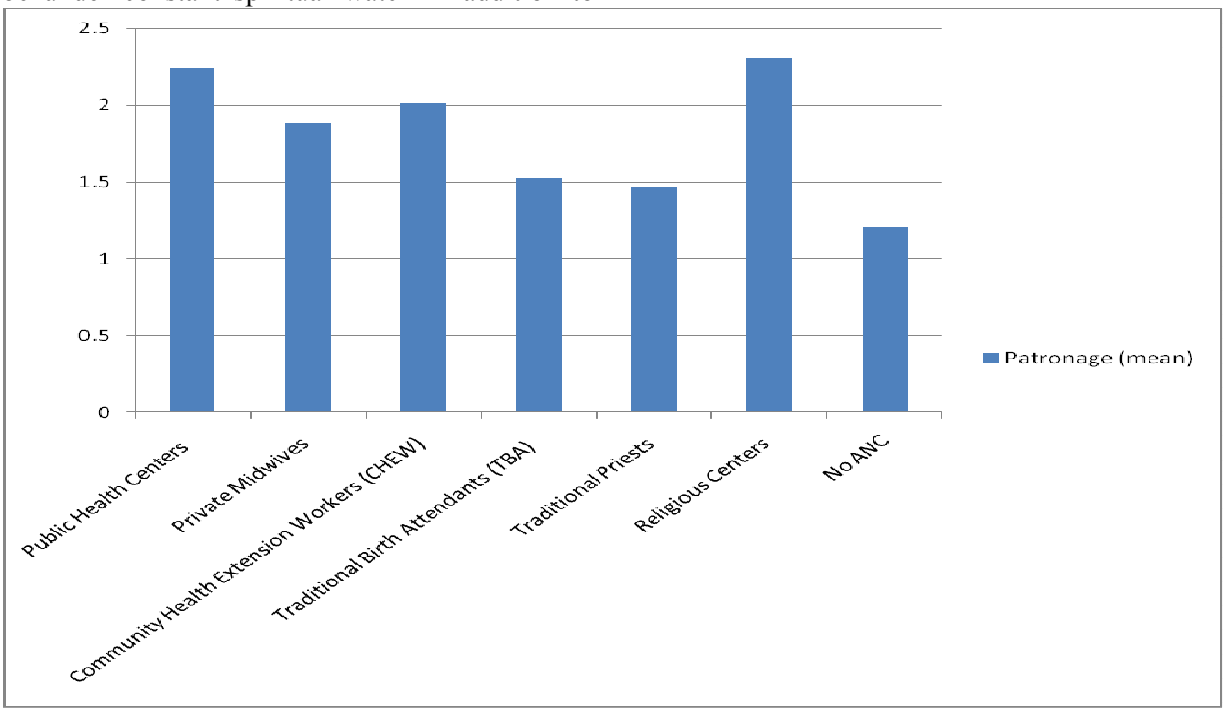

Figure 1: Patronage of antenatal service providers in the study area

Table 4 shows that delay respondents faced at health centers before they received attention from service providers ranked as the highest constraint they faced in uptake of antenatal care services (mean=2.32). This was followed by long distance between their residence and health centers (mean=2.04) and high cost of antenatal care services (mean=1.60). The finding on delay experienced at health centers as a major constraint is an indication that the ratio of health care service providers to clients is wide in the study area. This finding is in line with the argument of Adebimpe, Owolade and Adebimpe (2011) that there is dearth of skilled health care workers in Nigeria. Furthermore, findings on long distance between place of residence of mothers and health centers suggests that health centers where respondents can access antenatal services are not adequate in the study area. This might be another reason why most respondents utilized the religious centers and other non-governmental alternatives for antenatal care service uptake. The foregoing therefore indicates that efforts aimed at decreasing the existing wide gap between health workers and clientele ratio (through training and recruitment of more health workers) and increasing the number of health facilities providing antenatal services would translate in higher utilization of antenatal care services among mothers in the study area. On the other hand, poor antenatal care services and poor technical skills of health care providers (mean=1.2 respectively) ranked as low constraints among respondents. This suggests that these conditions or factors were not major reasons why mothers did not attend or uptake antenatal care services from government facilities.

TABLE 4
Constraints to uptake of ANC Services from government health facilities

S/N	Constraints	Mean	Rank
1	Poor antenatal care services	1.12	7
2	Poorly equipped health centers	1.16	5
3	Inadequate health personnel	1.16	5
4	Poor technical skills of health care providers	1.12	7
5	Lack of fund to access Antenatal services	1.39	4
6	High cost of Antenatal care services	1.60	3
7	Long distance between place of residence and health centers	2.04	2
8	Delay at health centers before getting attention	2.32	1

Table 5 shows a significant relationship between the mothers places of residence (location) and their uptake of antenatal care services (χ^2=15.89; $p<0.05$). This result implies that respondents who were closer to public health centers utilized antenatal care services more than others who are farther. This result corroborates the earlier findings of this study (table 4) that long distance between mothers residence and health centers was a major constraint to utilization of antenatal care services among the respondents. On the other hand, respondents' religion, education, household size and occupation had no significant relationship with their uptake of antenatal care services (χ^2= 2.55, 3.24, 0.925 and 4.30 respectively; $p>0.05$). This suggests that there is no religious bias towards antenatal care programme in the study area. It also implies that level of education of mothers and the type of occupation in which they engaged did not influence their decision to uptake antenatal care services. The non-significant relationship between education and uptake as observed in this study is however contrary to the findings of Nigerian Academy of Science (2009) that level of education of mothers affects their attendance of antenatal care. It can therefore be inferred that factors that influence attendance and utilization of antenatal care services at the national level may not be the same at local levels giving the possibilities of location specific differences. This observation is an indication that measures aimed at improving antenatal care attendance and utilization among mothers in Nigeria should consider factors relating to their location differences.

TABLE 5
Relationship between mothers' personal characteristics and uptake of ANC services

Variables	df	χ^2 value	p - value
Location of respondents	3	15.89	0.001*
Religion	2	2.55	0.280
Education	4	3.24	0.518
Household size	3	0.925	0.819
Occupation	4	4.30	0.367

*Significant at P≤0.05

CONCLUSION AND RECOMMENDATIONS

The study concludes that uptake of ante natal care services was low among mothers in the study area despite a generally high awareness of each of the content of antenatal care services among them. In addition, antenatal care services rendered at religious centers had gained a wide popularity among mothers in the study area. Delay respondents faced at health centers before they received attention from service providers and the distance between place of residence of mothers and health centers were major limitations that hindered utilization of ANC in public health centers. Efforts aimed at decreasing the existing wide gap between health workers and clientele ratio and to increase the number of health facilities providing antenatal services should be given urgent attention. Also, government should evolve a policy that would integrate alternative ANC providers (such as private midwives in religious centers, traditional birth attendants and traditional priests) into the antennal care service framework through appropriate training and regulatory activities.

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Effect of Credit Facility on Aquaculture Technology Adoption by Fish Farmers in Oyo State

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ABSTRACT

The development of aquaculture can only be enhanced by the introduction of modern technologies. The study was therefore aimed to identify effect of credit on aquaculture technologies adopted by fish farmers,. The study area is Oyo state. Questionnaires were administered to registered fish farmers under Oyo State Agricultural Development Programme (OYSADEP) through stratified sampling method. Clarias gariepinus (84.0%) and Oreochromise niloticus (42.0%) were the most common species cultured. Majority (85.0%) of the fish farms were located in the urban or peri-urban where they can easily access credit. Sources of fund for aquaculture production were personal (45.0%), cooperative loan (35.0%) and bank loan (20.0%). There was an increase in units of technologies used before and after credit such as increase in boreholes users, number of nursery pond, drag net for fish harvesting and pumping machines. Quantity of fish seed produced, increased from 400,000 pieces to 900, 000 fingerlings/juveniles. In terms of their perception, 71.0% of the fish farmers were convinced that credit has a positive effect on technology adoption and that loans from cooperatives are the best (63.0%). Results of the Chi-square statistics show that access to credit has a significant effect on income and production ($p< 0.05$). Most of the farmers have challenges with being able to access bank credit, due to poor feasibility studies and inadequate farm record keeping. Other constraints to acessing credit include high interest rates, short pay back period and limited credit sources.The success of modern fish farming business in Nigeria is dependent on technology adoption and credit. More credit should be made available to the fish farmers at reduced interest rate, to enable them purchase inputs for increased fish yield.

Keywords: *Credit, Fish farmers, Adoption, Technology, Aquaculture*

INTRODUCTION

The development of the aquaculture industry can only be enhanced by the introduction of modern technologies. Various aquaculture technologies available include production of fish seed, management of aquaculture systems, fish feed, integrated farming, waste and waste water management, fish harvesting method and processing. These technologies will help reduce the inefficiencies of man power thereby boosting the rate of production within a reasonable period. The adoption of these technologies depends on awareness and the financial status of the fish farmers.

In effort to improve the level of production, credit facilities were provided. According to Babale (2008), Nigerian Agriculture, Cooperative and Rural Development Bank (NACRDB) Limited was established by the Federal Government of Nigeria, in October, 2000 following the merger of the former People's Bank of Nigeria (PBN), the defunct Nigerian Agricultural Cooperative Bank (NACB) and the risk assets of the Family Economic Advancement Programme (FEAP). The bank was incorporated as a limited liability company registered under the Company and Allied Matters Act in 1973. The mandate of the bank is to deliver affordable credit facilities to the micro, small and medium scale enterprises in the agricultural sector and the food industry in particular. It is also mandated to mobilize savings from among its target clients and the economically disadvantaged Nigerians in the agricultural sector.

One major constraint to increased fish production in Nigeria as identified by Federal Department of Fisheries (FDF), (2000) cited by Omitoyin and Fregene (2008) is poor rate of capital formation and lack of credit facility. Lack of fund is a major challenge that has direct impact on the level of technology adoption. The awareness and adoption of modern technology is important in equating demand to supply and developing the aquaculture sector. The amount of fund available to the aquaculturist will determine the level of technology

they can adopt. Though the fish farmers are aware of these technologies, they do not have adequate fund to adopt.

Due to the fact that credit is one of the major factors in the development of aquaculture, several researches had been carried out on it. The work done by Alufohai (2006) examined the sustainability rates of co-operatives and NGOs in farm credit delivery in Edo and Delta States of Nigeria. It was observed that, the adoption of new technology is a vital tool in development. This is because majority of the fish farmers are poor, therefore access to credit will enhance adoption of developed and improved technology. Although, researches has been carried out on the various sources of credit, its effect on the socio economic status of farmers and fisher men, its effect on the level of technology adoption is yet to be determined. The study was therefore aimed to identify sources of credit, aquaculture technologies adopted by fish farmers, estimate the relationship between aquaculture technologies adopted and access to credit, effect of credit and technology adoption on the total output among fish farmers in Oyo state.

Methodology

The study area is Oyo state. Oyo state is an inland state in south-west Nigeria and Ibadan is its capital. Oyo state covers 35,742.84 Km^2 with a population of 6,617,720 (NPC, 2006). The total number of registered fish farms under Oyo State Agricultural Development Programme (OYSADEP) and their locations was obtained from State Department of Fisheries in the state. There are thirty-three local government areas (referred to as blocks in the OYSADEP classification) in Oyo state. The local government areas (blocks) are grouped into four zones. Stratified random sampling was used to select proportionally from each zone to make up the targeted number of 100 being 23.2% of 431 fish farms registered in OYSADEP, Oyo state (Table 1). Questionnaires were administered to the fish farmers with assistance of the extension agents. Descriptive and inferential statistics were used for the analysis of data. Descriptive statistics used includes frequency counts and percentage, while inferential statistics are chi-square and regression.

RESULT AND DISCUSSION

Socioeconomic characteristics of fish farmers

Table 1 shows that 22.0% of the fish farmers were female, while 78.0% were males in the sample population. This implies that, more males engage in fish farming than females. Almost half (44.0%) were between 31 to 40 years of age, 39.0% fell between 41 to 50 years and 12.0% were above 50 years. Majority (93%) were married therefore have the possibility of making use of family labour and this will result to reduced cost of production. One-third 935.0%) had educational level below secondary education, while 45.0% had above and 20.0% attained tertiary education. The low level of education of the farmers could be responsible for most of the farmers having difficulty in accessing bank credit, due to poor feasibility studies and inadequate farm record keeping. The dominant religion was Christianity and 89.2% of them had 1 to 2 wives. Majority (79%) had fish farming as primary occupation while 21.0% as secondary and 59.0% earned above ₦100, 000 as annual income.

Aquaculture Technologies Adopted by Fish Farmers in Oyo State

More (82.0%) fish farmers used earthen pond compared to 53.0% that used concrete tank for culturing fish (Table 2). This indicates that, most farmers made use of earthen pond due to low cost of construction and good quality output as a result of availability of natural food i.e. planktons. Concrete tanks are used because it is easier to handle in terms of management, harvesting and test cropping. There are few (35.0%) that have both earthen pond and concrete tanks. The most common water exchange method for table size fish production was static water removal (100.0%) due to unreliable power supply which is required for water re-circulatory system. Water quality management is mostly done with the aid of pH meter (49.0%) and few (24.0%) test for oxygen.

Clarias gariepinus and *Oreochromis niloticus* are the most common species cultured, 84.0% and 42.0% respectively. This shows that some of the farmers practiced polyculture. Most of them adopted the culture of Tilapia for obvious reason (15.0%) being that they mature in 4 to 5 months with good output quality (15%), while majority culture *Clarias gariepinus* based on ease of handling (15.0%) in terms of hardiness and good quality output (15.0%). Other species cultured is *Heterotis niloticus*. Fish farmers prefer juvenile (65.0%) for stocking than fingerlings (35.0%). This is due to obvious advantage (relative large size), they tend to have higher survival rate than fingerlings and as such they are easy to adopt, handle and have good output quality. Only 44.0% of the fish farmers bred their own fish seed. This is because most of them lack the technical knowhow. Those that breed do it based on the low cost of breeding compared to buying fish seed and good output quality. In a study by Fregene and Aweto (2008) in Osun State, they observed that major problems confronting fish farmers are lack of capital and reliable sources of fingerlings (48.0%) among several others. Fish breeding (16.1%) and harvesting by pumping technology (14.5%) were

among the least adopted by the fish farmers. This could be due to the fact that some of the technologies are complex, costly and inadequately supplied (Fregene and Nwogu, 2010).

TABLE 1
Socioeconomic characteristics of fish farmers

Socioeconomic Variables	Frequency	Percentage
Gender: Female	22	22
Male	78	78
Age		
21-30	5	5
31-40	44	44
41-50	39	39
51-60	10	10
>60	2	2
Marital Status		
Single	5	5
Married	93	93
Divorced	2	2
Educational Qualification		
None Formal	20	20
Primary	15	15
Secondary	45	45
Tertiary	20	20
Religion		
Christianity	72	72
Islam	27	27
Others	1	1
Number of Wives		
None	7	7
1-2	83	83
3-4	10	10
Primary Sources of Income		
Fish Farming	79	79
Trading	18	18
Others	3	3
Secondary Sources of Income		
Fish Farming	21	21
Trading	76	76
Others	3	3
Annual Income		
< 50, 000	3	3
50, 000- 100, 000	38	38
>100, 000	59	59

TABLE 2
Distribution of aquaculture technologies adopted by fish farmers in Oyo State and reasons for adoption

Technologies	Frequency	Percentage (%)	Reason Adoption (Frequency)
Fish Enclosure			
Earthen pond	82	82.0	1* (33), 2* (12), 4* (24), 5*(84)
Concrete tank	53	53.0	3* (27), 4* (7)
Culture system			
Static system	100	100.0	1* (80), 4* (15)
Flow through system	17	17.0	2* (10)
Water recirculatory	1	1.0	5* (1)
Water quality management			
Use of pH meter	49	49.0	2* (8), 3* (26)
Testing for oxygen	24	24.0	-
Integrated farming			
Vegetable/rice cum fish	5	5.0	2* (5)
Poultry/piggery cum fish	5	5.0	2* (5)
Weed Control			
Manual	92	92.0	1* (41), 4* (19), 5* (13)
Chemical	1	1.0	-
Biology	1	1.0	-
Fish Feed			
Compounded	71	71.0	1* (32), 4* (4)
Floating feed	64	64.0	5* (39)
Maggot	80	80.0	1* (35), 5* (26)
Effluent Disposal			
Public drainage	97	97.0	1* (40), 4(19)
Soak away	3	3.0	-
Fish species cultured			
Tilapia spp	42	42.0	2* (15), 5* (15)
Clarias gariepinus	84	84.0	5* (40), 3*(7)
Others	4	4.0	2* (40)

Harvesting System			
Drag net	78	78.0	4* (17)
Pumping draining	13	13.0	-
Fish stock selectivity			
Fingerlings	35	35.0	2* (6), 4*(7), 5*(10)
Juvenile	65	65.0	2* (15), 3* (22), 4* (4), 5* (17)
Fish breeding	44	44.0	1* (11), 5*(30)
Total	**100**	**100.0**	

Key: the figures with asterisk represent the reasons for adoption**;**
1* = low cost, 2*= Obvious advantage, 3* = ease of handling, 4* = easy to adopt and 5* = good quality output. The numbers in parentheses represent the frequency..

Harvesting is mainly done using drag net (78.0%), others use pumping machine (13.0%) for total draining of the water. Vegetable/rice cum fish and poultry cum fish are the main form of integrated fish farming practiced by 10.0%. Weed Control is done manually (92.0%). The use of chemicals for weed control is discouraged in order to prevent contamination of the pond water with the chemicals most especially, during rainy season (Fregene and Ayodele, 2003). Majority of the fish farmers (71.0%) feed their fish with compounded feed and maggot (80.0%), but 60% use floating feed mainly. Waste is majorly disposed by public drainage (97.0%) is and very few (3.0%) used soak away. The waste water is collected and used for wetting vegetables.

Fish farmers' sources of credit, production and aquaculture technology adopted

In Table 3, personal savings (45.0%) was a main source of credit, 20% secured loan from banks and 35.0% from cooperatives. Majority of those who used their personal savings are those that saved as much as ₦ 200,000. More farmers (10.0%) seeking for for fund from formal financial institutions applied for loan from banks only when the capital needed is high (₦ 200,000) and cannot be easily obtained from other sources. This could be due to high interest rate (18.0 – 21.0%) by banks. Most of the loan (35.0%) obtained is from the Cooperative and this could be due to low interest rate attached. According to Aryeetey (1997), farmers get their fund from different sources, such as personal savings or loans from family, friends, fish farmers' cooperatives and banks.

Sources of credit available to fish farmers in Oyo state include microfinance banks, Cooperatives and the Nigerian Agriculture, Cooperative and Rural Development Bank (NACRDB) Limited at Total Garden Oyo state. The major cooperatives are the Agricultural credit cooperative, Multi-purpose Cooperative Society and Catfish Farmers' Association of Nigeria (CAFAN) Oyo state.

Technology adoption before and after Credit

Table 4 presents the units of technologies adopted before and after credit. There were only 30 boreholes users in the whole sample population before obtaining credit. After credit it increased to 39. The few units prior to obtaining credit could be due to insufficient capital. This also applies to the other technologies. Number of nursery pond increased from 40 to 60 units and the use of other rearing facilities increased from 30 to 40. Harvesting nets, which included drag net, and hand, increased from 100 to 150 units. It was observed that out of the 100 nets, 60 were drag nets. Most of the fish farmers rented drag nets at the inception of the farm. There was also an increase in fish seed production as a result of credit obtained. The quantity produced was 400,000 pieces; it increased to 900,000 fingerlings or juvenile as the case may be. During this research, it was observed that majority of the fish farmers obtained their water from surface water bodies e.g. rivers, streams and lakes. The water is channeled into reservoirs or directly into the ponds, such that, the pond is often impounded and drained by gravity. This could be the reason for few numbers of pumping machine i.e. 45 units, although it increased to 56 units, but only one re-circulatory system was found.

TABLE 3
Distribution of fish farmers by sources of funds

Sources of fund (₦)	Interest rate	Frequency	Percentage
Personal Savings			
Less than 100,000	-	12	12.0
100,000 – 200, 000		25	25.0
More than 200,000		8	8.0
Sub-total for personal savings		45	45.0
Cooperative loan	10 – 12%		
Less than 100,000		12	12.0
100,000 – 200, 000		13	13.0
More than 200,000		10	10.0
Sub-total for cooperative loan		35	35.0
Bank Loan	18 – 21%		
Less than 100,000		4	4.0
100,000 – 200,000		6	6.0
More than 200,000		10	10.0
Sub-total for bank		20	20.0
Grand Total		100	100.0

TABLE 4
Distribution of technology adoption before and after credit

Technologies	Unit before credit	Units after credit
Borehole	30	39
Nursery pond	40	60
Production pond	500	550
Concrete tanks	200	250
Other rearing containers	30	40
Harvesting nets	100	150
Pumping machine	45	56
Fish breeding (fish seed)	400,000	900,000
Water re-circulatory system	1	1

Constraints of access to credit

The growth of the aquaculture industry has been confronted by several challenges as perceived by fish farmers to accessing credit (Table 5). Although, there was no response (36.0%) from some of the fish farmers, especially those that had no access to credit (33.0%), 17.0% believed that high interest rate was a major constrain and 16.0% indicated limited credit sources. Flores (2004) corroborating this assertion that institutional credit if made available to farmers could ameliorate some of the farmers problems such as small farm size, low output, low income and low social –economic status. It can also relieve farmers of the excess interest impose on them by the informal creditors who usually charge high interest rate of between 100.0-300.0 % per annum.

Others were short payback period (15.0%), unavailability of collateral (9.0%) and delay in the release of loan (7.0%). All these factors were as a result of the unpredictable nature of aquaculture production. This has to do with its yield which could be affected by several unforeseen factors such as disease outbreak, flooding, theft etc. Another factor is the literacy level. Most farmers are not well educated to be able to prepare a viable business proposal and a good farm accounting record which the banks often requested for and this has reduced the available credit sources.

It has been observed that, the highest source of credit is from the cooperatives, which may be because of the high interest rate of bank loans. The unpredictable nature of aquaculture product also made it difficult for the farmer to meet up with the short payback period and high interest rate. Due to the low resource control of fish farmers, very few can afford the collateral demanded by banks.

Presently most fish farmers are aware of most of these technologies but the major challenge is the purchasing power of the fish farmers which is based on their financial status. Fregene and Digun-Aweto (2008) observed that though the fish farmers are aware of these technologies, they

do not have adequate fund to adopt. Therefore the inability of farmers to afford technologies extended to them has made some fish farmers to abandon their ponds.

TABLE 5
Distribution of constraints of accessing credit

	Frequency	Percentage
Overall		
No response	36	36.0
Unavailability of collateral	9	9.0
Delay in the release of loan	7	7.0
High interest rate	17	17.0
Short payback period	15	15.0
Limited credit sources	16	16.0
Total	100	100.0

Relationship between access to credit and number of technologies adopted, fish production and income

The result of the Chi-square in Table 6 reveals that access to credit was significantly related to number of technologies adopted ($P < 0.1$), fish production and income after access to credit ($P< 0.05$). This implies that fish farms that have access to credit are likely to adopt more technology, thereby resulting in increase fish production and subsequently increase income.

TABLE 6
Result of Chi square analysis of farmers' access to credit and technology adoption, fish production and farmers' income

Variables	Chi square	df	p
Number of technology adopted	4.807	2	0.090*
Fish production after credit	10.411	3	0.015**
Income after access to credit	7.966	2	0.019**

* P < 0.10 ** P < 0.05

Regression results in Table 7 show that year of establishment ($P < 0.005$) and income ($P < 0.01$) had a significant effect on access to credit. Owners of fish farms that have been established for many years prefer the traditional methods of production and are reluctant to adopt new technologies. This may hinder their chances of being granted credit because they may not be able to pay. But fish farmers with high income level have better chances of obtaining credit because creditor tends to believe they are capable of paying back. Therefore, the null hypothesis is rejected.

TABLE 7
Regression analysis for relationship between socioeconomic characteristics and access to credit

Variables	Coefficient	t	p
Constant	0.005	- 0.024	0.981
Education	- 0.034	- 0.344	0.731
Fish farmers experience	0.084	0.862	0.391
Year of establishment	- 0.217	- 2.236	0.028**
Annual Income	0.371	3.680	0.000***
Household size	0.141	1.392	0.168

$R^2 = 0.230$, Adjusted $R^2 = 0.184$, ** P < 0.005 and *** P < 0.01

CONCLUSION AND RECOMMENDATION

The development of aquaculture is dependent on technology adoption and credit. Most of the fish farmers are aware of the technologies but only a few have the purchasing power. Those who have access to credit have the advantage of adopting more technology than their counterparts. Although most fish farmers are willing to access credit, sources of credit are limited and there are other conditions attached. Access to credit has improved the level of technology adoption and increased annual fish production. Due to the vast nature of aquaculture production input, more credit should be made available to the fish farmers. Commercial banks should be encouraged to invest in fish farming by allocating more loans and more credit institutions should be set up. If the loan will be useful to fish farmers, reduced interest rate and affordable collateral should be demanded. Fish farmers' loan should be released on time and the payback time should commence at least two years after the loan has been given in order to prevent unnecessary disappointment in pay back.

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Comparative Response of Cowpea to Different Levels of Mineral P Fertilizer and Organic Residues

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ABSTRACT

Organic residues had been identified has having the potential to replace mineral fertilizers as cheap source of nutrients for cultivated crops. Pot experiment was conducted at the Department of Agronomy, Ladoke Akintola University of Technology, Ogbomoso, Nigeria to determine the comparative response of cowpea to different levels of mineral P fertilizer and organic residues. The experiment which was laid out as completely randomized design replicated four times had Pueraria, Mucuna, Tithonia compost, cow dung, goat and poultry manures as the organic residues each applied at 5tDM/ha. Single super phosphate was applied at 15, 30, 45, and 60 kg P_2O_5/ha. Pots without mineral fertilizer and residues were included for comparison.

Poultry manure, Tithonia compost and Mucuna residues produced cowpea grain weights that were comparable to those observed for the mineral P fertilizer treatments but significantly higher than what was obtained for cow dung and Pueraria residues. Similarly, shoot weight obtained for pots that received mineral P fertilizer was not significantly ($P \geq 0.05$) different from that recorded for pots that had poultry manure and Tithonia compost treatments. Generally, pots that received organic residues amendments had higher shoot P content than those that received mineral P fertilizer. Shoot P content was significantly highest in cow dung treatment (2.57%) and lowest in pot without any amendment (0.78%). Grain P was significantly higher in pots that had poultry manure treatment (7.51%) than other treatments. Cow dung (3.33%) and Goat manure (3.77%) had significantly lowest grain P content. Shoot P uptake did not differ among the treatments whereas; grain P uptake was significantly highest in poultry manure treatment (21.53 mgP/pot) while goat manure had the least value (6.73 mgP/pot). Total P uptake was significantly higher in poultry manure (27.20 mgP/pot) and Tithonia compost (19.82 mgP/pot) treatments compared with any of the mineral P fertilizer treatments and the other organic residues amendments. From the results presented, poultry manure and Tithonia compost can serve as alternative source of P for cowpea production.

***Keywords**: Cowpea, grain weight , Organic residues, P uptake, single super phosphate,*

INTRODUCTION

Cowpea is an important grain legume in the tropics. It is cultivated on 10 million hectares in central and western Africa where it serves as major source of dietary protein for man (Muleba *et al* .,1997) with its residue as feed for livestock (Fatokun, 2002). This crop is known for its ability to fix atmospheric nitrogen into the soil thus making it a valuable crop for African farmers who struggle with their inherently poor soils (Abayomi *et al*., 2008) in terms of presence of low activity clay, high phosphorus fixation rate (Ahiabor and Hirata, 2003), high nutrient leaching intensity among others. The optimum production of this crop is hindered by poor soil nutrient status especially phosphorus, pests and diseases. The role of phosphorus in plant nutrition cannot be overemphasized as it participates in a wide range of physiological and biochemical processes which culminate in improve performance and yield of plants. This made it to be needed by plant in relatively large quantities along side with nitrogen. Tropical soils are inherently low in phosphorus (Norman *et al*., 1995; Adetunji, 1995) as a result of high P fixation aggravated by poor soil, water and nutrient management practices. Phosphorus has been reported to be critical in cowpea production for nodule formation towards symbiotic N-fixation (Magani and Kuchinda, 2009), improving seed quality and over all yield (Kolawole *et al.,* 2002; Owolade *et al.,* 2006). This therefore calls for need of phosphorus application to ensure sustainable cowpea production (Akande *et al.,* 2005). The conventional agriculture that utilizes synthetic

fertilizer has in recent times being receiving attention from researchers in finding ways of replacing it with system that uses nutrient sources that are of organic origin as a result high cost of procurement (Akande *et al.,* 2005) and environmental threat associated with the use of these chemicals (Mohamed and Abdelnaser, 2010). The use of organic ameliorants which include green manure, animal manure and crop residues on soils had been reported by many authors to enrich the soil with organic matter which improve soil physical properties such a water infiltration, aeration and tilth (Mohamed and Abdelnaser, 2010), react with clay minerals and reduce P sorption characteristics of the soil thereby making more P available for plant use (Hue 1990; 1991), be effective in the control of root knot nematode of leguminous crops which has direct effect on the activities of symbiotic bacteria, grain yield, seed protein content among others. The present work aimed at investigating the possibility of using organic residues as alternatives to synthetic P fertilizers for sustainable cowpea production.

MATERIALS AND METHODS

A pot trial was conducted in the screen house at Ladoke Akintola University of Technology (LAUTECH), Ogbomoso Oyo state (8˚10'N; 4˚10'E), in the southern Guinea savanna of Nigeria. The study was carried out between May and July 2009. Surface soil samples (0-15 cm) were collected from the Teaching and Research Farm and composite soil sample was taken from the whole lot. This was air dried, passed through 2mm sieve and analyzed for its physical and chemical properties.

Soil analyses

The soil particle size distribution was determined by hydrometer method (Bouyoucos, 1951). The soil pH (1:1 soil/water) was determined using a glass electrode pH meter. The soil organic matter was determined by method described by Walkley and Black (1934) and total nitrogen by Kjeldahl method. Available phosphorus was extracted by Mehlich extractant and its concentration determined colourimetrically. Exchangeable cations were extracted by NH_4OAc and concentration of Mg and Ca read on the Atomic absorption spectrophotometry while Na and K were determined using the flame photometer. The physiochemical properties of the soil used is presented in Table 1.

TABLE 1
Physical and chemical properties of the soil used for the experiment

Soil Properties	Value
Sand (%)	73.0
Clay (%)	16.0
Silt (%)	11.0
pH (H_2O)	6.5
Total N (g/kg)	0.10
Avail P (mg/kg)	4.04
Ca (cmol/kg)	2.17
Mg (cmol/kg)	0.96
K (cmol/kg)	0.15
Na (cmol/kg)	0.20
Organic Carbon (g/kg)	1.5

Treatments and experimental design

The experiment had *Pueraria phaseoloides* (PP), *Mucuna pruriens* (MP), Tithonia compost (TC), Cow dung (CD), Goat manure (GM) and Poultry manure (PM) as the organic residues with each applied at 5 t/ha (equivalent to 5 g/pot) and Single super phosphate (SSP) was used as the inorganic P source and was applied to appropriate pots at 15, 30, 45 and 60 kg P_2O_5/ha (equivalent to 0.08, 0.17, 0.25 and 0.33 g P_2O_5/2kg soil). A control which received neither SSP nor organic residue was included for comparison. The eleven treatments were replicated four times. Samples of the organic residues were prepared prior to application by oven drying at 70˚C for 72 hour, powdered in a willy mill and analyzed for their N, P and K contents. The chemical compositions of the residues are presented in Table 2. Two kilogram soil each was weighed into 11 pots representing each treatment with four replications to make 44 pots which were laid out in a completely randomized block design. Three cowpea seeds (Variety TVX 3236) were sown per pot and the seedlings were later thinned to one plant/pot at 2 weeks after planting (WAP). Watering was done daily, weeds were controlled by hand pulling of any emerged weed and left inside the pot to decompose. Insect pests were controlled using karate.

TABLE 2
Nitrogen, P and K contents of the organic materials used for the experiment

Organic residues	N (%)	P (%)	K (%)
Pueraria	3.21	1.07	2.41
Mucuna	2.93	1.15	2.58
Tithonia compost	2.26	0.95	2.13
Cow dung	2.72	0.97	1.85
Goat manure	3.03	1.29	1.97
Poultry manure	2.98	1.31	2.34

Data collection

Data were collected on plant height (3, 6 and 9 WAP), grain and shoot weight taken at maturity. The grain and shoot were later subjected to tissue analysis for the determination of percentage P content using the vanado molybdate method. The grain and shoot P uptake were then estimated from the product of individual percentage P and individual weight while total P uptake was taken as the sum of the shoot and grain P uptake. The data were subjected to analysis of variance using SAS statistical package with significant means separated by LSD at 5% probability level.

RESULTS

Plant height

Plant height was highest in plants that received 60 kg P_2O_5/ha (although not statistically different from other treatments except from the control) as shown in Table 3.

Grain and shoot weights

The grain yield obtained from some organic residues (PM, TC and MP) are highly comparable to those of inorganic P source and sometimes better (Table 3). The performance of GM, CD and PP were considerably low. Grain yield was highest with PM (2.85 g/plant) followed closely by TC (2.78 g/plant). The yield from PM was comparable though not statistically different from all the mineral P treatments with PM and TC producing 21 and 18% grain yield increment respectively over the highest SSP rate (60 kg/ha). Least yield was observed for PP (1.33 g/plant). Shoot weight on the other hand was highest with 60 kg/ha (5.5 g/plant) but not statistical different from other treatments except CD, PP and control.

TABLE 3

Effect of organic residues and inorganic P fertilizer on height and yield parameters of cowpea

	Height				
	3WAP	6WAP	9WAP		
Treatments	----------(cm)----------			Grain weight(g/plant)	Shoot Weight(g/plant)
Poultry manure	18.03	42.63	74.4	2.85	4.56
Tithonia compost	16.88	44.88	80.53	2.78	3.83
Mucuna	15.86	47.13	66.85	2.68	3.08
Goat manure	18.80	45.63	66.53	1.96	3.35
Cow dung	15.58	37.75	54.65	1.80	2.38
Pueraria	14.68	39.73	65.8	1.33	2.10
0 SSP	17.58	26.45	46.45	2.43	2.13
15 SSP	16.18	31.28	63.93	2.55	3.75
30 SSP	18.38	35.53	63.15	2.08	3.73
45 SSP	17.43	30.8	70.7	2.55	4.06
60 SSP	18.93	54.2	82.53	2.35	5.5
LSD(0.05)	4.00	24.57	36.55	1.00	2.00

Phosphorus contents and uptake

Phosphorus content in the grain varied significantly among organic residue treatments while those of mineral P were not significantly different (Table 4). PM recorded the highest grain P content (7.51%) which was statistically superior to all the mineral P treatments. Least grain P content was obtained from GM and CD pots. Shoot P however was statistically the same among all treatments. Grain P uptake in PM was statistically superior (21.53mg/plant) to all other treatments with least performance from CD, GM and PP. Shoot P uptake did not vary statistically whether plant received organic or inorganic treatments.

TABLE 4
Effect of organic residues and inorganic P fertilizer on phosphorus contents and uptake of cowpea

Treatments	Shoot P (%)	Grain P (%)	Shoot P uptake (mg/plant)	Grain P uptake (mg/plant)	Total P uptake (mg/plant)
Poultry manure	1.33	7.51	5.67	21.53	27.2
Tithonia compost	1.51	5.16	6.05	13.74	18.82
Mucuna	1.32	5.91	3.43	11.73	15.15
Goat manure	1.13	3.77	3.85	6.73	10.58
Cow dung	2.27	3.33	6.34	7.05	13.38
Pueraria	1.45	5.18	3.32	6.98	10.30
0 SSP	0.78	5.11	2.16	13.96	16.12
15 SSP	1.20	5.39	5.19	12.94	18.13
30 SSP	1.07	5.74	4.19	12.32	16.51
45 SSP	1.11	5.01	4.42	13.61	18.04
60 SSP	0.93	5.4	5.78	12.78	18.56
LSD(0.05)	0.55	0.91	4.56	5.46	8.00

DISCUSSION

The early head start of cowpea in terms of plant height at 6WAP observed for organic treatments compared with SSP treatments could be due to the fact that organic residues do not only release phosphorus but also nitrogen and other nutrient elements essential for plant growth. The N from organic residues was probably used by cowpea at the early stage for vegetative growth, development of rooting system and nodule formation before they could start to produce required nitrogen via symbiotic N-fixation unlike SSP that supplies only phosphorus since no initial N fertilizer was applied in this trial. Nevertheless, the inherent nutrient release pattern of individual organic residue regardless of their initial N and P contents might have been responsible for the variations observed for the organic residues in their potential suitability for use as alternative P source for cowpea cultivation. Similar low performance for some organic residues (especially for CD) had been reported by Kumari and Ushkumari (2002) as a result of slow nutrient release to plants by this manure. PM and TC gave best performance across all the parameters considered. The high initial P content of the PM (1.31%) and probably nutrient release pattern in synchrony with plant demand might have contributed to their superior performances over other treatments. Significant benefits have been reported for use of organic residues in terms of nutrient supply to both planted and successive crops (Muir, 2001; Sullivan *et al*., 2002; Barbarick and Ippolito, 2003; Cuevas *et al*., 2003; Daudén and Quílez, 2004). Poultry manure has been found to be similar to mineral fertilizer in its ability to supply N and the other major nutrients to silage maize grown on a Typic Melanoxerands soil (Hirzel *et al*., 2007). The lack of response of cowpea yield parameters to mineral P treatments is surprising, despite the low inherent available P status of the soil used for the experiment. Under low P soil conditions, P application has been reported to increase the yield of cowpea (Cassman *et al*., 1981; Okeleye and Okelana, 1997; Vanlauwe *et al*., 2001). However, using a low P soil (4.9 ppm Olsen P) Ssali and Keya (1984) found that P application had no effect on neither N_2-fixation nor dry matter production of mono cropped cowpea in the field. It is likely that the soil under study had high P sorption intensity which might make the added inorganic P unavailable for plant uptake. Unlike inorganic P fertilizers, on decomposition, organic P in green manure tissues could provide a relatively labile pool of P to succeeding crops, thus providing a larger pool of mineralizable soil organic P to supplement soluble inorganic P pools (e.g. Tiessen *et al*., 1994)

The result of this present study therefore showed that of all the organic residues investigated, poultry manure and tithonia compost can serve as an alternative source of P for sustainable cowpea production in terms better crop yield and quality.

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Comparative Use of ICTs Among Extension Workers in Research Institutes, Public and Private Extension Agencies in Oyo State.

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ABSTRACT

The study determined the extent of use of ICTs among extension workers in research institutes, Public (ADP) and the Private extension agencies in Oyo State. Simple random sampling technique was used to select 80% of the respondents from each extension agency to make up a sample size of 123 respondents for the study. A structured questionnaire was then administered to collect relevant data. The data collected were analyzed using descriptive and inferential statistics. About half (49.6%) of the respondents fell within the ages of 30-39, while one-third (33.3%) were within the ages of 40-49. Majority (35.0%) of the respondents had B.Sc and M.sc degrees (30.9%). About two-third (68.3%) of the respondents had a working experience of between 1-10 years. Almost all the extension workers in the ADP (97.6%), in the private extension agencies (100.0%) and in research institutes (87.5%) owned and used mobile phones for their official duties. Inadequate electricity (77.2%) and high cost of ICT materials (61.8%) were the major constraints faced by extension workers in the use of ICTs. There was a significant difference in the extent of use of ICTs among extension workers in the public (ADP), private and research institutes. The private extension agencies were found to be more ICT inclined than the extension workers in the research institutes and the ADP. Therefore, training and retraining of extension staff especially in the area of ICT utilization should be encouraged.

Keywords: Private extension, ICT use among extension workers.

INTRODUCTION.

The use of ICTs is fast gaining grounds in developing countries, and is being applied in several fields of human endeavor including agriculture. ICT has been used in recent times to solve agricultural related problems ranging from site selection to sale of farm produces in many parts of the world. (Stienen *et al*.2007). Michels and Vancrowther (2001), defined ICTs as a range of electronic technologies which when converged in a new configuration are flexible, adaptable, enabling and capable of transforming organizations and redefining social relations. Information communication technologies (ICTs) are set of activities that facilitate the capturing, storage, processing, transmission and display of information by electronic means (Olowokere, 2006). According to Hafkin and Odame (2002), ICTs are individual or set of technologies that include both new and old equipment for human and digital communication. From these definitions, ICTs can be seen as a collection of electronic devices which can be used individually or collectively for communication purposes either by individuals, groups, communities or organizations.

Kiplang'at (2003) affirms that ICTs have become a driving force in development, providing a means of narrowing the information gap between developed and developing countries. The accessibility to information which is made readily available by ICTs has helped in moulding our attitudes towards life, as there is more information about certain aspects of life including the agricultural sector (Spore, 2004). ICT adoption has aided the rapid spread of human attitude, knowledge and skills between and among local and international communities. Problem solving has been made much easier with the use of ICTs. In fact, most agricultural related problems especially in the developed and technologically advanced countries rely on ICTs for solution.

Akinbile and Alabi (2010) asserted that the incorporation of ICTs in fish farming enterprise, will further boost production, increase market access and ultimately increase the income generation potentials of fish farmers in Oyo state and in Nigeria as a whole. (Yusuf 2005) stated

that the field of agriculture has not been unaffected by the penetrating influence of ICT. Several advances have been made to incorporate ICTs into Agriculture with most of them recording a very high level of success.

However, organizational differences especially in the mode of operation and the activities they involve in, can lead to significant differences in ICT literacy level between individuals in different organizations and even among individuals in the same organization. It is evident that individuals, who are exposed to different ICTs by the nature of their work, tend to be more ICT inclined. This study was therefore designed to compare the extent of use of ICTs among extension workers in the public (ADP), Private and research institutes in Oyo State.

METHODOLOGY

For the purpose of this study, extension workers were classified into three groups; Public (ADP) extension, Private extension and Research Institutes. Simple random sampling technique was employed to select respondents from each extension group. Eighty percent of the extension workers from research institutes (23), private extension agencies (29) and OYSADEP (71) were selected to make up a sample of 123 respondents for the study. The respondents indicated their extent of use of each of the relevant ICTs using (Always, Sometimes and Never). Extent of ICT use was computed through the frequency and number of specific ICT components utilized. Analysis of Variance was carried out to compare the extent of use among the groups.

RESULTS AND DISCUSSION

From the results on Table 1, (49.6%) of the respondents fell between the ages of 30-39, while (33.3%) were between the ages of 40-49. This indicates that a good majority of the respondents are within the middle age class. This trend may have significant implication for ICTs usage since the elderly might be less interested in using hi-tech communication devices and prefer oral to printed information channels which are less efficient (Agwu and Chah, 2007). Information on the ediucational qualifications of the respondents reveals that (35.0%) of the respondents were B.sc holders, while (30.9%) were M.sc holders. This indicates that the respondents are well read and are capable of harnessing the enormous potentials of (ICTs) in the dissemination of Agricultural information (Agwu and Chah, 2007).

From data on working experience, (68.3%) of the respondents had working experience of between 1-10 years, while (26.0%) had working experience of between 11-20 years. Majority of the respondents had long years of working experience which implies that they must have been exposed to various ICTs, and must have gained a lot of operational experiences over the years (Agwu and Chah, 2007)

TABLE 1
Distribution of Respondents according to their Selected Personal Characteristics. (n=123)

AGE (YRS)	FREQUENCY	PERCENT
20-29	14	11.4
30-39	61	49.6
40-49	41	33.3
>50	3	2.4
No Response	4	3.3
EDUCATIONAL QUALIFICATION		
OND	12	9.8
HND	21	17.1
B.Sc	43	35.0
PGD	3	2.4
M.sc	38	30.9
Ph.D	1	0.8
No Response	5	4.0
WORKING EXPERIENCE (YRS)		
1-10	84	68.3
11-20	32	26.0
21-30	5	4.1
No Response	2	1.6

Source: Field Survey, 2012

Table 2 shows the extent of ICT use among the extension workers for official duties. From the results obtained, it was observed that the ADP and research institutes extension workers utilized only a few of the available ICTs with mobile phone and print being prominent. The private extension agencies were more ICT ready as compared to the ADP and the research institutes. Among private extension workers, mobile phone, the internet, computer and radio were popular. This finding agrees with Oladeji (2010) who opined that the private extension agencies utilize more ICTs in the discharge of their duties as compared to her counterparts. Yekinni and Olaniyi (2007) also reported that majority of the research and extension personnel in Southwestern Nigeria

never used video, CD-ROM technology, organizational e-mail, organizational website and personal website in their work schedule. However, this situation can be reversed through the entrenchment of ICTs availability and access, backed up with strong government policies (Agwu *et al*; 2008).

TABLE 2
Extent of Use of ICTs among Extension Workers

	ADP				PRIVATE				RESEARCH			
ICTs	ALWAYS (%)	SOMETIMES (%)	NEVER (%)	REMARKS	ALWAYS (%)	SOMETIMES (%)	NEVER (%)	REMARKS	ALWAYS (%)	SOMETIMES (%)	NEVER (%)	REMARKS
Radio	22.0	26.8	51.2	N	48.8	24.4	26.8	A	19.5	22.0	58.5	N
TV	4.9	39.0	56.1	N	46.3	36.6	17.1	A	17.1	24.4	58.5	N
Mobile phone	80.5	12.2	7.3	A	92.7	2.4	4.9	A	70.7	17.1	12.2	A
Internet	9.8	19.5	70.7	N	63.4	17.1	19.5	A	43.9	41.5	14.6	A
Computer	19.5	31.7	48.8	N	70.7	9.8	19.5	A	48.8	34.1	17.1	A
DVD/VCD	4.9	22.0	73.2	N	34.1	36.6	29.3	S	12.2	17.1	70.7	N
Print media	39.0	41.5	19.5	S	43.9	39.0	17.1	A	56.1	26.8	17.1	A
Video recorder	2.4	19.5	78.0	N	24.4	39.0	36.6	S	9.8	7.3	82.9	N
Audio recorder	2.4	22.0	75.6	N	19.5	36.6	43.9	N	12.2	14.6	73.2	N
Digital camera	2.4	29.3	68.3	N	43.9	39.0	17.1	A	17.1	24.4	58.5	N
Projector	2.4	14.6	82.9	N	22.0	34.1	43.9	N	14.6	26.8	58.5	N
ICT mean Use score	6-58				13.34				9.00			
Std. dev. Use score	2.95				4.30				4.64			

A=ALWAYS, S=SOMETIMES, N=NEVER
Source: Field Survey 2012

TABLE 3
Duncan Multiple Comparison showing the extent of ICT use among Extension workers

EXTENSION GROUPS	N	Subset for alpha = .05		
	1	2	3	1
PUBLIC (ADP)	71	6.5854		
RESEARCH INSTITUTES	23		9.0000	
PRIVATE EXTENSION	29			13.3415
Sig.		1.000	1.000	1.000

Source: Field Survey 2012

TABLE 4
Extension workers constraints to the use of ICTs

CONSTRAINTS	SEVERE (%)	MILD (%)	NOT A CONSTRAINT (%)	REMARKS
High Cost of ICT	61.8	33.3	3.3	Severe
Inadequate Electricity	77.2	20.3	0.8	Severe
Lack of Funds	51.2	43.1	4.1	Severe
Limited Access to ICTs	31.7	52.0	13.8	Mild
Poor Technical Know-How	24.4	44.7	29.3	Mild
Complexity of some ICTs	29.3	52.0	17.1	Mild
Poor Network Coverage	51.2	33.3	13.0	Severe
High Call Tariffs	52.8	34.1	10.6	Severe
Low Computer Literacy	23.6	45.5	28.5	Mild
Poor Sensitization on ICT	30.9	40.7	26.0	Mild

Source: Field Survey 2012

There was a significant difference in the use of ICT among the three extension groups. Table 3 shows the Duncan Multiple comparison table, showing that the private extension agencies were more ICT compliant than their counterparts in the research institutes and public extension agencies.

From the results on Table 4, inadequate power supply (77.2%) and high cost of ICT materials (61.8%) were discovered to be the major constraints to the effective and efficient use of ICTs by extension workers. Also, lack of funds (51.2%), poor network coverage (51.2%) and high call tariffs (52.8%) were some other severe constraints faced by extension workers.

CONCLUSION AND RECOMMENDATIONS

It can be concluded that all extension workers make use of one or more ICTs however; the level of ICT use by private extension workers is higher than that of the public extension workers and those in the research institutes. The extension workers in the research institutes, the public and the private extension agencies, face similar constraints in the use of ICTs for agricultural information dissemination. Inadequate electricity supply and high cost of ICT materials remains the chief constraints to the effective use of ICTs. The test of difference showed that there was a significant difference in the use of ICTs among extension workers in the public, private and research institutes.

It is recommended that extension staff should be trained and retrained in the area of ICT utilization to foster effective extension service delivery. Government should strive to stabilize power supply for stable electricity to power ICTs both in extension organization and other key sectors of the economy. Also, Government is advised to provide incentive for local ICTs assemblage plant to beat the prohibitive cost of the ICTs materials.

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