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A double hurdle analysis of determinants of protein consumption pattern among rural households in Egbeda local government area, Oyo state

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Abstract: This study was carried out in selected rural areas in Egbeda LGA of Ibadan, to investigate the protein consumption pattern of rural households as well as the factors responsible for households' decision to consume protein. A double hurdle model was specified for this purpose. Findings from the research show that for animal protein consumption, all the specified exogenous variables had statistically significant relationship with the household's decision to consume animal protein, albeit at different levels. Also, for actual rural household animal protein expenditure, all the specified exogenous variables, with the exception of household monthly expenditure on food supplement, had significant relationships. All the specified variables in the model had significant marginal effects on household's decision to consume animal protein. For both plant and animal protein sources, a unit increase in household size decreased the probability of households decision to consume each of the protein sources, albeit the more so for plant protein sources (by 9.1% for plant protein against 3.5% for animal protein sources). Increase in expenditure on substitutes for both sources decreased the probability of household's decision to consume protein sources, albeit the more for plant protein sources (10%) than for animal protein sources (1.4%). However, this influence translated to an increase in household actual expenditure on protein sources but both with inelastic coefficients.

Increase in food supplement expenditure increased the probability of household's decision to consume protein sources by close to 10% (7.8% for animal protein and 6.5% for plant protein sources). The elasticity coefficient was not significant though inelastic for animal protein but was significant and elastic for plant protein sources. It can be concluded that plant protein expenditure among these rural dwellers is very responsive and sensitive to household's expenditure on food supplements, while increase in expenditure on plant protein substitutes also increases household expenditure on plant protein. However, the significant variables with respect to actual animal protein consumption had inelastic coefficients. It is therefore recommended that among rural households there is the need for massive campaigns to educate them on the need to plan parenthood and the productive capacities of rural dwellers (the larger percentage of who are farmers) should be enhanced. Also, it is recommended that efforts should be made intensify nutrition campaigns to rural areas that would help in raising the level of awareness of rural dwellers with respect to the importance of proteinous food.

Keywords: Animal protein, plant protein, protein energy, malnutrition, kwashiorkor

INTRODUCTION

Research over the years has shown that many people in Nigeria are given to diets characterised by high starch content and low protein value (a fall out of the harsh economic condition). Excessive feeding on starchy food has been found to cause malnutrition conditions. Adequate nutrition has been defined as a nutritional condition which has a regular quantity and quality of food intake that meets some nutritional need (Ojo, 1991). A major component and important part of an adequate nutrition is protein. Scientifically, protein consists of many amino acids of which only 20 are used by the body in various combinations for body tissue synthesis. Protein in human nutrition can be of two types, animal sources and plant sources. The animal sources of protein however have an edge over the plant sources in that they all contain the 20 amino acids required for body tissue synthesis while no one plant protein source contains all the 20 amino acids (Cattlemen's Beef Board and National Cattlemen's Beef Association, 2009). The issue lies in the fact that in the absence of one of the amino acids in ones' daily diet, body tissue synthesis cannot be done hence a waste of otherwise useful other amino acids (Wolfe, 2006)

It has been discovered that protein malnutrition causes kwashiorkor, a disease condition resulting from protein deficiency. Prolonged cases of protein malnutrition could cause marasmus or even retarded growth. Rarely an isolated condition, protein deficiency usually accompanies a deficiency of dietary energy and other nutrients resulting from insufficient food intake (Elamin, undated). In fact, Elamin (undated) pointed out that in developing areas of the world, people often have diets low in energy and an attendant shortage of protein. People who consume too little protein and food energy can go on to develop protein-energy malnutrition (PEM).

Children suffer from the effects of starvation more quickly than adults. According to the United Nations Children's Fund (UNICEF), malnutrition contributes to the deaths of more than 6 million children under age five each year. Typically, starving children develop a condition called protein-energy malnutrition (PEM). The two most common forms of PEM, marasmus and kwashiorkor, occur in all developing countries and are life-threatening conditions (Microsoft Encarta, 2007). In fact, the Nigerian 2015 Millennium Development Goal (MDG) target of reducing by two-thirds, the proportion of under-five mortality rate per a thousand live births, in line with the Millennium Development Goals, is worsening (as depicted in Table 1). This owes in some to malnutrition (National Planning Commission, 2005). This situation is particularly worse off in rural areas, hence the focus of the study. Marasmus occurs when a child is weaned earlier than normal and receives foods low in nutrients. The child may also suffer repeated infections, such as gastroenteritis, due to poor hygiene. A child with marasmus is very underweight, with no body fat and wasted muscles. Kwashiorkor occurs when a child is weaned later than normal and receives starchy foods low in protein. In this disease, the child's abnormally low body weight is often masked by water retention, which makes the face

moon-shaped and the belly swollen (Elamin, undated).

The presence of malnutrition before 6 months of age is known to leave a permanent scar in the child's intelligence. Apart from infants and children alike, protein energy malnutrition (PEM) or protein calorie malnutrition (PCM) as it is sometimes called, is known to affect the physical development of individuals and job performance of the workforce in a nation, which in turn has a negative impact on the nation's growth and development. It is also known to reduce adult capacities by reducing work attendance and output and even when work is done, it makes for a slow pace of work as a result of fatigued muscle (Elamin, undated)

The aggregation of all these implications affects the economic growth of the nation in a negative way. Thus there is the need to investigate into the factors which determine the demand for protein based components of household food. This demand component can further be decomposed into two, namely, the decision to consume these protein based food and the actual consumption of these food types, given the factors influencing the two components.

The study therefore aims to

i) Determine the factors that significantly influence rural households' decision to consume protein based food and the direction of the influence
ii) Determine the factors that significantly influence rural households' actual consumption of protein based food and the direction of the influence

LITERATURE REVIEW

The double hurdle model has been applied widely in household consumption. The model was formulated by Cragg(1971) and assumes that households make two decisions with regards to purchasing an item, which in turn is determined by a different set of explanatory variable. In order to observe a positive level of expenditure, two separate hurdles must be passed. In double hurdles model, two hurdles must be overcome to observe a positive value. The first is that a positive amount must be desired and the second is that favourable conditions must be in place for the positive expenditure to be achieved.

The double-hurdle model, assumes that households make two decisions with regard to purchasing an item, each of which is determined by a different set of explanatory variables. In order to observe a positive level of expenditure, two separate hurdles must be passed. A different latent variable is used to model each decision process, with a probit model to determine participation and a Tobit model to determine the expenditure level.

$Y^* = W_i + V_i$ (1) Participation decision

$Y^{**} = X_i\beta + U_i$ (2) Expenditure decision

$Y_i = X_i\beta + U_i$

If Y_i^* □ 0

and

Y_i^{**} □ 0

Otherwise, $Y_i = 0$

The double hurdle model is a parametric generalization of the tobit model in which two separate stochastic processes determine the decision of household to consume and the eventual consumption level.

The Tobit model was widely used in early studies for this purpose, which treats all the zero observations as corner solutions and assumes all households consume the product (Gao, Wailes and Cramer, 1995). In more recent studies, various improvements of the Tobit model have been developed, modified, and applied for different problems (e.g. Cragg, 1971). These bivariate decision models have also gained widespread applications in the food demand literature. A basic property of these models, according to Gao et al (1995), is that they model a consumer's zero value of purchase as a decision result, the Tobit assumption of equivalence between zero demand and a comer solution is relaxed. The double-hurdle model and the infrequency purchase model are the most frequently used models with this property. When these bivariate models are applied in demand analysis, the decision to buy and the decisions of how much to buy depend on different sets of exogenous variables. These decisions can be modelled jointly, if consumers decide whether and how much to buy simultaneously. They can also be modelled sequentially, where the decision on whether to purchase will affect how much to purchase, but not vice versa (in some circumstances, the decision sequence can also be turned around when the second decision affects the first).

The double hurdle model has an adoption equation given as

Di = 1 if Di* □0 and = 0 if D* 0

Where Di = αZi + Vi

Where D* is a latent variable that takes a value of 1 if household consumes and zero if otherwise, and Z is a vector of household characteristics and α is a vector of parameters. In our case for protein consumption as measured by protein food expenditure (Y) would be given as

Yi= yi* if yi* □0 and Di*□0

And yi* =0 if otherwise

yi*= βiXi + Vi

The log-likelihood function for the double hurdle model can be specified as follows

Log L= (1-Φ(αZi))+ (Φ(αZi) Φ) ---------- (1)

Under the assumption of independency between the error terms Vi and Ui, the model is equivalent to a combination of a truncated regression model and a univariate Probit model. The Tobit model as presented above arises if

ʎ = and X=Z

A simple test for the double hurdle model against the tobit model can be used. It can be showed that the tobit log-likelihood is the sum of the truncated and the probit models. Therefore, one can simply estimate the truncated regression model, the tobit model and the probit models separately and use a likelihood ratio test.

Ґ= -2(ln Lt – (ln Lp + ln Ltr)) ˜χ2k

Where Lt is the likelihood for the tobit model, Lp is the likelihood for the probit model, Ltr is the likelihood for the truncated regression model, k is the number of independent variables in the equations.

Burton, Tomlinson and Young (1994) using the double hurdle analysis, carried out their work in consumption-expenditure with the view of increasing the number of consumers who choose to eat meat against the backdrop of those who chose not to eat, bearing in mind the implication of this decision for livestock farmers and the obvious implications of this trend on livestock farmers and the industry. Results from

the study indicated that employment class and adult gender were significant determinants of meat consumption. Income was also found to affect the decision to buy or not to buy in opposite direction. Expenditure was found to affect expenditure alone and not the decision to buy or not to buy.

Burton and Young (1991) also carried out a non-parametric test for changes in consumer preferences for meat. The objective of the study was to investigate if the changing pattern of meat and fish purchases was due to the structure of consumer preferences or attributable to conventional economic factors such as changes in relative prices and total expenditure. The work analysed data based on two non-parametric tests derived from the revealed preference theory. Results showed that observed changes in meat consumption was as a result of conventional economic factors.

Gao et al (1995) observed that per capita rice consumption in the U.S. has doubled over a period of a decade. The effects of social and demographic variables on the household's rice consumption decisions was analyzed along with income and price variables. A double-hurdle model was used to solve simultaneously the consumer decisions whether to purchase rice and how much. The joint decision hypothesis was tested and accepted. They posited that the non-normal distribution of error terms may be responsible for possible bias in the empirical test of the joint decision hypothesis. The hyperbolic sine transformation was also used to correct the problem in this study prior to testing the joint decision hypothesis.

Newman, Henchion and Matthews (undated), in their study on Irish households' expenditure on prepared meals for home consumption, analysed consumption using the 1987 and 1994 Irish Household Budget Survey datasets. The aim of the paper was to analyse the factors influencing Irish households' decisions to purchase prepared meals and how much to spend on these food items. This was done using the double-hurdle methodology adjusted for the problems of heteroscedasticity and non-normality. Income elasticities was estimated for household expenditure on prepared meals in both years and significant socio-economic influences identified. These socio-economic factors were assumed to underpin the tastes and preferences of Irish households, with convenience identified as a significant preference of many household groups.

METHODOLOGY

Sampling Procedure:

The study area is Egbeda local government area in Ibadan metropolis of Oyo state. Ibadan is the largest city in West Africa and the second largest in Africa, with the land size of 240 km2. The metropolis is made up of 11local government areas of which Egbeda local government is one. Egbeda local government area has an area of 191km2 and a population of 281,573 as at the 2006 census, with its capital at egbeda town. The target population consisted of selected rural areas within egbeda local government in Ibadan. The sample was obtained through a multi-stage sampling technique. From a list of villages, 5 villages were randomly selected, namely Molade, Ayegbami, Opeyemi,

Orisunmibare and Adogba villages. From each of these villages, twenty households were then randomly selected. Thereafter, a structured questionnaire was administered to both the household head and the member of the household most directly involved with the household food pot and purchase. In order to capture household food behaviour, the researcher relied on a 7-day memory recall by the respondents.

Empirical Model Specification and Estimation

For the purpose of determining factors determining household's decision to consume protein based food and those affecting actual consumption, the double hurdle model was used.

Like Newman et al (undated) rightly identified, theory provides no guidance as to which explanatory variables to include in the first and second hurdles of the double-hurdle model. Including the same set of regressors in each hurdle makes it difficult to identify the parameters of the model correctly and so exclusion restrictions must be imposed (Jones, 1992). An underlying assumption of the double-hurdle model is that the first hurdle is a function of non-economic factors determining household's decisions to participate.

$yi^* = \beta iXi + Vi$

where Xi ranges from X1 to X6 for both animal and plant protein sources

X1= household size

X2= monthly income of household head

X3= awareness of nutritional importance of protein (either plant or animal protein); if household head is aware = 1, if not aware = 0

X4= relative affordability of protein source ; if affordable relative to its substitute =1, if not affordable relative to its substitutes= 0

X5= monthly expenditure on substitutes (if plant protein, then substitutes would be animal protein and vice versa)

X6= monthly expenditure on food supplements.

RESULT AND DISCUSSION

Table 2 shows the socio-economic characteristics of households interviewed in the five villages. Majority of the households were headed by men (94.0%) while a minority (6.0%) were headed by women. Out of the households interviewed, 63.0% were involved in farming as a profession either on a full time basis or on a part time basis, while just about 37% were not involved in any form of farming at a professional level. This means that majority of the respondents were farmers. A few of the population interviewed had over 10 household members (5%), while majority of the respondents (71.0%) had between 6 and 10 members. Much of the household head (34.0%) were between the ages of 51 and 60 years i.e. close to retirement and becoming economically unproductive, while just 2.0% were above the productive years, over 60 years of age. Another 33.0% of the household heads were between the ages of 21 and 30 years.

Table 3 shows that for animal protein consumption, all the specified exogenous variables had statistically significant relationship with the household's decision to consume animal protein, albeit at different levels. Also, for actual rural household animal protein expenditure, all the specified exogenous variables, with the

exception of household monthly expenditure on food supplement, had significant relationships. Rural household size and household monthly expenditure on animal protein substitutes were found to decrease the likelihood of household's decision to consume animal protein. By implication, this means that households with large members tended to decide against consumption of animal protein based food while households with lesser members tended to decide in the favour of animal protein food. In the same vein, the higher a household's expenditure on animal protein substitutes the less likely would the house be in deciding for animal protein sources of food. Other variables such as monthly income of household head, relative affordability of animal protein, awareness of nutritional importance of protein and monthly expenditure on food supplements, were found to increase the likelihood of household spending on animal protein. Hence, households with more monthly income tended to spend more on animal protein, just as the perception of the household head with respect to affordability of animal protein relative to plant protein, tended to also increase household's spending on animal protein.

Table 4 shows that for plant protein consumption, household size and household monthly expenditure on plant protein substitutes significantly decreased the odds in favour of household decision to consume plant protein. This is similar to the result obtained for animal proteins. Monthly income of household head and increase the households' monthly expenditure on food supplements was found to significantly increase the odds in favour of household decision to consume plant protein. Household size was found to decrease the likelihood of household's spending on plant protein, while household expenditure on plant protein substitutes as well as expenditure on food supplements was found to increase the likelihood of household spending on plant protein.

Table 5 presents the marginal effects on the decision to consume protein sources (animal and plant alike) of the explanatory variables. It also presents elasticity(s) of household expenditure on animal and plant protein sources relative to the explanatory variables calculated at sample means and were computed using the SHAZAM 10.0 software. The marginal effects are used to calculate percentage changes in the dependent variable when variables shift from zero to one.

For animal protein sources, all the explanatory variables were statistically significant in their influence of household's decision to consume. The percentage ranged from 0.6% to 7.8% for the explanatory variables. The result showed that a unit increase in household size would decrease the probability of household's decision to consume animal protein consumption by 3.5%. Another variable decreasing the probability of a household's decision to consume animal protein was household expenditure on animal protein substitutes (decreasing the probability by 1.4%). Also, a naira increase in the monthly income of household head was found to increase the probability of household's decision to consume animal protein by 0.6%. An increase in the level of awareness of household of nutritional importance of protein was found to increase the probability of decision by 1.5% and household's

perception of relative affordability of the protein source relative to its substitutes also increased the probability by 1.8%. Finally, for animal protein sources, a unit increase in the expenditure of households on food supplements was found to increase the probability by 7.8%.

For the plant protein sources, a fewer variables were statistically significant in determining the probability of decision for consumption. The percentage decrease in the probability of decision of the households to consume plant protein arising from a unit increase in the household size was higher in this case than in the animal protein case (9.1%). Following the same trend as in the animal protein case, expenditure on plant protein sources also decreased the probability of household's decision to consume animal protein by 10%, again a higher figure compared to that for the animal protein sources. A unit increase in household's expenditure on plant protein sources increased the probability of household's decision to consume plant protein by almost twice (6.5%) the increase in the probability of such decision arising from a unit in the income of household head (3.4%).

From table 5, it was also discovered that more of the elasticities of the estimates for animal protein were significant determinants of household's level of protein consumption than for the plant protein sources arguably based on the significance levels of their underlying marginal effects. Whereas the relative affordability of animal protein sources and household's expenditure on food supplements were significant determinants of the probability of households decision to consume animal protein, they were however not significant in the determination of households actual level of consumption. Household size was the only variable with negative elasticity for actual consumption level of animal protein with elasticity coefficient of -0.45. This implies that as household size increases, expenditure on animal protein sources decreases but at a less than proportionate rate. The same pattern was observed for plant protein sources but with as much unitary elasticity (-0.95). This implies that plant protein consumption is more responsive to changes in household sizes than animal protein. Household head's monthly income, nutritional awareness level of importance of animal protein as well as household's expenditure on substitutes were all positively significant determinants of animal protein consumption but with inelastic coefficients (between 0.17 and 0.61). For plant protein sources however, the other two positively significant determinants of plant protein consumption were household's expenditure on substitutes and household's expenditure on food supplements, with elasticity coefficients of 0.58 and 1.17 respectively. This implies that increases in household's expenditure on plant protein substitutes increased in a less than proportionate increase in plant protein sources, while increases in household's expenditure on food supplements increased more than proportionate the household expenditure on plant protein.

SUMMARY, CONCLUSION AND RECOMMENDATION

With the exception of nutritional awareness of the importance of protein and relative affordability of plant protein variables

for plant protein consumption, all the other variables had significant marginal effects on household's decision to consume plant protein.

All the specified variables in the model had significant marginal effects on household's decision to consume animal protein.

For both plant and animal protein sources, a unit increase in household size decreased the probability of households decision to consume each of the protein sources, albeit the more so for plant protein sources (by 9.1% for plant protein against 3.5% for animal protein sources).

Increase in expenditure on substitutes for both sources decreased the probability of household's decision to consume protein sources, albeit the more for plant protein sources (10%) than for animal protein sources (1.4%). However, this influence translated to an increase in household actual expenditure on protein sources but both with inelastic coefficients.

Increase in food supplement expenditure increased the probability of household's decision to consume protein sources by close to 10% (7.8% for animal protein and 6.5% for plant protein sources). The elasticity coefficient was not significant though inelastic for animal protein but was significant and elastic for plant protein sources.

It can be concluded that plant protein expenditure among these rural dwellers is very responsive and sensitive to household's expenditure on food supplements, while increase in expenditure on plant protein substitutes also increases household expenditure on plant protein. This may be so maybe as a result of the fact that what households consider substitutes may actually be complements, or may be necessary part of the household food basket or bundle.

It can also be concluded that for animal protein sources in these rural areas, unlike for plant protein sources, expenditure on food supplements were not significant determinant of actual expenditure on animal protein. However, the significant variables with respect to actual animal protein consumption had inelastic coefficients.

It is therefore recommended that among rural households there is the need for massive campaigns to educate them on the need to plan parenthood and manage small family sizes as this impact negatively on their ability to consume protein sources of food.

Also, since the results show that monthly income of household head increased both the probability of decision to consume plant and animal protein sources as well as the actual consumption level of the preferred animal protein sources, it would be of help if the productive capacities of rural dwellers (the larger percentage of who are farmers) are enhanced. This can be done by injection of credit and capital into these rural areas in order to break the vicious cycle of poverty which so predominantly characterise them.

Since, nutritional awareness of the importance of protein as a variable increased the probability of household's decision to consume the more preferred animal protein as well increased the actual consumption level of animal protein, it is recommended that government and non-governmental organisations alike intensify nutrition campaigns to rural areas that would

help in raising the level of awareness of rural dwellers with respect to the importance of proteinous food.

REFERENCES

Burton M, M. Tomlinson and T. Young (1994) Consumers decisions whether or not to purchase meat: A double hurdle analysis of single adult households; Journal of Agricultural Economics Research, Vol.42 No.3, pp.27-34.

Burton M, and T. Young(1991) Non-Parametric tests for changes in Consumer preferences for Meat; Journal of Agricultural Economics, Vol. 42, No 2, pp. 138-145.

Cattlemen's Beef Board and National Cattlemen's Beef Association (2009) Proteins Are Not Created Equal. An internet material. www. BeefNutrition.org. Site visited on 14th April, 2011.

Elamin A. (undated) Protein Energy Malnutrition. A power-point presentation. An internet material; www.pitt.edu/~super 7/17011-18001/17671.ppt. Site visited 13th of March 2011.

Cragg J.G.(1971) Some Statistical Models for limited Dependent Variables with Application to the Demand for Durable Goods; Econometrica, Vol.39, pp 829-844.

Gao X.M, J.E. Wailes and G.L. Cramer (1995) Double Hurdle Model with Bivariate Normal Errors: An Application to U.S. Rice Demand; Journal of Agriculture & Applied Economics, Vol. 27, No 2, pp 363-376. A publication of Southern Agricultural Economics Association.

Jones, A. (1992). A Note on Computation of the Double Hurdle With Dependence with an Application to Tobacco Expenditure, Bulletin of economic Research, Vol. 44, pp 67-74.

National Planning Commission (2005). Nigeria: Millennium Development Goals, 2005 Report. Published by the National Planning Commission, Old Central Bank Building, Garki, Abuja.

Newman, C., M. Henchion and A. Matthews(undated) A double Hurdle Model of Irish Household Expenditure on Prepared Meals. An Internet material.

Ojo, M. O. (1991) Food Policy and economic Development in Nigeria; Central Bank of Nigeria, pg 78.

Wolfe R (2006) The underappreciated role of muscle in health and disease. American Journal of Clinical Nutrition. Vol. 84, pp 475-482

A gender analysis of poverty profile of rural farming households in North Central, Nigeria

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Abstract: This study used 510 representative households to profile the poverty status of rural farming households in North Central Nigeria based on gender of the household heads. The Foster, Greer and Thorbecke class of weighted poverty indices as well as social indicators were used as analytical tools. The results of the study showed that the female-headed households were disadvantaged on all counts with poverty incidence of 63 percent as against 59 percent for male-headed households. In terms of asset ownership they were equally disadvantaged; only 33 percent had access to farm land as against 81 percent for their male-headed counterparts. The widow sub-group of female-headed households was particularly disadvantaged despite remittances from friends and relations. Monthly emolument as safety net was recommended for this particularly vulnerable sub-group of households.

Keyword: Poverty measures, female-headed households, male-headed households, consumption, social indicators.

INTRODUCTION

Poverty a severe and endemic phenomenon is on the increase in Nigeria. Its incidence as recorded by NBS, (2006) approximated 64 per cent in 2006. The pattern of poverty in Nigeria shows the pre-eminence of agriculture and rural dominance with eighty-five per cent of the rural households being poor in 2006 (NBS, 2006). Among the numerous causes of poverty is low or fluctuating levels of labour productivity in agrarian-based-livelihoods (Belshaw, 2002). The renewed interest in agriculture in meeting poverty reduction targets therefore stems from the contribution the sector can make to the Nigerian economy. Agriculture is the source of food, livelihood, market, raw materials, foreign exchange earnings and savings. However, the ability of the Nigerian agricultural sector to meet these roles is of concern, considering the high poverty level inherent in the sector. The inter-linkages between gender and poverty have also been major issues in the role and effectiveness of policy interventions in poverty reduction in developing countries. Women have been known to be highly represented among the poor with lack of access to social and human capital to participate in development and to contribute to higher living standards for their families (World Bank, 2001). Poverty assessment studies in Nigeria have focused mostly on all households (Odusola 1997 and Anyanwu 1997). Scanty literature however exists on female-headed households and poverty and challenges faced by rural women. This study therefore carried out a gender analysis of poverty profile of rural farming households in North

Central Nigeria using Kwara State as a case study. The incidence, depth and severity of poverty of the rural farming households were estimated based on gender of the household heads. A thorough investigation of the rural households poverty status was also made using social, human, livelihood and asset based characteristics. A gender perspective of poverty means recognizing that women stand at the crossroads between production and reproduction, economic activities and care of human beings, and therefore between economic growth and human development. Women are workers in the two spheres and thus the ones with higher stake and the most vulnerable when the two spheres meet at cross purposes and therefore the most sensitive to the need for better integration between the two spheres (Sen, 1999).

METHODOLOGY

The study area is Kwara State which is essentially agrarian with about 80 per cent of the population living in the rural areas. Primary data obtained through a set of pre-tested structured questionnaire administered with the aid of 16 trained enumerators were used for the study. Pre-test of the survey was carried out in 2006 in four rural villages of the state. The actual survey started in October 2006 and ended in March 2007. The bulk of the information collected was mainly on weekly households' consumption expenditure and income. Information was also obtained on socio-economic and demographic characteristics of the households. The state is divided into four zones by Agricultural Development Project (KWADP) of the state. The target population for the study is the entire rural farming households in the state. A two stage simple random sampling technique was used for selecting the representative farming households for the study. The first stage was a random selection of 36 villages from the four zones. The second stage involved a random selection of ten per cent of the farming households in the chosen villages. The cooking pot definition of household was adopted and as such households that conformed to this consumption-based definition were used. Where a house had more than one household based on our definition of households, a household was randomly chosen. A total of 510 farming households were used for the study. Sixteen per cent of these households were headed by females while the remaining eighty-four per cent had male heads.

Consumption is preferred to income as a money-metric measure of economic welfare for its being able to capture easily the value of home grown food. The following indicators were used for the study: consumption expenditure per adult equivalent, food consumption and food share, income, assets, social indicators such as education and health and poverty indicators. Poverty refers to the lower decile or quintile of the distribution of economic welfare which is consumption expenditure per adult equivalent for the purpose of this study. The Foster, Greer and Thorbecke, (1984) class of weighted poverty indices were used for the poverty measure. The formula, following Foster *et al*. (1984) and as adapted by (IFAD, 1993), is given as:

$$P_\alpha = 1/n \sum_{i=1}^{q} (z - y_i / z)^\alpha \quad \text{.....(1)}$$

Where P_α is the weighted poverty index; n is the number of households; y_i is the expenditure per adult equivalent of *ith* household; z is the poverty line defined as 2/3 of mean consumption per adult equivalent of the sampled population (FOS, 1999); q is the number of the sampled household population below the poverty line; α is the aversion to poverty (a coefficient reflecting different degrees of importance accorded to the depth of poverty and it ranges from 0 to 2. When α equals 0, 1 and 2 it measures proportion, depth and severity of poverty respectively. The overall poverty was expressed as the sum of groups' poverty weighted by the population share of each group.

Thus, $P_\alpha = \sum k_j p_{\alpha j}$ ……..(2)

Where j = 1, 2, 3…m groups, kj is population share of each group (n_i / n), and $p_{\alpha j}$ is the poverty measure for each group. The contribution of each group, c_j to overall poverty was calculated as follows:

$C_j = k_j p_{\alpha j} / p_\alpha$ ……..……..... (3)

Where C_j is the contribution coefficient of subgroup j; k_j is the proportion of subgroup j to the total population; $p_{\alpha j}$ is poverty index of the subgroup j; p_α is the total poverty index. The poverty indices estimates were tested for statistical differences using Kakwani, (1993). The test of significance of subgroup poverty measure ($p_{\alpha i}$) is given as:

$$t = \frac{p_{\alpha i} - p_\alpha}{SE(P_{\alpha i})} \quad \text{……..…..(4)}$$

Where $SE(P_{\alpha i})$ is the standard error of ($p_{\alpha i}$). This was used to test whether significant differences existed between the P_α measures of a subgroup i with another one j. The number of the subgroup pairs was obtained using the combination formula ${}^nC_2$. Where n is the number of subgroups in a particular characteristic of the farming households. The results of the poverty measures were tested for robustness to the changes in the estimated poverty line with the use of stochastic dominance analysis. The estimated poverty line (2/3 of mean per adult equivalent expenditure) obtained from the survey was varied at an interval of 15% (following Canagarajah, (1997) from 70% to 145% to obtain a poverty range for the sensitivity analysis. The proportion of this range that is 0.7-1.45 was used for the dominance analysis.

RESULTS AND DISCUSSION

Socio-economic Characteristic of Farming Households based on Gender of the Heads

Table 1 gives the summary of the descriptive statistics based on gender of the household heads. Expectedly male-headed households (84%) were more than female-headed households (16%) in the study area. The presence of female-headed households was due to death of male heads, migration, divorce and economic reasons. The mean age for the household heads for the two categories of households were 51.9 and 54.0 years for male and female-headed households respectively. The

modal age group of the two categories of households fell within the active and virile age class of 44-64 years. Sixty-five per cent of the male-headed households engaged in full time farming; while 42 per cent of the female-headed households took farming as means of livelihood. The percentage of livelihood diversification varied with gender of the household heads. Rural farming households' involvements in civil service were relatively small in the study area; 6% and 4% respectively for male and female-headed households. Nonetheless, farming as a means of livelihood was still the major occupation in rural Kwara for the two categories of households. NBS, (2005) reported a similar finding. The rural areas in Kwara State were characterised by large family sizes with the modal family size class being 6-10 members per household. Forty-two per cent of the male-headed households had more than 10 members per households as against 4% for the female-headed ones. This was probably as a result of polygamous nature of most male-headed households in the study area; 58% of these households were polygamous (Table 3). Fifty-one percent of the female-headed households had child dependency ratio of between 0.51-1.0 as against only 35 percent for the male-headed households. This is an indication that the female-headed households had more children that were age fifteen and below who were not contributing to households' income and this properly accounted for their lower level of consumption and higher level of poverty. Interestingly however, the male-headed households had more adult dependants (13%) than the female-headed households (8%).

Table 1: Descriptive Statistics based on Gender of the Household Heads

Items	Male-headed n=430	Female-headed n=80	All households n=510
Gender	430 (84)	80 (16)	510 (100)
Age:			
25-44	73(17)	15 (19)	88 (17)
45-64	328 (76)	49 (61)	477 (74)
>64	29 (7)	16 (20)	45 (9)
Mean Age	51.9	54.03	52.19
Standard deviation	9.46	9.61	9.15
Marital Status			
Single	17 (4)	-	17 (3.3)
Married	411 (96)	32 (40)‡	443 (87)
Widowed	1 (0.5)	46 (58)‡	47 (9.2)
Divorced	1 (0.5)	2 (2)	3 (0.6)
Major Occupation			
Farming only	280 (65)	42 (53)‡	322 (63)
Farming and Trading	45 (10)	35 (44)†	80 (16)
Farming and artisan	81 (19)	-	81 (16)
Civil service and farming	24 (6)	3 (4)	27 (5)
Input access			
Yes	230 (53)	38 (48)‡	268 (67)
No	200 (47)	42 (52)	242 (47)
Extension Access			
No visit	286 (66)	56 (70)	342 (67)
1-2 visits	137 (32)	21 (26)	158 (31)
>2	7 (2)	3 (4)	10 (2)
Mean	0.48	0.45	0.47
Standard deviation	0.76	0.83	0.77
Cooperative Membership			
Yes	140 (33)	17 (21)‡	157 (31)
No	290 (67)	63 (79)	353 (69)
Household Size			
Small (1-5)	35 (8)	28 (35)‡	63 (12)
Medium (6-10)	216 (50)	49 (61)	266 (52)
Large >10	179 (42)	3 (4)	181 (36)
Mean	10.10	6.39	9.52

Child dependency Ratio			
Nil (0)	10 (2)	2 (3)†	12 (2)
0.01-5	271 (63)	37 (46)	308 (60)
0.51-1.0	149 (35)	41 (51)	190 (37)
Mean	0.49	0.54	0.50
Standard deviation	0.18	0.19	0.18
Adult Dependency Ratio			
Yes	56 (13)	6 (8)	62 (12)
No	374 (87)	74 (92)	448 (88)
Ratio of Food Expenditure to Total Expenditure			
0-0.5	39 (9)	5 (6)	44 (9)
0.61-1.0	391 (9)	5 (6)	44 (9)
Mean	0.64	0.64	0.64
Standard deviation	0.14	0.16	0.15

Source: Field Survey, 2007. The tests are for differences by gender of household heads, ‡,†denote significance
at 1% and 5% respectively.

Consumption-based measures of welfare

Consumption is probably the single most comprehensive ability to meet wants (World Bank, 2005). The consumption expenditure obtained from the survey was adjusted per adult equivalent to verify the likely differences among the two categories of households. The mean per adult equivalent household expenditure by deciles showed the male-headed households had a significant higher level of consumption than the female-headed households with the tenth decile figure of N6,345 per adult equivalent per month as against N5,396 for the female-headed households (Table 2). The mean per adult equivalent household expenditure for all households (the pooled data) was N2,557.11. Significant difference existed between the means of the two categories of households based on gender.

Table 2: Expenditure Pattern of Rural Farming Households in Kwara State based on Gender of the Head

Deciles	Male-Headed (n=430)	Female-Headed (n=80)	All Households (n=510)
First	896.35 (3.47)	903.5 (3.76)	896.82 (3.51)
Second	1092.19(4.47)	1054.4.39	1086.17 (4.25)
Third	1229.19(4.76)	1177.63 (4.91)	1220.18 (4.77)
Fourth	1338.47(5.18)	1271.5 (5.30)	1327 (5.19)
Fifth	1436.65 (5.56)	1356.63 (5.65)	1424.75 (5.56)
Sixth	1638.05 (6.34)	1493.75 (6.22)	1594.53 (6.24)
Seventh	3108.26 (12.03)	2783.5 (17.12)	3080.08 (12.05)
Eight	3978.02 (15.39)	4111.25 (17.12)	3998.76 (15.63)
Ninth	4781.58 (18.5)	4555.38 (18.78)	4727.49 (18.49)
Tenth	6345 (24.55)	5396 (22.48)	6215.33 (24.31)
Total	25844.13 (100.00)	24,003.77 (100.00)	25571.11 (100.00)
Mean	2584.41	2410.38‡	2557.11
Standard Deviation	1808.00	1632.72	1781.30
Per Adult Equivalent Monthly Expenditure by Category			
<N1000	82 (19)	16 (20)	97 (19)
N 1,001–2,000	177 (41)	39 (49)	217 (42)
N 2,001–3,000	47 (11)	6 (8)	54 (11)
> N 3,000	124 (29)	19 (23)	142 (28)

Field Survey: 2007. Figures in parentheses are expenditure distribution in percentages.‡ Tests are for differences by gender of the household Heads, significant at 1%.

The difference in consumption patterns of the two categories of households was further investigated by categorization of monthly expenditure, 69 per cent of the members in the female-headed households lived on less than two thousand naira a month as against 60% in the male-headed households. This is less than 1.25 dollar a day as recommended by the World Bank and is in agreement with earlier reports (World Bank, 2001; NBS, 2005 and a host of others). In

all, the male-headed households faired better than the female-headed ones. The expenditure per adult equivalent was further disaggregated based on gender and marital status of the households as shown in Table 4 to capture the heterogeneity of the households better.

Table 3: Disaggregation of Consumption Expenditure by Gender and Marital Status of the Household Heads

Items	Male-Headed Households	Female-Headed Households	All Households
Mean Real Consumption Expenditure Per Adult Equivalent (MPAEHE)			
Single	6,447‡	-	6,447
Married	2,415	3,765‡	2,355
(i) Monogamous	3,360	-	3,360
(ii) Polygamous	1662‡	-	1,662
Widowed	5,060	1,459‡	1,514
Divorced	5,033	2633†	3,433

Source: Field Survey, 2007. The tests are for differences by gender of the household head. ‡, denotes significant at 1%, † denotes significant at 5%.

The sub-groups of households headed by widows had the lowest significant mean expenditure per adult equivalent of N1,459 while the highest figure of N6,447 was recorded by male single sub-group. Those households headed by married women enjoyed a significant higher level of consumption than other sub-groups in the female-headed category. Widow-headed households had significantly lower consumption than widower-headed ones; conversely, households headed by married women had significantly higher per adult equivalent consumption than those headed by married men. Female-headed households with divorced heads resembled those with widowed heads in that they appeared to suffer from a gender disadvantage: they were worse off than male-headed households with divorced heads, but were not particularly poor; their living standards were fairly comparable to those of female-headed households with married heads. The large variations in consumption per adult equivalent were more vivid based on disaggregation by gender and marital status of the household heads.

(b) **Food consumption per adult equivalent and food share**

Using the food consumption per adult equivalent, the female-headed households also recorded lower level of consumption than their male counterpart except in the first and second decile (Table 4). Significant differences also existed among the means based on gender.

Table 4: Rural Farming Households Food and Non-food Consumption by Decile

Deciles	Male-Headed		Female-Headed		All-Households	
	Food	Non-Food	Food	Non-Food	Food	Non-Food
First	689.63	104.38	703.63	158.72	691.74	108.83
Second	792.29	167.11	801.63	221.38	793.83	175.74
Third	880.87	218.45	876.64	250.46	879.72	227.42
Fourth	982.51	299.47	933.36	298.63	965.98	299.20
Fifth	1088.31	386.77	968.08	354.18	1070.18	380.89
Sixth	1272.62	514.12	1088.56	487.14	1243.26	510.89
Seventh	1779.28	984.54	1555.32	1080.28	1746.28	998.06
Eight	2219.71	1477.60	2009.90	1727.64	2178.84	1509.0
Ninth	2689.28	2013.50	2343.02	2352.85	2632.67	2065.8
Tenth	3586.02	3074.90	2471.17	2981.17	3494.83	3070.9

Total	15980.3	9240.84	14165.80	8832.17	15697.27	9346.73
Mean	1598.30	924.09	1416.58‡	991.25†	1569.73	934.62
Standard Deviation	960.07	983.91	748.62	1018.62	932.15	990.23

Source: field Survey, 2007. ‡,†Tests are for differences by gender of the household heads, ‡,† denote significant at 1% 1nd 5% respectively.

Education

Sixty per cent of adult members in the female-headed households had informal education while only 40% of adult household members in the male-headed category had no formal education. This corroborates earlier reports by Baulch and Masset, (2003); Deere and Leon, (2003); World Bank, (2005); and NBS, (2006). The gender differentials in education were also evident in the mean years of schooling of the adult members in the male-headed households (4.21 years) as against 3.50 years in the female-headed households (literacy in English language). In terms of literacy in any language that is, with inclusion of Arabic education, the mean years of schooling for adult household members in the male-headed households was 5.20 years as against 4.35 in the female- headed ones.

Table 5: Mean Educational Indicators by Gender of the Household Heads

ITEMS	MALE-HEADED n=430	FEMALE-HEADED n=80	ALL HOUSEHOLDS n=510
Educational Status of Household Members			
Percentage with :			
No formal education	175 (41)	48 (60)‡	223 (44)
Arabic	104 (24)	3 (4)	107 (20)
Primary	54 (13)	15 (19)†	69 (14)
Secondary	70 (16)	11 (13)	81 (16)
Tertiary	27 (6)	3 (4)	30 (6)
Mean years	4.21	3.5‡	4.09
Standard deviation	5.18	4.91	5.19
Post Primary Education (%)			
Yes	102 (24)	14 (17)	116 (23)
No	328 (76)	66 (83)	394 (77)
Post Secondary Education			
Yes	27 (6)	3 (4)	31 (6)
No	403 (94)	77 (96)	479 (94)

‡† Tests are for differences by gender of the household head,‡ denotes significant at 1%, † denotes significant at 5%

Other Indicators of Welfare based on Gender of the household Heads

Table 6 presents the living condition characteristics of the rural farming households in the State based on gender of the household heads. The two categories of households had varying percentages of living condition characteristics. Sixty-nine per cent of the female-headed households utilized open field for faeces disposal as against sixty per cent for the male-headed category. The use of open spaces for faeces disposal had negative implication on the rural households' well-being. This finding is in agreement with Dhanani and Islam, (2002) and

NBS, (2006) that rural households generally have poor sanitation facilities.

Table 6: Other Indicators of Economic Welfare based on Gender of the Household Heads

ITEM	*MALE-HEADED n=430 Frequency*	*FEMALE-HEADED n=80 Frequency*	*TOTAL HOUSEHOLDS n=510 Frequency*
Farm Income Per cropping Season (N)			
0-25,000	87 (20)	27 (34)	114 (22)
25,001-50,000	133 (31)	28 (35)	161 (32)
50,001-100,000	148 (35)	18 (23)	166 (32)
>100,000	62 (14)	7 (8)	69 (14)
Mean	108,526.57	64,054.19‡	101,550.51
Standard Deviation	117,131.01	74,434.69	112,629.28
Non-Farm Income Per Month			
Nil	302 (70)	55 (69)	357 (70)
0-2,500	99 (23)	17 (21)	116 (23)
2,501-5,000	17 (4)	8 (10)	25 (5)
>5000	12 (3)	-	12 (2)
Mean	992.56	630‡	767.06
Standard Deviation	2069.52	1131.42	1952.42
TREATMENT SOURCE			
Clinic	28 (7)	2 (4)‡	30 (6)
Dispensary	199 (45)	28 (35)	223 (44)
Native Herbs	114 (27)	26 (32)	140 (27)
Spiritualist	8 (2)	1 (1)	9 (2)
Drug Hawkers	75 (17)	10(13)†	85 (17)
Dispensary &Native	6 (1)	-	6 (1)
ASSETS			
Farm Size			
<1 Ha	21 (5)	14 (18)†	35 (7)
1-2 Ha	343 (80)	66 (82)‡	409 (80)
>2	66 (15)	-	66 (13)
Mean Ha	1.60	1.15	0.75
Land Access			
Yes	350 (81)	26 (33)‡	404 (79)
No	80 (19)	54 (67)	106 (21)
Water Source:			
Pipe borne water	15 (3)	2 (2)†	16(3)
Well Water	192(45)	41(52)	233(46)
B/hole	57 (13)	9 (11)	66 (13)
Stream	166 (39)	28 (35)‡	195 (38)
House Type:			
Flat	31 (7)	3 (4)‡	34 (6)
Room and Parlour	195 (45)	28 (35)	223 (44)
Single Rooms	204 (47)	49 (61)†	253 (50)
Room per Capita			
0-0.5	318 (74)	58 (72)†	376 (74)
0.51-0.99	90 (21)	15 (19)	123 (24)
1 and above	22 (5)	7 (9)‡	11 (2)
Toilet Facility:			
Flush	17 (4)	1 (1)‡	18 (3)

Pit	153 (36)	24 (30)	177 (35
Bush	260 (60)	55 (69)	315 (62
Light Source:			
Electricity	75 (17)	6 (8)‡	81 (16)
Kerosene lantern	219 (51)	47 (59)†	266 (52)
Kerosene Lamp	82(19)	18 (22)	100 (20)
Electricity and lantern	54 (13)	9(11)‡	63 (12)
Cooking Material:			
Stove	13 (3)	-	13 (3)
Firewood	285 (66)	58 (73)	343 (67)
Stove and Firewood	126 (29)	21 (26)	147 (29)
Firewood & Sawdust	6 (2)	1 (1)	7 (1)

Source: Field Survey, 2007. The figures in parentheses are percentages. ‡,†Tests are for differences by gender of the household head.

Assets

The female-headed households had less access to land for farming (33% as against 81% for the male-headed category). Also in terms of land holding, their performance was poorer than that of the male-headed households; none had more than two hectares of land for farming as against 15 percent for the male-headed households. They were equally at a disadvantage in terms of accommodation; only 39 percent had a relatively decent accommodation such as flat and room and parlour as against 52 percent for the male-headed households. This was due to the fact that the male-headed households earned higher level of income than the female-headed ones (Table 2). This probably allowed for more savings and asset acquisition by the male-headed households. This is in agreement with past studies that female-headed households were particularly deprived in terms of asset ownership (Buvinic and Gupta, 1996; World Bank, 2001). Conversely, female-headed households had more remittance access that is 76% as against 45% for the male-headed households. The implication of this is that much of the female-headed households' consumption was augmented by remittances from kiths and kins and this notwithstanding; their level of consumption was not at par with their male-headed counterparts.

Poverty Profile of Farming Households in Kwara State based on Gender of the Household Heads

Using the estimated relative poverty line of N1,704.74 per adult equivalent per month for rural Kwara, 58% and 63% of the male and female-headed households were poor respectively. Seventy-four per cent of total expenditure of poor households in the female-headed category was spent on food while the non-poor households on the other hand spent 52% (Table 7).

Table 7: Per Adult Equivalent Food and Non-Food Share of Total Expenditure of Respondents by Poverty Levels

HOUSEHOLDS	FOOD	NON-FOOD	TOTAL
MALE-HEADED HOUSEHOLDS: n=430			
Poor Households	967.40 (77.37)	302.24 (24.17)	1250.40
Non-Poor Households	2482.36 (58.00)	1796.06 (42.00)	4278.42
Total	1598.01 (63.36)	924.08 (36.64)	2522.04
FEMALE-HEADED HOUSEHOLDS: n=80			
Poor-Households	909.28 (74.30)	313.24 (25.59)	1223.84
Non-Poor Households	2482.36 (52.00)	2121.25 (48.34)	4387.93
Total	1598.01 (58.81)	991.24 (41.11)	2410.37
ALL HOUSEHOLDS: n=510			
Poor Households	922.73 (73.6)	231.04 (26.4)	1253.77
Non-poor Households	2396.41 (53.30)	2098.67 (46.69)	4495.08
Total	1526.65 (59.13)	1055.42 (40.87)	2582.07

Source: Field Survey 2007. Figures in parentheses are shares of food and non-food in total expenditure.

In the male-headed category, 77% of the mean per adult equivalent household expenditure of the poor households was spent on food. The poor households in the two categories of households spent more of their total expenditure on food component. The implication of this is that, poor households in the study area would require more level of income to bring them out of poverty.

Poverty Profile of Rural Households in Kwara State by Socio-Economic Characteristics

The results of the poverty indices of the rural farming households in the study area are presented in Table 8 based on their demographic characteristics. The head count indices were 63 and 59 per cent respectively for the female and male-headed households. The indices were significantly different from the whole group indices at 1%. This is in conformity with Martin and Fernandes, (2008) for Cape Verde. The contribution of the male-headed households to whole group's poverty incidence was however 83% as against 17% for the female-headed ones. This might be as a result of the large number recorded for the male-headed households' category 84% as against only 16% for the female-headed category. The female-headed households with married heads had the lowest poverty incidence with only 19 per cent of this sub-group being poor. The widow-headed households were the poorest; 95 per cent of this sub-group was poor. The contribution of this marital sub-group to the whole group's poverty incidence was also highest 87%. Widows are usually one of the vulnerable groups in Africa where cultural and religious beliefs put this category of households at a disadvantage (Buvinic and Gupta, 1996). The identified sub-groups for the male-headed households were male-single, male-monogamous, male-polygamous, male-widowed and male-divorced. On the three counts, the polygamous households were poorer than other sub-groups of the household types with 82%, 22% and 8% recorded for the head count, depth and poverty dispersion respectively. Their contribution to poverty was also highest. The married male-headed households were poorer than their unmarried counterpart with headcount, depth and dispersion being 61, 16 and 5 per cent

respectively. This was probably due to large family size and large number of dependants in such sub-groups of households. Large family size and dependants are mostly found in married households and this often times offset the pooling effect of income from spouses from such homes. Snyder *et al.,* (2006) reported a similar finding.

Table 8: Poverty Sub-groups based on Socioeconomic Characteristics of Rural Households

Item	P_0	P_1	P_2	q	n	Contribution to		
						P_0	P_1	P_2
Gender:								
Female	0.63**‡	0.18**‡	0.06**‡	50	80	0.17	0.18	0.19
Male	0.59**	0.16**	0.05**	251	430	0.83	0.82	0.81
All Households	0.58	0.15	0.05	301	510	-		
Household Type:								
Male-divorced	-	-	-	0	1	0.00	0.00	0.00
Male monogamous	0.30**	0.07**	0.02**	49	163	0.16	0.14	0.11
Male polygamous	0.82**	0.24**	0.08**	202	248	0.68	0.67	0.75
Male single	-	-	-	-	17	-	-	-
Male widowed	-	-	-	-	1	-	-	-
Female married	0.19**‡	0.06**‡	0.02**‡	6	32	0.02	0.06	0.01
Female widowed	0.94**‡	0.26**‡	0.09**‡	3	46	0.14	0.04	0.13
Female divorced	0.51	0.18	0.06	1	2	0.00	0.00	-
Age:								
Female-headed:								
<25	-	-	-	-	-	-	-	-
25-44	0.07**‡	0.03**†‡	0.01**‡	1	15	0.02	0.03	0.02
45-64	0.69**	0.18	0.06	34	49	0.68	0.64	0.60
>64	0.94**‡	0.30**‡	0.12**‡	15	1	0.30	0.33	0.38
Male-Headed								
<25	-	-	-	-	-	-	-	-
25-44	0.15**	0.05**	0.02**	11	73	0.04	0.25	0.06
45-64	0.66**	0.17**	0.06**	215	328	0.86	0.72	0.91
>64	0.86**	0.25**	0.10**	25	29	0.10	0.11	0.13
HOUSEHOLD SIZE								
Female-Headed Household								
<5	0.69*	0.19	0.06	22	32	0.44	0.42	0.40
5.1-10	0.59	0.17	0.07	27	46	0.51	0.56	0.58
>10	0.50	0.20	0.08	1	2	0.02	0.02	0.02
Male-Headed Household								
<5	0.08**	0.02**	0.01**	4	48	0.02	0.02	0.02
5.1-10	0.51*	0.11*	0.03*	125	243	0.49	0.40	0.34
>10	0.88**	0.28**	0.10**	122	139	0.49	0.58	0.64
EDUCATIONAL STATUS								
Female-Headed								
No Formal Education	0.90**	0.15**	0.05**	43	48	0.86	0.50	0.50
≤ 6 Years	0.39*	0.10*	0.03*	7	18	0.56	0.29	0.17
7-12 Years	-	-	-	-	11	-	-	-
Above 12 years	-	-	-	-	3	-	-	-
Male-Headed Households								
No Formal Education	0.83**	0.21**	0.07**	145	175	0.58	0.55	0.56
≤ 6 Years	0.63*	0.18*	0.10*	100	158	0.40	0.43	0.42
7-12 Years	0.07*	0.02*	0.01*	5	170	0.02	0.02	0.02
Above 12 years	0.04*	0.01**	0.00**	1	27	0.00	0.00	0.00
MAJOR OCCUPATION								
Female-Headed								

Farming Only	0.88**‡	0.25**‡	0.09**‡	37	42	0.74	0.74	0.78
Farming & Trading	0.37**	0.10**	0.03**	13	35	0.26	0.26	0.22
Farming & Artisan	-	-	-	-	-	-	-	-
Farming & Civil service	-	-	-	-	3	-	-	-
Male-Headed Households								
Farming Only	0.59	0.15	0.05	165	280	0.66	0.64	0.64
Farming & Trading	0.51*	0.15	0.05	23	45	0.09	0.10	0.10
Farming & Artisan	0.57	0.76*	0.06	48	81	0.19	0.20	0.20
Farming & Civil service	0.68*	0.22*	0.08*	15	24	0.06	0.06	0.06
Cooperative Membership								
Female-Headed								
Non-member	0.68	0.19	0.07	43	63	0.86	0.86	0.86
Member	0.41**‡	0.12**	0.04**	7	17	0.14	0.14	0.14
Male-Headed								
Non-member	0.74*	0.15*	0.05	216	290	0.66	0.62	0.64
Member	0.26*	0.07*	0.06*	36	140	0.34	0.35	0.36

Source: Field Survey, 2007. ****, *** Tests are for differences from group total, denotes Significant at 1% and 5% respectively. ‡, † Tests are for differences by gender of the household heads, denotes significant at 1 and 5 % respectively.

Table 8 reveals that poverty incidences were highest among households with no formal education and lowest among those with above 12 years of schooling. The poverty depth and severity followed the same pattern for the two categories of households. The contribution to whole group's poverty also reduced with increase in the years of schooling of the rural households. The results revealed that the average years of schooling of adult household members were inversely related to the poverty status of rural households in the study area. Households with educated members were more liable to adopt new technology than their unlettered counterparts. This might result in increase in output and level of consumption for such households. This is in agreement with earlier studies, (Fagernas and Wallace, 2007 and FAO, 2008) that a higher level of educational attainment reduces poverty. Poverty incidence was also prevalent among households with farming as the only means of livelihood that is 88% and 59% respectively for female and male-headed households. The households that combined farming with civil service jobs were not poor in the female-headed category. Sixty-eight per cent of this sub-group of households were however poor in the male-headed category. The contribution to whole group's poverty incidence also followed similar pattern. High poverty incidence had been reported among farming households all over the world (Fagernas and Wallace, 2007 and FAO, 2008).

Identified Poverty Sub-groups based on Living Condition Characteristics of the Households

The households that occupied flat accommodation recorded the lowest figures for the indices. The head count indices for households living in flats were 33% and 16% for female and male-headed households as against 81% and 80% for those living in single rooms. Households that had flush toilet had 12% of their members being poor in the male-headed households while no value was recorded for the female-headed category (Table 9).

Table 9: Poverty Sub-groups based on Living Condition Characteristics

Item	P_0	P_1	P_2	q	N	Contribution to		
						P_0	P_1	P_2
FEMALE-HEADED								
Building Type								
Flat	0.33*‡	0.03*‡	0.00*‡	1	3	0.2	0.1	-
Room & Parlour	0.39*	0.12*	0.04	11	28	0.22	0.23	0.22
Single Rooms	0.78**‡	0.23**‡	0.08**‡	38	49	0.76	0.76	0.78
House Construction:								
Concrete Block	0.60‡	0.18‡	0.06‡	18	30	0.37	0.38	0.38
Mud with Zinc	0.63	0.18	0.06	32	50	0.63	0.62	0.62
MALE-HEADED:								
Building Type.								
Flat	0.16*‡	0.06*‡	0.02*‡	5	31	0.02	0.03	0.02
Room & Parlour	0.43*	0.12*	0.04*	83	195	0.34	0.35	0.30
Single Rooms	0.80**	0.21**	0.06**	163	204	0.64	0.62	0.47
House Construction.								
Concrete Block	0.32**	0.07**	0.02**	61	194	0.25	0.20	0.17
Mud with Zinc	0.81**	0.23**	0.08**	190	236	0.75	0.78	0.83
TOILET FACILITY								
Female-Headed								
Flush Toilet	-	-	-	-	-	-	-	-
Pit Latrine	0.33*‡	0.09*‡	0.03*‡	8	24	0.16	0.16	0.16
Bush/ Open space	0.76**	0.22**	0.07**	42	55	0.84	0.84	0.84
MALE-HEADED:								
Flush Toilet	0.12*	0.04*	0.02*	2	17	0.01	0.01	0.02
Pit Latrine	0.33*	0.09*	0.03*	51	153	0.21	0.20	0.22
Bush / Open Space	0.76**	0.20**	0.07**	198	260	0.78	0.79	0.76
Water Source:								
Female-Headed								
Pipe-Borne Water	-	-	-	0	1	-	-	-
Well	0.39*	0.09*	0.27*	16	41	0.32	0.28	0.25
Bore Hole	0.89*	0.25*	0.08*	8	9	0.16	0.15	0.15
Stream	0.90**	0.28**	0.10**	26	29	0.52	0.57	0.60
Male-headed								
Pipe-Borne Water	0.13*	0.04*	0.01*	2	15	0.01	0.01	0.01
Well	0.33**	0.07**	0.02**	66	192	0.26	0.22	0.18
Bore Hole	0.44*	0.13	0.05	25	57	0.09	0.11	0.12
Stream	0.95**	0.27**	0.09**	158	166	0.64	0.66	0.69
Female-Headed								
Clinic	0.50	0.51	0.02	1	2	0.05	0.02	0.02
Dispensary	0.41*	0.11	0.03	17	41	0.32	0.31	0.30
Native Herbs	0.85*	0.27*	0.09*	22	26	0.43	0.43	0.44
Spiritualist	1.00*	0.34	0.12	1	1	0.02	0.02	0.02
Drug seller	0.90*	0.31*	0.10*	9	10	0.18	0.22	0.22
Dispensary and Native	-	-	-	-	-	-	-	-
Male-Headed								
Clinic	0.11	0.03	0.01	3	28	0.07	0.01	0.02
Dispensary	0.44*	0.11	0.04	87	199	0.46	0.35	0.32
Native Herbs	0.81*	0.23*	0.08*	91	112	0.27	0.37	0.37
Spiritualist	0.75*	0.20	0.06	6	8	0.02	0.03	0.04
Drug seller	0.80*	0.21*	0.07*	60	75	0.17	0.23	0.22
Dispensary and Native	0.67*	0.27*	0.11*	4	6	0.01	0.01	0.03

Source: Field Survey, 2007. **,* Tests are for differences from group total, denotes significant at 1% and 5% respectively. ‡, † Tests are for differences by gender of the household heads, denotes significant at 1% and5% respectively.

The households with access to good accommodation and good sanitation facility were less poor on all counts and contributed less to all the poverty indices of their groups. Significant difference also existed between these sub-groups and the whole group poverty incidence.

In terms of use of modern toilet facility, there was prevalence of poverty among rural households that utilised open spaces for disposing their faeces, 76% for all households as against 11% for households that used flush toilets. Rural households in the study area had low income and had no means of constructing modern sanitary facilities. The use of open spaces for faeces disposal however has negative implication on water pollution and health hazards for the rural households. Dhanani and Islam, (2002) reported a similar finding. The households that utilized stream water recorded the highest figures for the indices for the two categories of households. The head count was 90% for the female-headed households as against 95% for the male-headed ones. Access to and utilisation of potable water is an indication of better standard of living (Dhanani and Islam, 2002; World Bank, 2005; and NBS, 2006). Eighty-three per cent of households that utilised kerosene lamp were poor in the female-headed household category while 90% were poor in the male-headed category. This showed that households with no access to modern sources of energy for lightning were poor in the study area. This may not be unconnected with the low farm income recorded in the study area, which was barely enough for meeting the nutritional needs of these households with little or nothing for non-food needs. Access to and utilization of modern sources of energy is an indication of higher level of well-being for the rural households.

Table 10: Sub-groups of Farming Households based on Energy Sources

Item	P_0	P_1	P_2	q	n	Contribution to		
						P_0	P_1	P_2
LIGHT SOURCE								
Female-Headed: n=80								
Electricity	0.50*	0.23*	0.06	3	6	0.13	0.10	0.09
Kerosene lantern	0.58‡	0.16‡	0.05‡	30	52	0.6	0.54	0.45
Kerosene lamp	0.77	0.14	0.05	10	13	0.13	0.16	0.18
Electricity and lantern	0.78*†	0.33*†	0.15*†	7	9	0.14	0.20	0.28
MALE-HEADED: n=430								
Electricity	0.27**	0.06**	0.02**	21	77	0.08	0.07	0.05
Kerosene lantern	0.61*	0.17*	0.06*	132	216	0.52	0.53	0.58
Kerosene lamp	0.87*	0.25*	0.09*	72	83	0.29	0.30	0.31
Electricity and lantern	0.48*	0.12*	0.03*	26	54	0.11	0.10	0.06
SOURCE OF ENERGY FOR COOKING								
FEMALE-HEADED :n=80								
Firewood	0.71*	0.19*	0.06	41	58	0.83	0.81	0.81
Stove and firewood	0.38*‡	0.12‡	0.04‡	8	21	0.16	0.17	0.17
Wood and sawdust	1.00	0.39	0.15	1	1	0.02	0.02	0.02

MALE-HEADED :n=430								
Stove	0.31*	0.11*	0.04*	4	13	0.02	0.02	0.02
Firewood	0.75**	0.20**	0.07**	214	285	0.85	0.84	0.85
Stove and firewood	0.23**	0.06**	0.02**	29	126	0.11	0.11	0.12
Wood and sawdust	0.67	0.26	0.10	4	6	0.02	0.03	0.02
Number of Income Earners in the households								
Female- Headed								
1	0.68*	0.19	0.07	44	65	0.88	0.88	0.95
>1	0.40**	0.13**	0.03**	6	15	0.12	0.12	0.05
Male-Headed								
1	0.76**	0.21**	0.07**	203	262	0.80	0.81	0.84
> 1	0.29**	0.07**	0.02**	48	168	0.20	0.19	0.16
Remittances								
Female-Headed								
No	0.74*	0.22*	0.08*	14	19	0.72	0.71	0.67
Yes	0.59*‡	0.16*‡	0.05*‡	36	61	0.28	0.29	0.29
Male-Headed								
No	0.82*	0.22*	0.08*	196	236	0.79	0.80	0.82
Yes	0.36**	0.10**	0.03**	55	194	0.21	0.20	0.18

*Source, field Survey, 2007.***,* tests are for differences from group total, denotes significant at 1% and 5% respectively. ‡‡,†tests are for differences by gender of the household heads, denotes significant at 1% and 5% respectively.

In terms of sources of energy for cooking, the two categories of households recorded fluctuating results with no clear-cut indication of better welfare for one than the other. The use of wood fuel was predominant in the study area, households that utilised wood fuel for cooking recorded high prevalence of poverty 71% and 73% respectively for female and male-headed households. The poverty depth and severity followed the same pattern for the two categories of households. Dhanani and Islam, (2002) and NBS, (2006) reported similar findings. Households with no access to remittances were poorer, (82%) in the male-headed households than in the female-headed category that is 74%. Conversely however, the proportion of the poor was more in female-headed households with access to remittances (59%) as against (36%) for the male-headed households. Incidentally, more female-headed households (76%) had access to remittances than the male-headed households (45%) (Table 3). It could be said that despite the support from kith and kin, female-headed households were still more deprived than their male-headed counterparts in the study area. The implication of this is that drastic strategic measures would have to be adopted to get the households in the female-headed category out of poverty. Martins and Fernandes, (2008) reported a similar finding.

Conclusion

The study profiled the poverty status of rural farming households in Kwara State using 510 randomly selected farming households based

on gender of the heads. Descriptive statistics, social and Foster, Greer and Thorbecke consumption based indicators were used as analytical tools. The study revealed that the female-headed households in the state were significantly deprived based on all indicators. The widow-headed households of the female category were particularly disadvantaged. The study recommended provision of safety nets to this particularly disadvantaged sub-group of households.

REFERENCES

Anyanwu, J. C. (1997) Poverty in Nigeria: Concepts, Measurements and Determinants. Selected Papers from the Nigerian Economic Society's Annual Conference.

Baulch, B., and Masset, E. (2003). Do Monetary and Nonmonetary Indicators Tell the Same Story About Chronic Poverty? A study of Vietnam in the 1990s. *World Development 31 (1): 441-453.*

Belshaw, D., (2002). Strategising Poverty Reduction in Sub-Saharan Africa: The Role of Small–Scale Agriculture. Presidential Address. *Journal of Agricultural Economics, 53 (2): 161-193.*

Buvinic, M and G. R. Gupta (1996). Female-Headed Households and Female Maintained Families: Are they Worth Targeting to Reduce Poverty? *Journal of Development and Cultulral Change pp 259-281.*

Canagarajah, S. J. N. and S Thomas (1997). "The Evolution of Poverty and Welfare in Nigeria, 1985-92". *World Bank Policy Research Working Paper No.1715 (January) Washington, DC.*

Deere, C.A., and Leon, M. (2003). The Gender Asset Gap: Land in Latin America. *World Development*, 31 (6): 925-947.

DeGraff, D.S. and Bilsborrow R.E. (1992). Female-Headed Households and Family Welfare in Rural Ecuador. Paper presented at the 1992 meetings of the Population Association of America, 30 April-2 May, Denver, Colorado, U.S.A.

Dhanani, S., and Islam, I. (2002). Poverty, Vulnerability and Social Protection in Indonesia. *World Development*, 30 (7): 1211-1231.

Fagernas S. and Wallace, L. (2007). Determinants of Poverty in Sierra Leone, 2003. *Economic and Statistics Analysis Unit Working Paper 19, Overseas Development Institute (ODI)*

Food and Agricultural Organisation (FAO) (2008). Gender Differences in the Transitional Economy of Vietnam. FAO, United Nation.

Federal Office of Statistics (1999). *Poverty and Agricultural Sector in Nigeria.*

Federal Office of Statistics (2000). *General Household Survey.*

Foster, J., Greer, J. and Thorbecke, E. (1984). A Class of Decomposable Poverty Measures *Econometrica, 52:761-765.*

International Fund for Agricultural Development (IFAD)(1993). The State of World Rural Poverty: A Profile of Latin America and the Caribbean Pp1-92.

Martins, M.F.O. and Fernandes, J.M. (2008). The Determinant of Poverty in Cape

Verde: An Econometrc approach. Http: www.CBS.org : Accessed on Monday 16th of March, 2009.

National Bureau of Statistics (NBS) (2005). Poverty Profile for Nigeria. Federal Republic of Nigeria.

National Bureau of Statistics (NBS) (2006). 2006 Core Welfare Indicator Questionnaire (CWIQ) Survey, National Summary and Kwara State Summary, Federal Republic of Nigeria.

Odusola, A.F. (1997). Poverty in Nigeria: An Eclectic Appraisal. Selected Papers from the Nigerian Economic Society's Annual Conference.

Omonona, B. T. (2000). The Determinants of Poverty among Farming Households in Kogi State, Nigeria. Unpublished Ph.D. Thesis, University of Ibadan, Ibadan.

Sen, A. K., (1999). Development as Freedom, New York :Alfred Knof.

Snyder, A.R.; McLaughlin, D.K. and Findeis, J. (2006). Household Composition and Poverty Among Female-Headed Households with Children: Differences by Race and Residence. *Journal of Rural Sociology, 71 (4): 597-624.*

World Bank (2001). Bangladesh Poverty Assessment: Background Paper on Poverty Trends, Dhaka, World Bank.

World Bank (2005). African Development Indicators. Washington D.C. The World Bank

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An economic assessment of plantain production in Rivers State, Nigeria

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Abstract: This study examined the profitability and resource-use of plantain production in Nigeria, using Rivers State Nigeria as a case study. The study sample respondents comprised eighty 80 plantain producing households. These were selected randomly across River State. The gross margin and regression analysis were used to analyse the farmers' plantain production data. The result showed that the plantain farmers in the study area are aged and of poor literacy status Gross margin per hectare of plantain averaged **N**34,317.00 while net farm income averaged **N**31,267. Rate of returns on investment and rate of return on capital invested are 173 and 73 per cent respectively implying that plantain production is a profitable and viable venture. The OLS regression estimate showed that labour did not significantly influence plantain output. However land and planting material: sucker are shown to enhance plantain production Theft, bad roads, poor producer prices and high cost of fertilizer were reportedly the constraints to plantain production. The study therefore recommends subsidy on fertilizer, group marketing of plantain by farmers themselves via their cooperative, provision of basic rural infrastructural (road) and the rehabilitation of existing ones, so as to better rural life thereby attracting youth population to the rural areas for plantain production.

Keywords: gross margin, rate of return, suckers, factors, resource-use, regression.

INTRODUCTION

Plantain and banana are major sources of food in many regions throughout the world. Total world production of these crops is estimated to be over 76 million metric tones, out of an estimated 12 million metric tones are produced in Africa annually. Most of these are consumed or traded locally (INIBAP, 2003). About 70 million people in the African sub-region are estimated to derive more than one quarter of their food energy requirements from plantain. Plantain is very critical in bridging the gap between the demand and supply of the basic carbohydrate staples. It also control land degradation which could occur with the constant use of machinery (FA0, 1993). Plantain is undoubtedly one of the oldest cultivated fruits in west and central Africa. In Nigeria, plantain production is becoming a significant economic activity for income generation for both large scale and small holder farmers, especially for those who produce them within their home compounds or gardens. Plantain also plays an important role in the structuring of rural landscape throughout the producing areas in the country. Also, the gross value of plantain and

banana in terms of their annual product exceeds that of several other crops such as maize, rice, cassava and sweet potato in sub-Saharan Africa (FAO, 2001).

Plantain production is becoming a significant economic activity for income generation for both large scale and small holder farmers in the country, especially for those who produce them within their home compounds or gardens. The crop is one of the Primary Commodities for Investment across the south-south zone in Nigeria, River state inclusive (Table 1)

Though, the gains derivable from plantain are numerous, its level of production in Nigeria has been inconsistent and low (FOS, 1999). To harness the export potential of plantain, the current level of its production must be improved. This implies that the limited resources available to plantain farmers have to be optimized. The poor plantain output problem in Nigeria therefore centers on the efficiency with which farmers use resources on their plantain farm. It also borders on how the various factors that affect plantain production can be examined, so as to improve plantain production in the country. This quest therefore raises research questions as to how could farmers be enhanced to produce a basic stable crop like plantain more efficiently? How productive is the plantain enterprise?, how viable is it? What are the constraints and possible areas of conservation towards a greater plantain output? This study thus examined the productivity of plantain farms in Nigeria using River state, Nigeria as a case study. The study specifically examined the resource use efficiency, and the nature of costs and returns in plantain production.

This study assumes sizeable importance in view of the traditional system of plantain production in Nigeria (Ogunfowora and Olayide, 1975, Awotide *et al*, 2004). Such traditional systems are characterized by low level of productivity (FACU, 1992; FDA, 1993, 1995).. The efficiency with which farmers use existing resources and technologies in these systems is therefore important. This is more so where farmers are not making efficient use of existing resources, in the face of geometrical growth in population, increasing pressure on natural endowed resources diminishing traditional fallows and fast shrinking land frontiers. It is no surprise therefore that considerable effort have been devoted to the analysis of farm level efficiency in developing countries. An underlying factor behind much of these works is that if farmers are not making efficient use of existing technology, then efforts designed to improve efficiency would be more cost-effective that introducing new technologies as a means of increasing agricultural output (Shapiro, 1983). In an economy where resources are scare and opportunities for new technologies are lacking, efficiency studies can show the possibility of raising productivity by improving efficiency without expanding the resource base. Plantain farmers can thereby maximize profit and produce more, leading to food security and competitiveness in plantain production. This study will therefore serve as a guide to agricultural key players on plantain production investment decisions. It could also serve as a

source of relevant information to other countries facing similar situation.

Study Area and Data

The study was carried out in River State, Nigeria. Rivers State is one of the 36 states of Nigeria. Its capital is Port Harcourt. About two thirds of Rivers state lies in the Niger Delta geographical terrain of Nigeria and the state is bounded in the south by the Atlantic ocean which has a great influence on the its climate. To the North, the state is bounded by Anambra, Imo and Abia States, to the East by Akwa Ibom State and to the West by the Bayelsa and Delta States. The state has a population of about three million people and occupies an area of 21,850 square kilometers (NPC,2006) The dominant ethnic groups in the state are the Ijwa, Ikwere, Etche, Ogoni, and Ogba/Egbema. Ijaw and Ikwerre are the most spoken languages although pidgin English is widely used in radio and television broadcasts. Rivers State is currently made up of 22 local government areas. These are Ogba/Egbema, Ndoni, Ahoada, Ikwerre, Etche, Andoni/Opobo, Bonny, Okrika, Iyigbo, Ehana, Gokana Tai/Eleme, Obio/Akpor, Emohua, Degema, Aseri Toru, Akuku, Abua/Odial, Omumma, Opobo/Nkoro, Ogu/ Bolo, Ahaoda West and Eleme (Ngex Nigeria Site,2008).

Agriculture is the main occupation of the people of Rivers State and the agricultural policy of the state government is anchored on food production. This provides employment for young school leavers and university graduates. These agricultural activities are grouped' under Community Block Farming Scheme, Community Fishing Scheme, Livestock Scheme and Rabbi try. Major crops cultivated in the state include yam, cassava, maize, oil palm, banana and plantain.

The inland part of Rivers state consists of tropical rainforest; towards the coast the typical river delta environment features many mangrove swamps. Rivers state's climate consists of two main seasons, the dry and wet seasons. The rainy season fall between March and October of each year. The state also enjoys low temperature ranges of between 22^{o}C-33^{o}C and a high relative humidity due to its proximity to the Atlantic Ocean. (River State Ministry of Information, 2008).

Plantain is produced in nearly all the local government areas of Rivers State (RSADP, 2003). However, some towns and villages in three local government areas of the state are popular for plantain production. These include Ikwerre, Emohua and Obio/Akpor (Table 2).

Based on the foregoing, albeit pertinent information, the study sample was spread across the three popular plantain production areas in Rivers State. The sampling procedure thus adopted comprised a two stage sampling procedure. The first stage involved the random selection of towns and villages across the three popular plantain production areas in Rivers State. The second stage comprised a random selection of ten (10) respondents across the selected towns and villages. In all a total of one hundred (100) respondents were interviewed for the study. However due to non-response, only eighty of the respondents information were processed for the study (Table 3)

Data Analysis

The gross margin and regression analysis were employed to analyse the data for

the study. The gross margin analysis was employed to determine the overall gross margin per hectare and net farm income (NFI) per hectare. The Gross Margin and net farm income were estimated as equations (1) and (2)

GM = TVP – TVC …….. (1)

NFI = GM – TFC…… (2)

Where GM = Gross Margin, TVP = Total Value of Production, TVC = Total Variable Cost, NFI = Net Farm Income and TFC = Total Fixed Cost

Other estimations from the gross margin were the Rate of Return on Investment ROR and the Rate of Return on Capital Invested RORCI. The rate of return on investment is the ratio of the total revenue to total cost of production. It is almost similar to the undiscounted benefit/cost of a project. The Rate of Return on Capital Invested RORCI is the ratio of the profit to the total cost of production. It indicates what is earned by the business per naira outlay. The ROR and RORCI were estimated as equations (3) and (4)

Rate of return on investment =Total value of production / total cost of production (3)

Rate of return on capital invested =Profit / total cost of production (4)

Regression Analysis

The Regression tool was employed to identify the factors affecting plantain production in the study area. The regression equation estimated is stated as equation (5)

$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \mu$ …… (5)

Where Y = Total Value of Output in Naira (N), X_1 = Size of land cultivated to plantain in hectares, X_2 = Quantity of Labour used in Man-days, X_3 = Value of Purchased input (sucker) in Naria (N) and μ= Stochastic error term. The Xis are the factors hypothesized as factors affecting of plantain production

The data gathered on these variables were fitted to different regression models (example Cobb – douglas, semi – log, quadratic and the exponential models). The model that gave the best fit was therefore selected as the lead equation based on different econometric criteria. These criteria include the magnitude of the models' R^2, the number of independent variables that were statistically significant, and the number of independent variable's co-efficient signs that conform to apriori expectation.

The Resource use efficiency ratio was also estimated for each of the resources used in plantain production, as in equation

$$\text{Resource use Efficiency Ratio} = \frac{MVP}{UFC} \text{…….(6)}$$

Where MVP = Marginal Value Product, UFC = Unit Factor Cost

$$MVP = b\frac{Y}{X} \text{ ……..(7)}$$

Where MVP = Marginal Value Product, b = Regression Co-efficient, Y = means of Output, X = Mean of input.

If RUE = 1 resource is optimally utilized

If RUE = >1 resource is under – utilized

If RUE = <1 resource is over – utilized

RESULTS AND DISCUSSION

The summary statistics of some socio-economic variables are presented in Table 4: The mean age of 53 years shows that the farmers are relatively old based on (WHO, 2003) average life span 42 years for Nigeria. This results because majority of the youths in the study area have migrated to the urban areas to seek for white collar jobs. This generally aged plantain farmers could have negative implications on the

future of plantain cultivation in the study area. Table 3 also indicates that the respondents on the average have had five years of formal education. This duration of schooling is below the primary school duration period in Nigeria which is six years. The poor literacy level of the respondents could affect their choice of inputs and the utilization of existing inputs and also their willingness to adopt improved technologies. However the average rice farming experience for the plantain farmers is 15years. An average farming experience of at least 15 years for the plantain farmers implies that plantain farmers in the study area can be considered to be quite knowledgeable on the operations and constraints of plantain production. The plantain farmers could therefore appreciate any improved technology introduced to them.

The area of land farmed by the farmers is very important as it determines to a large extent the crop population on the farm and consequently the quantity of harvest. Majority of the plantain farmers cultivated small plots that were equal or less than 1 hectare. The mean farm sizes for is 0.86 hectare implying that the plantain farm units were generally small sized. Plantain farming in the study area is therefore on small scale basis. These findings agree with Okunola and Adekunle, (2000) that majority of the Nigerian farmers are the small scaled types. The small–scale platain cultivation may constrain the quantity of farmers output. Mean income earned by the plantain farmer is N 73,416.15 (US$ 622.17).

Costs and Returns

The costs and returns on average farm size of one hectare is presented in Table 5. The table shows that on average the variable cost is N43,692.05 per hectare which accounts for about 97.8% of the overall production cost. The fixed cost is N3,900:06 and it accounts for only 9.2% of the overall production cost. The gross margin and net farm income were N 38,678.11 and N34,773.05 respectively. The rate of return (ROR) estimates is N173% meaning that for every N1 invested into the plantain cultivation, N1.73 is made as revenue. The Rate of return on capital invested (RORCI) estimate is 0.75 and is therefore greater than the prime lending rate of between 25 –35 per cent (Table 5). The results therefore support both viability and profitability of plantain production in the study area.

Regression Estimates

A stepwise regression analysis was carried out to identify the factors affecting plantain production in the study area. The lead equation is the Cobb Douglas. The variable coefficients of the independent variables: farm size (X_1), labour input (X_2) and the cost of plantain suckers (X_3) hypothesized as factors affecting plantain production were positively indicating that all the variables had the expected a priori signs. The positive coefficients implies that a unit increase in these variables will raise the level of plantain production. The presence of the positive co-efficient variable inputs/factors therefore contributes to plantain production. However, only the sucker and farm size variables have coefficients that are significant at 5 percent levels. These variables are therefore those that significantly affect plantain production. The labour variable was not significant even at 10 per

cent level. The lead equation which is the Cobb Douglas has the highest R^{-2} value of 0.721 and is significant at 5 per cent level of significance as indicated by the F-ratio. The R^{-2} value of 0.721 implies that the lead equation explains 72.1 per cent of the variability in the quantity of plantain produced.

$\log Y = \log 2.505 + 0.438 \log X1 + 0.911 \log X_2 + 2.017 \log X_3$

(17.179) (1.965)* (0.168) (2.658)*

$R^2 = 0.721$

F = 204.603.

Figures in brackets are t-values

* variable significant at 5 per cent level

Resource Use Efficiency

In order to examine the productivity of resources used in plantain production, the resource use efficiency ratios of the various factor inputs used in plantain production were estimated. In estimating the ratio, the marginal value product (MVP) of each resource was computed and compared with its unit factor cost (UFC) (Table 6).

Table 5 indicates that land (X_1) and purchase plantain suckers (X_3) have low efficiency ratios that are less than unity. This implies that land and plantain sucker have more potential to raise plantain yields in the study area scale basis. For the labour input to the efficiency ratio is also less than unity implying that the labour resource is underutilized. The result on labour is due to the inefficient use of labour in plantain production. Though plantain usually shades areas around it thereby suppressing weeds and reducing soil water losses from the soil, the result indicates that the addition of more labour into plantain farming would improve efficiency in the plantain production.

Constraints Associated with Plantain Production

Table 7 shows the main constraints to banana production in the study area. The Table indicates that the most popular constraint to plantain production is the high price for the fertilizer input. This is followed by the poor and unstable price of the commodity, bad road networks, inadequate farm land and theft. The issue of land is common because most of the land owners were reportedly not willing to lease out their lands for farming purposes.

CONCLUSION AND RECOMMENDATIONS

This study examined the efficiency and viability of plantain production farms in River State, Nigeria. The study result indicates that plantain production is profitable through the rate of return and rate of return to capital invested to plantain production are 173 per cent and 73 per cent respectively. However, plantain is practiced by the aged farmers, who are of poor literacy status. The result also indicates that land and planting material (sucker) are determinants of plantain production in the study area. The efficiency ratio result indicates that land, labour and planting material (sucker) are underutilized in the production of plantain. Inadequate land for farming purposes, theft, bad roads, poor producer prices and high cost of fertilizer were reportedly the constraints to plantain production.

Based on the study findings, the study recommends the need to provide and rehabilitate the necessary infrastructures and other utilities in the study area. This would help to discourage

rural–urban migration. This can help retain young people including extension agents in the rural areas. Also efforts at making available lands, and improved planting materials for plantain production should be enhanced. Land which is a very scarce commodity, especially in the study should be made available readily to the plantain farmers in the study area. In the light of this, government and other stake holders should sought ways by which some of the degradated soils in the study area could be reclaimed for agricultural uses. Also the rural people who are mostly the farm households should be encouraged to improve on their farm knowledge and practices. There is an urgent need to ensure easy access of farmers to adult and farm related education, when farmers are educated, they can better appreciate improved technologies. Subsidy on the fertilizer input to relieve costs of plantain production is indeed necessary to enhance good plantain output. Group marketing of plantain by farmers via farmers cooperative can also help alleviate unstable prices and poor returns to plantain production. Lastly, small scale agro-processing industries could be enlightened and encouraged to exploit the potentials of plantain.

REFERENCES

Awotide, D.O., Rahji, M.A.Y. and Adejobi, O.A. 2004: "Modelling Technical Efficiency

Effects in Plantain Production in the Humid Zone, Nigeria. *Journal of Peasant Studies. 1:3*

Federal Agricultural Coordinating Unit (FACU) 1992: "Proceedings on the 4th Annual National Farming Systems. Research and Extension Workshop. Federal Agricultural Coordinating Unit (FACU) Reports, Ibadan.

Federal Department of Agriculture (FDA) 1993.: "Food Security and Nigeria Agriculture, Water Resources and Rural Development". Federal Department of Agriculture Bulletin (1993) Abuja, Nigeria

Federal Department of Agriculture (FDA) 1995:; Federal Ministry of Agriculture Reports. (1995). Abuja, Nigeria.

Food and Agricultural Organisation (FAO) 1993: FAO 1993 Year Book. 46:361

Food and Agricultural Organisation (FAO) 2001: Technical Report on Banana and Plantain

Production. Accessed on Septemember 5,2003 at www.inibap/fr/promusa/tabprod.html.

Federal Office of Statistics (FOS) 1999: Annual Abstract of Statistics 323

International Network for Improvement of Banana and Plantain (INIBAP) 2003; Networking Banana and Plantain, Montpellier, France, 24.

National Population Commission (NPC) 2006: "Population of Rivers State" National Population Commission of Nigeria. Abuja (2006).

Ngex Nigeria Site 2008:"Rivers State of Nigeria". Accessed on 10th March, 2008 at htt://www.riversstatenigeria.net/

Ogunfowora, O and Olayide, S. O. 1975: Resource Problems of Rural Economy. In "Element of Problems of Rural Economics." Ibadan University Press, Ibadan. 191 – 217.

Okunlola, J.O and Adekunle (2000): Indigenous Knowledge Approach for Rice Pests and Diseases Control for sustainable Environmental Management by Rice Farmers in Niger State, Nigeria. Journal of Environmental Extension 1 (1) 28-35.

Rivers State Agricultural Development Project 2003 Crop Area Yield Report. (2003).

River State Ministry of Information, 2008: Rivers State Diary 2008.

Swennen, R. 1990. "Plantain Cultivation Under West Africa Conditions, A Reference Manual.International Institute of Tropical Agriculture (IITA) Ibadan, Nigeria. 24

World Health Organisation (WHO): 2003. "World Health Organisation News Reports".

2003.

Table 1: Priority Primary Commodities for Investment across Zones in Nigeria (Rank 1 = Highest and 7 lowest)

Primary Commodity	Rank assigned						
	NC	NE	NW	SE	SS	SW	NIGERIA
Staple Foods							
Rice	7	1	3	2			3.25
Maize	3	2	1	4			2.5
Millet	5	3	4				4.0
Cowpea	6	4	2				4.0
Sorghum		5	5				5.0
Cassava	2	6	6	1	1	2	3.0
Yam	1	7	7	3	2	1	3.5
Sweet Potato				5			5.0
Cocoyam				6			6.0
Melon				7			7.0
Plantain					4		4.0
Guinea Corn	4						4.0

Key: NC=Northcentral, NE=Northeast, NW=Northwest, SE=Southeast, SS=Southsouth, SW=southwest
Source: Manyong *et al* , 2008

Table 2: Popular Plantain Production Areas in Rivers State, Nigeria.

Local Government Areas	Towns/Village
Ikwerre	Omuanwa, Ubioma, Ozuaha, Elele
Emohua	Obelle, Ibaa, Ndele, Alimiru
Obio/Akpor	Choba Village, Ekekahia, Ozuoba

Source: Rivers State Agricultural Development Programme (2003)

Table 3: Sample Design Outlay for the Study

Local Government Area	Town/village	No of Respondents	No of Responses
Ikwerre	Omuanwa Elele Ubima Ozuaha	10 10 10 10	10 7 7 8
Emohua	Alimini Ndele Ibaa Obelle	10 5 5 10	7 5 5 9
Obio/Akpor	Choha Ozuoba Elekahia	10 10 10	8 8 8
Total	11	100	80

Source: Field Survey, (2007)

Table 4: Summary Statistics of Socio- economic Variables of Respondents

Variable	Mean
Education (years)	5.41
Experience (years)	15.7
Age (years)	53.8
Farm Size (hectare)	0.86
Income (in Naira N)	73,416.15

(US 1 dollar = 118 naira)

Source: Results Based on Data Analysis

Table 5: Cost and Returns in Plantain Production in the Study Area.

Variable	Amount in Naira (N)
Total value of production (revenue)	82365.16
Total variable cost	43,692.05
Gross margin	38,673.11
Total fixed cost	3900.06
Net farm income	34,773.05
Rate of return (ROR) (%)	173
Rate of return on capital invested RORCI (%)	73
Bank interest rate (%)	25% - 35%

(US 1 dollar = 118 naira)

Source: Results Based on Data Analysis

Table 6: Resource-use Efficiency Ratios of Inputs used in Plantain Production

Resource	MVP	UFC (N)	Efficiency Ratio
Land	2.713	2000	0.001365
Labour	2.59	450	0.00575
Purchased Input Sucker	0.93	200	0.00465

Source: Results Based on Data Analysis

Table 7: Reported Constraints of Plantain Production

Constraint	Frequency	Percentage
High cost of fertilizer	68	85.0
Bad roads	65	81.3
Theft	34	42.5
Poor price	77	96.3
Inadequate farm land	56	70.0

Source: Results Based on Data Analysis

Appraisal of weed management effectiveness in North Eastern Nigeria: A study of Leventis Foundation trained farmers

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Abstract: The appraisal of weed management effectiveness in Northern Nigeria was carried out using Leventis Foundation Agricultural Schools' trained farmers as case study. A total of 150 respondents were randomly sampled from the list of all trained and practicing farmers in Kaduna and Kano states. The result of this study shows that 98% are engaged in farming as their major occupation, 85.3% are married while majority (50.7%) had secondary education. Majority (59.3%) cultivated between one and two hectares of farmland while 59.4% are confronted with both grasses and broad leaf weeds on their farmland. Significant relationships existed between weed management effectiveness and educational qualification, cost of weed management and weed type, all at p=0.05. However, no significant relationship existed between farm size and weed management effectiveness. Integrated weed management practices through adoption of proper land preparation that will minimise the cost and enhance effectiveness of herbicides application is recommended. Educational efforts which address weed management problems and associate such problems with other production practices must be intensified, if weed-induced yield losses must be minimised in the area.

Keywords: Weed management, Herbicides application, Northern Nigeria

INTRODUCTION

Weeds are plants found grown on lands where they are not particularly wanted; they represent important pest to crops, reducing world food and fibre production. Weeds are adaptable to all agronomic systems and have impacts on all aspects of crop production, competing favourably for water, space, air and nutrients with crops. Weeds also adversely affect humans in both agricultural and non-agricultural environments. Weed problem is a global phenomenon; it has been discovered that production systems have direct implications on weed management practices, difficulties, and future problems. Jason (2003) surveyed Soybean producers of South Carolina to determine which production practices limit seed yields the most, he discovered that improved weed control strategies would improve current soybean production. In Nigeria weed problem has reduced the interest of people in farming drastically. While it causes great loss in yield, its control requires more inputs in terms of cost and labour than any other farming activities. Marley et al (2004) reported that *Striga hermonthica* is a major biotic constraint to sorghum production in Nigeria, sometimes causing total yield loss. Their recommendations for striga management

include the use of cultural and agronomic practices, herbicides and host plant resistant when available. Lagoke et al (2006) reported that in the Southern Guinea Savanna Zone of Nigeria, where early grass weed control was more important, *alachlor* or *metolachlor* at 1.5 kg ha^{-1} gave adequate weed control and pod yields comparable with that of the hoe-weeded check. In the Northern Guinea Savanna Zone of Nigeria, grass and broad-leaved weeds were equally important. The bulk of cereals and pods that feed the people and poultry industries in Nigeria are produced in the Northern part of Nigeria. Yet, production capacity and output of farmers in Nigeria are limited by weed infestation. Therefore, for Nigerian farmers to contribute to the food production in Nigeria sufficiently, they must, as a matter of necessity, be helped to overcome or at least minimize the havoc of weed on their farmland, and consequently crop yield. Doing this will sustainably guarantee the efficient production of crops, especially cereals to feed humans and poultry in Nigeria. This therefore calls for a research into the appraisal of weed management effectiveness in the area. The following research questions were proposed to be answered by the study:

1. What are the demographic characteristics of respondents in the area?
2. What weed type is prevalent in the area?
3. What is the estimated cost of weed management in the area?
4. How effective are respondents in weed management in the area?

The study therefore appraised the farmers weed management effectiveness in Northern Nigeria, with the aim of achieving the following specific objectives, to:

1. identify the demographic characteristics of the farmers
2. identify the prevalent weed types in their area
3. estimate the cost at which weed is managed by the farmers in the area
4. appraise the effectiveness of weed management techniques adopted by farmers in the area
5. make recommendations that will further enhance weed management in the area

Hypotheses of the study

The following hypotheses, stated in null form, were tested in this study:

Ho 1: There is no significant relationship between farmers' education and their weed control effectiveness

Ho 2: There is no significant relationship between cost of weed control and farmers' weed control effectiveness

Ho 3: There is no significant relationship between farm size cultivated and farmers' weed control effectiveness

Ho 4: There is no significant relationship between weed type and farmers' weed control effectiveness.

METHODOLOGY

The research was carried out in Northern Nigeria to appraise the weed management effectiveness of Leventis Foundation trained farmers. Leventis Foundation is a Non-Governmental Organisation (NGO) that has the mandate to transform agriculture and

create sustainable employment among the rural poor in Nigeria and Ghana through training and acquisition of skills by youths who are desirous of taking up a profitable profession in Agriculture. The foundation has 4 agricultural schools in 4 states in the Northern Nigeria. These are in Kaduna, Kano, Gombe and the Federal Capital Territory (FCT), Abuja. Two of the schools; Kano and Kaduna in the North Western Agro-ecological zone of Nigeria were purposively selected for this study. In the area, farmers cultivate crops like maize, soya beans, millet, rice, wheat, cassava, sorghum, pop corn etc; and keep livestock such as poultry, cattle, sheep and goat. All practicing trained farmers of Leventis Foundation Agricultural Schools in the area constitute the population for the study. In Kano and Kaduna, an estimated 825 and 1,249 farmers respectively, have been trained from inception in 1988 to date, while an estimated 342 and 1,158 farmers respectively, are currently actively engaged in farming the area, and constitute the sampling frame. Ten percent, which is 150 respondents, were randomly selected for inclusion in the sample. Data for this study were collected in 2008 but updated in the year 2010.

Measurement of Variables

Independent Variables **-** The independent variables measured in this study include:

Educational Status: This was measured by asking the respondent to indicate their highest educational qualification from the categories listed: No education, primary school, secondary school and tertiary education

Cost of weed management: Respondents were asked to state the amount of money paid to labourers for weeding per hectare. Amount spent to purchase herbicides and amount paid to labourers for spraying weed per hectare of farmland in the last cropping season was also estimated.

Farm Size cultivated: Respondents were asked to indicate their farm sizes from the farm size categories listed: Less than 1 hectare, between 1-2 hectares, more than 2 hectares.

Weed type: Respondents were asked to indicate the prevalent weeds on their farms from the categories listed: Grasses, broad leaves and both grasses and broad leaves

The Dependent Variable **-** The dependent variable measured was Weed Management Effectiveness. Using a 3-point Likert type scale with response options: Very effective, Effective and Not effective, respondents were asked to state the degree of their effectiveness in weed management using the following weed management practices: Land preparation, plant spacing, mulching, crop rotation, bush burning, use of insects, use of plant breeding, herbicides identification, herbicides spraying equipment calibration, choice of herbicides, herbicides formulation and herbicides application. The highest weed management effectiveness score was 36 while the least score was 12. Weed management effectiveness score was then operationalised and categorised as Low effectiveness scores (12-19), Medium effectiveness scores (20-27) and High effectiveness scores (28-36). Descriptive statistics was used to describe the demographic characteristics of the respondents while Chi square was used to test the relationships between the variables in the stated hypotheses.

RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

The data in Table 1 showed that 60.0% of the respondents are between the ages of 30 and 39 years, the average age was 31 years old. This age structure indicates that majority of the farmers are still in their active and productive stage. Majority (85.3%) of the respondents are married. The data on the major occupation of the respondents showed that 98.0% are engaged in farming as their major occupation, implying that farming is the most prevalent occupation and income generating enterprise in the area. Some other income generating activities in the study area are trading, tailoring and photography. Some of the respondents also work in government ministries as civil servants. This showed the popularity of the training programme among people of various occupational calling including the government parastatals and departments. Results on educational status showed that majority (68.0%) had secondary and higher educational qualification. This is expected to convey on the respondents the ability to access technical information and other extension services that would further enhance their production capacity and enable them to overcome serious production constraints among which is weed control. This is also expected to have positive and very significant impact on their productivity. Majority (90.7%) of the respondents are Muslims while 9.3% are Christians; indicating that both Islamic religion and Christianity have successfully taken over and have relegated traditional form of worship to the background in the area. This however may not have effect on weed management effectiveness of respondents.

Table 1: Distribution of Respondents according to Age, Marital Status, Major Occupation, Education and Religion (n=150)

Characteristics	Frequency	Percentage
Age (in years):		
20-29	55	36.7
30-39	90	60.0
40-49	05	3.3
Marital Status:		
Married	128	85.3
Single	22	14.7
Major occupation:		
Farming	147	98.0
Others	03	2.0
Educational status:		
No education	09	6.0
Primary education	39	26.0
Secondary education	76	50.7
Tertiary education	26	17.3
Religion:		
Christianity	14	9.3
Moslem	136	90.7

Source: Field Survey, 2010

Farm size cultivated and common weed types in the area

Results in Table 2 revealed that the modal (59.3%) farm size cultivated by the respondents was between 1 and 2 hectares. This is an indication of the fact that farmers in the area are still small-holders and subsistence in nature. This finding is supported by Rahji (1999) who reported that in Nigeria, agriculture is the preserve of small holding farm households; and Akinsorotan (2000) who asserted that Nigerian small scale farmers usually crop small hectare of farmland because of lack of adequate capital, education, extension services, storage and marketing facilities as well as inefficient use of

agricultural inputs such as improved seeds, chemicals and fertilizer. Both grasses and broad leafed weeds are prevalent in the area as most respondents (59.4%) reported to have serious challenges with these on their farmland. This implies that for weed management to be very effective, combinations of weed management methods that can take care of both grasses and broad leaved weeds must be employed.

Table 2: Distribution of Respondents according to Farm Size cultivated and Common Weed types in the area (n=150)

Characteristics	Frequency	Percentage
Farm size cultivated (Ha):		
Less than 1	42	28.0
1-2	89	59.3
More than 2	19	12.7
Common Weed Type:		
Grasses	29	19.3
Broad Leaves	32	21.3
Both	89	59.4

Source: Field Survey, 2010

Weed Management method and Cost of weed management

Results in Table 3 show that 38% of the respondents adopted cultural method and 36.7% of them used chemical method of weed management. None of the respondents however adopted biological method in the area. This may be due to the fact that the biological method of weed management is still unpopular and difficult to practice in the tropical Africa. The data also revealed that 25.3% combine both cultural and chemical method of weed management on their farmland. Majority, 65.3% spent between #5,000 to #10,000 to control weed on their farmland while very few (10.7%) spent more than #10,000 on weed management. For weed management to be effective; there is the need for proper plant identification, selection of effective management methods and monitoring of the effects of the management methods adopted over time. The weed management methods should include soil fertility maintenance, use of appropriate herbicide for appropriate weed type and proper handling through compliance with product requirement; and even awareness of the sources of weed seeds. All these, if properly understood and carefully applied; are expected to drastically reduce the cost of weed management.

Table 3: Distribution of Respondents according to Weed Management Methods and Cost of Weed Management (n=150)

Characteristics	Frequency	Percentage
Weed Mgt method:		
Cultural only	57	38.0
Chemical only	55	36.7
Biological only	0	0.0
Cultural and Chemical	38	25.3
Cost of weed mgt (N):		
Less than 5,000	36	24.0
5,000-10,000	98	65.3
More than 10,000	16	10.7

Source: Field Survey, 2010

Relationship between educational status of respondents, cost of weed management, farm size cultivated, common weed type in the area and weed management effectiveness

Results in Table 4 below show the relationship between educational statuses of the respondents; cost of weed management, farm size cultivated prevalent weed type in the area and weed management effectiveness. It showed that significant relationships exists between weed management effectiveness and educational qualification, cost of weed management and weed type, all at $p<0.05$. This implies that education of the respondents had a bearing on their ability to manage the weed on their farmland effectively. They may likely have

accessed effective weed control methods through their contact with extension agents and other sources of information. It may also imply that training received while in schools by the respondents on weed management is well understood and is being effectively applied on the farm. Once a weed infestation exists on a farmland, management efforts become more expensive, more costs are expended to ensure that the weed is properly handled. However, no significant relationship exists between farm size and weed management effectiveness, implying that farmers with smaller farm size may not have managed weed differently from farmers with larger farm size.

Table 4: Relationship between Educational Qualification of Respondents, Cost of Weed Management, Farm Size Cultivated, Common Weed Type in the Area and Weed Management Effectiveness

Variables	X^2 Cal	X^2 Tab	P	Decision
Educational Qualification	25.47	12.59	0.05	Significant
Cost of weed management	9.93	9.49	0.05	Significant
Farm size cultivated	1.24	9.94	0.05	Not Significant
Weed type	10.57	9.94	0.05	Significant

Source: Field Survey, 2010

CONCLUSION AND RECOMMENDATIONS

The study appraised the weed management effectiveness of Leventis trained and practicing farmers in the North Western Agro ecological Zones of Nigeria. All the variables, except farm size; tested against the weed management effectiveness were found to be significant at $p<0.05$. Based on the result of this study, an integrated approach which would involve adoption of proper land preparation that will minimise the cost and enhance effectiveness of herbicides application to suppress growth of weed is recommended. Moreover, educational efforts which address weed management problems and also associate such problems with other production practices must be intensified by extension services providers in the area and trainers of agriculture in Leventis Foundation, if weed management is to be improved and weed-induced yield losses minimised**.** Soil fertility and management practices such as crop rotation, cover cropping, intercropping and proper soil fertilization as enshrined in the Leventis Foundation training curriculum must also always be properly taught at schools level. Proper monitoring and evaluation visits to trained farmers should be intensified to ensure correct applications of such agricultural practices by farmers. Trained farmers should also act as agents of change by sharing the knowledge acquired during training with other local farmers in their various communities. This will boost up the growth and competitiveness of their crop plant, retard the growth of weed and produce appreciable multiplier effects on farmers' productivity, income and their general standard of living.

REFERENCES

Akinsorotan, A.O (2000), "Government withdrawal of Fertilizer subsidy and its effects on use by the small scale farmers in Kajola Local Government, Oyo State, Nigeria". Nigerian Agricultural Development Studies. Vol.1, No 1, 2000, pp. 48-56

Hess and Fernandez-rivera (2002), "A note on the chemical composition, intake and digestion of *striga hermonthica* herbage by sheep". International Jounal of Weed Biology, Ecology and Vegetation management. Vol. 20, issue 4, pp.351-358 on URL http://www3.interscience.willey.com/journal/120189298/abstract

Jason, K.N (2003) "Use of Soyabean production surveys to determine weed management needs of South Carolina farmers" Bioone journal, vol.17, issue 1, pp.195-201 on URL http://www.bioone.org/perkserv/?request=get-document&doi

Lagoke, S.T.O, Choudhary, A.H and Tanko, Y.M (2006), "Weed control in rainfed groundnut (*Arachis hypogaea L.*) in the Guinea Savanna Zone of Nigeria". International Jounal of Weed Biology, Ecology and Vegetation management. Vol. 21, issue 3- 4, pp.119-125 on URL http://www3.interscience.willey.com/journal/119574052 /abstract

Marley, P.S, Aba, D.A, Shebayan, J.A.Y, Musa, R and Sanni, A. (2004), "Integrated management of *striga hermonthica* in Sorghum using a *mycoherbicide* and host plant resistance in the Nigerian Sudano-Sahelian Savanna". International Jounal of Weed Biology, Ecology and Vegetation management. Vol. 44, issues 3, pp.157-162 on URL http://www3.interscience.willey.com/journal/118764654/abstract

Rahji, M.A.Y (1999), "Analysis of off-farm work participation by farm households in Oyo State, Nigeria". Journal of Rural Economics and Development. Vol. 13, No 1, 1998/99, pp. 57-66

Comparative analysis of poverty status of rural and urban households in Kwara state, Nigeria

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Abstract: Poverty is a global menace that threatens the standard of living of the people across various countries of the world. This study made a comparative analysis of the poverty status of the urban and rural housholds in Kwara State, Nigeria. Specifically the study examined the demographic and socio-economic characteristics of the people, examined their poverty profile and identified the determinants of poverty among the respondents. Primary data obtained from 250 respondents in urban and rural settlements of the state were used. Descriptive statistics, weighted poverty measures and logistic regression models were the tools employed for the analyses. The study revealed prevalence of poverty among the rural households, female-headed ones, those with no formal education, and households with farming as their only occupation. Poverty level was also dicovered to increase with household size, low per capita income, low educational status and living in the rural settlements. The study therefore calls for access to formal education by the people, control of family size through appropriate techniques, creation of more jobs in the rural areas, diversification of job activities by the people as well as improvement of the female individuals' access to job opportunities.

Keywords: Poverty profile, determinants, weighted poverty measures, job opportunities.

INTRODUCTION

Poverty is a global phenomenon which threatens the survival of mankind. It cuts across creed, race, and space. Poverty is a multifacet event in nature with physical, economic, social and psychological dimensions (Narayan and Chambers, 2000). This informed the United nations declaration of 1996 as the "International Year for the Eradication of Poverty" and October 17 of every year designated as the "International Day for the Eradication of Poverty" worldwide. Similarly, the decade 1997 – 2006 has been declared United Nations Decade of Eradication of Poverty (Usman, 2001). Poverty is now acknowledged as the main goal of international development, for instance the millenium declaration of the United nations signed by 189 countries commits the global community to reduce by half the proportion of the world's poor and hungry by 2015 (IFPRI, 2001).

Most previous analysis follow the conventional view of poverty as insufficiency in securing basic goods and services (Sen, 1983; Blackwood and Lynch, 1994; Olayemi, 1995; Ravallion, 2004). Others view poverty, in part, as a function of education, health, life expectancy, child mortality, housing, sanitation, potable water supply and adequate nutrition

(Obadan, 1997; Englana and Bamidele, 1997). By and large, the poor have been described as those who cannot satisfy their basic needs of food, clothing and shelther, unable to meet social and economic obligations, lack gainful employment, are deprived of access to basic facilities and human well being and unable to attain minimum standard of living (Aigbokhan, 2000; World Bank, 2001).

The poor in most developing countries are found among five identifiable economic groups - the urban underdeveloped, the rural landless, the resource poor farmers, the urban underemployed and the unemployed (World Bank, 1997). Generally, the poor are disproportionately located in the rural areas and the urban slums.

Poverty has the consequences of breeding social disillusion with respect to what the societal objectives are and members' responsibilities towards attainment of these objectives. A society where the majorities spend 90% of their income on consumption with little or nothing for saving and eventual plough back into the economy would be impeded by slow growth. This means that the affected group would not be able to participate effectively in national development. Poverty in this sense would result in a vicious cycle reproducing itself in perpetuity. In the light of this, this study presents a comparative analysis of poverty status of rural and urban households in Kwara State, Nigeria. The specific objectives of the study are to describe the socio-economic and demographic characteristics of the households, profile their poverty status, and examine the determinants of poverty among the households.

METHODOLOGY

Study Area

This study was carried out in Kwara State, Nigeria. The state is located in the north-central zone of the country. It lies between latitudes $7^0$45'N and $9^0$30'N and longitudes $2^0$30'E and $6^0$35'E. With a population of about 2.37 million (NPC, 2006), the state is made up of four zones – A, B, C and D, with sixteen Local Government Areas (LGAs). The people of the state comprise the Yoruba, Fulani, Nupe and Baruba. Agriculture is the mainstay of the people of the state with over 80 per cent of the population living in rural areas [National Bureau of Statistics (NBS), 2005].

Data Collection and Sampling Procedure

Primary data were used for this study. A four-stage sampling technique was used for the study. In the first stage, Zone C was purposively selected out of the four zones in the state because the zone has high concentration of rural and urban settlements (FOS, 2004). The second stage was a random selection of five LGAs from the zone. A random selection of one town and one village from each of the selected LGAs constituted the third stage. The last stage involved random selection of 25 households in each of the ten selected settlements to give a total of 250 households for the study.

The data used for the study was obtained with the use of structured questionnaire coupled with interview schedule. Information was obtained on both quantifiable and non-quantifiable factors affecting both income and expenditure pattern of the rural and urban households in the study area. Data were collected on household size, expenditure on various

consumer items, occupation employment and other household's non-food expenditure. The consumption items considered were food, accommodation, clothing, transportation, household goods, fuel, light, school fees, drinks and entertainments amongst others. The food items considered included yam, beans, cassava flour, rice, bread, egg, fish, meat, pap, vegetable, fruits amongst others.

Data analysis

Both descriptive and analytical techniques were used in the data analysis. Descriptive statistics used included percentages, tables, means, and mode. The Foster, Greer and Thorbecke (1984) class of weighted poverty measures were also used to profile the poverty status of the households. The formula is given as follows:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{Z-Y_i}{z}\right)^\alpha$$

Where α = 0 - 2 and indicate headcount, depth and severity of poverty respectively

n is the sample population

q is the number of the poor in the sampled population, and

z is the poverty line given as ($\frac{2}{3}$ or $\frac{1}{3}$) of the estimated mean per capita household expenditure. The isolation of the determinants of poverty was done using Logistic regression model. The logit regression model, a dichotomous regression model is based on cumulative logistic distribution function. The model is specified as follows:

$$P_i = E\left(Y_i = \frac{1}{X_i}\right) = \frac{1}{1+e^{-(\alpha+\beta X_i)}}$$

$$P_i = \frac{1}{1-e^{-z_i}}$$

Where $z_i = \beta_1 X_1 + \beta_2 X_2 \ldots\ldots \beta_n X_n$ where P_i is the cumulative logistic distribution function.

In order to obtain the value of z_i the likelihood of obtaining /observing the sample need to be formed by introducing dichotomous response variables (Yi) such that

$$Y_i = 1 \text{ if household is poor and } 0 \text{ if otherwise}$$

$$X_i = \text{independent variables}; i = 1, 2, 3..8; \alpha_i \text{ and } \beta_i \text{ are}$$

The hypothesized independent variables used are:

X_1 = Per capita income of the household (N)

X_2 = Household size

X_3 = Age of the household head (years)

X_4 = Gender of the household head (1 if male and 0 if otherwise)

X_5 = Farm Size (ha)

X_6 = Educational status of the household head

X_7 = Marital Status

X_8 = Type of settlement pattern (that is rural or urban D=1 if rural and 0 if otherwise)

RESULTS AND DISCUSSION

Demographic and Socio-economic Characteristics of respondents

Table 1 presents the demographic characterics of the respondents. The Table reveals that there are more male heads in the urban households than in the rural ones. There are more widows in the rural than the urban settlement.

Polygamous households were more prevalent in the rural areas. This accounts for large family size. The reason for this could be the quest to have much family labour for farm

activities which is more prevalent in the rural area.

More household heads in the urban area have formal education than the rural area. This could result from the migration of the educated people to cities in search of white collar jobs rather than farming in the villages. This is further reflected in the nature of the major occupation of the respondents – farming and civil service in the rural and urban areas respectively (Table 1). This corroborates earlier reports by Deere and Leon, (2003); World Bank, (2005); NBS, (2006) and Muhammad-Lawal *et al* (2009). The rural areas in the study area have aging population. This could result from migration of the youth to urban areas in search of green pasture.

The settlement pattern in the study area is more of urban than rural set-up. Over 63% of the rural dwellers earn not more than N15,000 as income per month as against 23% for the urban dwellers while the mean income is N9,860 and N14,003 for rural and urban dwellers respectively. This probably accounts for the higher level of consumption expediture recorded in the urban settlements than the rural areas (Table 2). This could also be a reflection of the assets in the settlements. More respondents obtain credit facility through cooperative societies in the rural area than the urban. This could result from fact that those in rural area are usually much closer to one another and can more easily form cooperatives than those in urban settlements.

Though there are more non-farmers in the urban than in the rural settlement, the average farm size in the latter is greater. This is logical as more piece of land would have been used for residential apartments in the urban areas to accommodate the teeming population.

Table 1: Descriptive Statistics of Demographic Variables of Respondents

Variable	Rural	Urban
Settlement Pattern	43.5	56.5
Gender of the Head		
Male	71.4	87.2
Female	28.6	12.8
Marital Status		
Single	4.8	5.5
Married	70.2	78
Divorced	3.6	5.5
Widowed	21.4	11.0
Household Type		
Monogamous	11.9	85.3
Polygamous	83.3	11.9
Others	4.8	2.8
Household Size		
1-5	23.8	35.8
6-10	63.1	61.5
>10	13.1	2.8
Mean	9	6
Educational Status		
No formal education	45.5	11.8
Primary	25.7	28.3
Secondary	14.5	29.4
Tertiary	5	25.0
Adult	8.3	4.6
Arabic Education	1.2	9
Age of Household Head		
25-40 years	9.5	9.2
41-60	56.0	73.4
>60	34.0	17.4
Mean years	58.5	42.8

Source: Field Survey, 2011

Table 2: Descriptive Statistics of Socio-Economic Variables

Item	Rural	Urban
Settlement Pattern	43.5	56.5
Monthly Expenditure (N)		
< 8000	33.3	13.8
8000-16,000	46.4	22.0
16,001-24,000	11.9	31.2
>24,000	8.3	33.0
Mean expenditure	9,023	13,502
Credit Facility		

Commercial Banks	6.0	11.9
Cooperatives	89.3	66.1
Money Lender	2.4	2.8
Friends and Relatives	2.4	2.8
Others	-	5.5
Income (N)		
≤5000	10.7	4.6
5001-10,000	42.9	9.2
10,001-15,000	9.5	9.2
15,001-20,000	7.1	33.0
20,001-30,000	14.3	24.8
>30,000	15.3	19.3
Mean income	9,860	14,003
Assets		
Flat	14.3	36.7
Single Room	40.0	32.1
Bungalow	4.8	5.5
Boys quarter	8.3	3.7
Room and Parlour	22.6	22
Farm size (ha)		
≤1.0	17.4	41.6
1.1-2.0	24.8	21.4
>2.0	10.1	8.3
Not Farming	47.7	28.5
Average farm size (ha)	1.14	0.93

Source: Field survey, 2011

Poverty Profile of Respondents

The profile of poverty of households in the study area is presented in Table 3 using the Foster, Greer and Thorbecke poverty measures. The table shows that there are more poor and core (extremely) poor people in the rural area than in the urban settlement. The high incidence of poverty of the rural dwellers could be connected with their low level of income, as over 50% earned not more than N10,000 as income per household per month as against 14% for the urban households (See Table 2).

Table 3: Poverty Profile of Respondents Based on Location

Item	Rural	Urban
Moderate poor	73%**	59%**
Core poor	25%	6%
Non-poor	27%	41%
Mean Per Capita Household Expenditure	N2,740.47‡	N4,095.63
Core Poverty Line	N913.59	N1,365.21
Moderate Poverty Line	N1,827.18‡	N2,730.42

‡ Tests are by location of households, denotes significant at 1%.

**, * denote significant at 1% and 5% respectively.

Source: Field Survey, 2011

The poverty status of the households was further decomposed based on demographic and socio-economic characteristics of the households (Table 4). More female-headed households were poor compared to the male-headed ones. The depth and severity of poverty were also higher for this category of households, 23% and 8% respectively as against 10% and 5% for the male-headed households. High incidences of poverty have been reported among female-headed households all over the world (Olorunsanya, 2009; Fagernas and Wallace, 2007 and FAO, 2008). The widowed sub-group of households had high prevalence of poverty in these marital sub-groups of households. The single-headed sub-group of households was less disadvantaged, 5% of the members in this sub-group of households were poor. The depth and severity of poverty follow the same pattern. Significant differences ($P<0.01$) existed between these sub-groups and the whole group.

Poverty incidences were highest among households with no formal education and lowest among those with post secondary education. The poverty depth and severity followed the same pattern. The results reveal that educational level of household heads was inversely related to the poverty status of the households. Households with educated members are more liable to adopt new technology than their unlettered

counterparts. This might result in increase in output and level of consumption. This is in agreement with earlier studies (Fagernas and Wallace, 2007 and FAO, 2008) that high level of education reduces poverty.

Table 4: Poverty Profile of Respondents Based on Socio-Economic Characteristics

Item	P_0	P_1	P_2
Settlement Pattern			
Rural	0.73‡	0.26‡	0.14†
Urban	0.59	0.18	0.08
Gender			
Male	0.47	0.10	0.05
Female	0.81‡	0.23‡	0.08‡
Age of the Household Heads			
25-40 years	0.13	0.01	0.02
41-60	0.30	0.06	0.02
>60	0.54	0.08	0.04
Marital Status			
Single	0.05	0.02	0.02
Married	0.23	0.06	0.05
Divorced	0.32	0.04	0.03
Widowed	0.76‡	0.12‡	0.07‡
Primary Occupation			
Farming	0.87	0.08	0.04
Farming and others	0.13	0.06	0.02
Educational Status			
No formal education	0.84‡	0.15‡	0.08‡
Primary education	0.22†	0.10†	0.05†
Secondary education	0.16	0.05	0.03
Tertiary education	0.09‡	0.03‡	0.01‡
Adult education	0.34	0.09	0.04
Arabic education	0.72	0.11	0.05
Household Size			
1-5	0.20	0.01	0.01
6-10	0.32	0.14	0.10
>10	0.60‡	0.19‡	0.15‡

‡,† Tests are from group total, denote significance at 1% and 5% respectively.

Source: Field Survey, 2011.

Households with farming as the only occupation had high incidence of poverty. Majority (87%) of households in this category were poor, and they also had high poverty depth and severity. This is probably due to acclaimed low labour productivity in agriculture (Belshaw, 2002). Large household size contributed to high incidence of poverty in the study area. This could result from the inability of the household head to adequately cater for the depandants. The depth and poverty disparity followed the same pattern. There was also significant difference among this sub-group and whole group poverty incidence.

Determinants of Poverty in the Study Area

Table 5 presents the factors influencing poverty among the respondents in the study area. All the included variables in the models were significant with exception of farm size and marital status of the household heads.

Table 5: Determinants of Poverty among Urban and Rural Households in Kwara State

Variable	Coefficients	t-test
Per capital income of the household	-0.766	-5.759‡
Household size	0.277	2.083‡
Age of the household head	0.070	5.833‡
Gender of the household head	-2.166	-2.955†
Farm size	-0.034	-0.241
Educational status of the household head	-0.471	-2.428‡
Marital status	-0.342	-1.082
Type of settlement pattern	0.281	2.674†
Constant	3.976	2.413
Likelihood Ratio	2.947	2.947
Cox & shell R^2	0.750	0.750
Naqel Kerke R^2	0.975	0.975

Source: Field Survey, 2011

The coefficient of per capita income of household is negative, implying that poverty status of the household decreases as per capita income of household increases. This is likely

because more of the basic needs of households are met as their per capita income increases.

The positive coefficient of household size implies that poverty level of the respondents increases with increase in household size. This could result from the inability of the resources available to household to satisfy their needs as there are more household members.

The results indicate that those who are male have lower level of poverty than the female. This is likely because the male are known to have the ability to do tedious work than the female. The need to take the responsibity of catering for the household by the male, as it is the case in Nigeria, could also account for this. The negative coefficient of educational status of the household head is also logical, as education correlates with ability to adopt sound innovations and strategies at overcoming poverty.

Table 5 also shows that those who live in the rural area are poorer than the urban dwellers. This may be connected to the low level of income of the rural households compared to their urban coubterparts (See Table 2).

CONCLUSION AND RECOMMENDATION

The results of the findings revealed incidence of poverty in the rural and urban part of the study area with a higher incidence among the rural households, female-headed households, less educated ones, households with large size, those with low per capita income and households with farming as their only occupation. Therefore, based on these results, the followings recommendations are suggested:

Government and development agencies should empower the rural people through creation of more jobs in the rural area. Besides, there should be no gender discrimination in creating jobs for the masses – women should be given ample opportunity to benefit from this effort. This would reduce the rate of poverty incidence among these groups of people.

Household heads should try and control the household's size. This could be through the use of modern family planning techniques. This however requires visiting the health centres around them for proper advice.

Government, NGOs and devopment agencies should promote access to formal education by the people. This could be through free education and award of scholarships. This would help the people to acquire skills to engage in activities that would improve their standard of living and reduce their poverty level.

Apart from farming, households should engage in other activities which can help increase income and improve their standard of living. Therefore, diversifying to these activities could assist in the achievement of the goal of poverty reduction in the economy. Policy makers should look for means of improving these activities and make good policies that will promote them without having negative effects on farming. Government and private sectors could also help to provide credit facilities that will help rural households to intensify their engagement in these activities which have the prospects of reducing poverty situation in the economy.

REFERENCES

Aigbokhan, B. E. (2000). "Poverty, Growth and Inequality in Nigeria: A Case Study." *AE R C Research Paper 102.*

Belshaw, D., (2002). "Strategising Poverty Reduction in Sub-Saharan Africa: The Role of Small –Scale Agriculture, Presidential Address." *Journal of Agricultural Economics, 53 (2): 161-193.*

Blackwood, K. and Lynch, C. (1994). " The Measurement of Inequality and Poverty: A Policy Maker's Guide to the Literature", *World Development 22(4):567 – 578.*

Deere, C.A. and Leon, M. (2003). "The Gender Asset Gap: Land in Latin America." *World Development*, 31 (6): 925-947.

Englena, D. and Bamidele, A. (1997). "Measurement Issues in Poverty." *Selected Papers from the Nigerian Economic society's Annual conference.*

Fagernas S. and Wallace, L. (2007). "Determinants of Poverty in Sierra Leone, 2003." *Economic and Statistics Analysis Unit Working Paper 19*, Overseas Development Institute (ODI).

Food and Agricultural Organisation (FAO) (2008). "Gender Differences in the Transitional Economy of Vietnam." FAO, United Nation.

FOS (2004). "Federal Office of Statistics Annual Reports", Abuja, Nigeria.

Foster, J., Greer, J. and Thorbecke, E. (1984). "A Class of Decomposable Poverty Measures", *Econometrica*, 52:761-765.

IFPRI (2001). "Poverty report." Accessed from www.ifpri.org on 1/4/2006.

Muhammad-Lawal, A, Omotesho, O.A. and Falola, A. (2009) "Technical Efficiency of Youth Participation in Agriculture: A Case Study of the Youth-in- Agriculture Programme in Ondo State, South Western Nigeria" ***Nigerian Journal of Agriculture, Food and Environment 5(1):20-26.***

Narayan, D. and Chambers, R. (2000). "Voices of the Poor, Can Anyone Hear Us?" New York University Press.

National Bureau of Statistics (NBS) (2005). "Poverty Profile for Nigeria". *Federal Republic of Nigeria Annual Reports.*

National Population Commission (2006). "The Nigeria Population Census 2006." Accessed on 12/12/2011 from http://www.population.gov.ng/index.php?option=com_content&view=artide&id=89

Obadan, M. O. (1997). "Analytical framework for Poverty Reduction: Issues of Economic Growth versus other Strategies." *Proceedings of the Nigerian Economic Society's Annual Conference.*

Olayemi, J. K. (1995). "A survey of appraoches to poverty alleviation." Paper presented at the NCEMA national Workshop on integration of Poverty Alleviation Strategies into Plans and programmes in Nigeria. NCEMA, Ibadan, Nov-Dec 1995.

Olorunsanya, (2009). *"Gender of Household Heads and Relative Poverty among Rural Farming Households in Kwara State, Nigeria".* Unpublished Ph.D. Thesis Submitted to the department of Agricultural Economics and Farm Management, University of Ilorin, Ilorin Nigeria.

Ravallion, M. (2004). "Issues in Measuring and Modeling Poverty". *Economic Journal, 106:1328-1343.*

Sen, A. K. (1983). "Poor Relatively Speaking", *Oxford Economics Papers 35.*

Usman, S. (2001). A Keynote address on the Proceedings of the Ninth in-house executive seminar of the Central Bank of nigeria on "Poverty Alleviation, A more Pragmatic Approach." 39(4):73

World Bank (1997). "Nigeria Poverty in the Midst of Plenty, the Challenge of Growth with inclusion a World Bank Poverty Assessment Handbook Number 14733 UN.

World bank (2001)." World Development Report: Attacking Poverty, World Bank, Washington D. C.

World Bank (2005). *"African Development Indicators."* Washington D.C. The World Bank Reports.

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Determinants of adoption of balanced nutrient management systems technologies in the Northern Guinea Savanna of Nigeria: A multinomial logit approach

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Abstract: A project on balanced nutrient management systems (BNMS) has been implemented in the northern Guinea savanna (NGS) of Nigeria since 2000 in order to address soil fertility decline. The project has tested and promoted two major technology packages: a combined application of inorganic fertilizer and manure (BNMS-manure) and a soybean/maize rotation practice (BNMS-rotation). This study used a Multinomial Logit model to examine factors that influence the adoption of BNMS technologies. The results indicated that factors such as farmers' perception of the state of land degradation, and extension services were found significant in determining farmers' adoption decision. As farmers got more perception of the state of their land degradation and depletion, the rate of adoption in of BNMS-manure increased by more than 5 times while that of BNMS-rotation was quadruple. Similarly, as farmers have more contacts with extension agents, adoption rate of the BNMS-manure and BNMS-rotation increased by over quadruple. Extension services, the project activities of the International Institute of Tropical Agriculture, and farmer-to-farmer technology diffusion channels were the major means of transfer of BNMS technologies.

Keywords: *Adoption, Multinomial logit, BNMS-manure, BNMS-rotation, northern Guinea savanna (NGS).*

INTRODUCTION

Agricultural growth in the midst of population and socio-economic pressures has led to land degradation and soil nutrient depletion, which have become a major constraint to agricultural productivity in northern Nigeria. It has been argued that effective use of organic soil amendment methods in combination with inorganic fertilizer could help reverse the nutrient depletion trend. Such an approach to tackle the soil fertility problem formed the basis of a project on integrated soil fertility management (ISFM) known as the Balanced Nutrient Management System (BNMS) project introduced by International Institute of Tropical agriculture (IITA) and Katholieke Universiteit (KU) Leuven the Northern Guinea Savanna of Nigeria.

Amongst the soil fertility technological options tested as BNMS technologies, two have emerged as breakthroughs: (i) the combination of organic manure and inorganic fertilizer that allows a saving of about 50% of the expenditure on inorganic fertilizer, and (ii) the use of less available Phosphorus (P) or rock P by grain and/ or herbaceous legumes that appear to have a more efficient mechanism for attracting P from the soil than other crops (Vanlauwe et al. 2001). The BNMS technological package combining organic matter with inorganic fertilizer is simply referred to as the BNMS-manure treatment (BNMS-manure) and the soybean/maize rotation with reduced fertilizer application to maize is the

BNMS-soybean/maize treatment (BNMS-rotation). Evidence from on-station and on-farm researcher-managed trials indicated that combined application of organic and inorganic fertilizer inherent in BNMS technologies gives higher yields than any singular application of either input (Iwuafor et al. 2002). According to Wallys (2003), the average yield per hectare from BNMS-manure was over 3.2 tons. Ugbabe (2005) also reported 3.0 ton/ha in 2004 from demonstration trials. Similarly, the yield from BNMS-rotation in 2004 was 3.4 ton/ha from adaptation trials. These yields were significantly different from those obtained from farmers' practice (about 2 ton/ha or less), though not significantly different from that obtained from the SG2000 package (Ugbabe 2005). SG2000 package consists of the use of hybrid seeds, specified proper plant density, and inorganic fertilizer application practice (Wallays 2003). However, no study has looked into the adoption of these land-improving technologies at farm level. Some studies have looked into the adoption of these technologies using tobit models but none has with multinomial logit model. The objectives of this paper are therefore to (i) determine the rate of the adoption of components as well as the package BNMS technologies; and (ii) analyze the socio-economic, demographic, institutional, policy and technology-related factors influencing the adoption and intensity of use of the technologies.

The remaining parts of this article are organized as follows. Section 2 presents the model used in this study and discusses the data and the empirical procedures. Section 3 discusses the results of this study. The conclusion and the recommendations are presented in the final section

METHODOLOGY

Theoretical model

A Multinomial logit model is based on the random utility model. The utility to an adopter of an alternative (U_i) is specified as a linear function of the farmer and farm-specific, the attributes of technology and other institutional as well as a stochastic component. The model is simply specified as:

$$U_i = \beta_i X_i + \varepsilon_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Suppose the observed outcome (dependent variable) = choice j. If $U_j > U_k$ and $j \neq k$, then

$$\beta_j X_j + \varepsilon_j > \beta_k X_k + \varepsilon_k \quad \ldots\ldots\ldots\ldots\ldots (2)$$

The chance of choosing an alternative is equal to the probability that the utility of that particular alternative is greater or equal to the utilities of all other alternative in the choice set. The dependent variable for a multinomial model is a discrete variable taking the values 0, 1, 2, 3… N, where n is the number of technology choices available to farmers. That is

$$\text{Prob (choice } j) = \frac{\exp(\beta_j X)}{\sum_j^n \exp(\beta_j X)} \quad \ldots\ldots\ldots (3)$$

A Multinomial model assumes that the choices of technologies by farmers are mutually exclusive.

Data source and sampling procedure

A household survey was conducted in the eight demonstration and adaptation trial villages. A total of 400 household heads were interviewed using a well-structured

questionnaire. To determine household sample size per village, household heads in the villages were listed and random selection was made based on the population of each village. The share of total sample size was as follows: Fatika (18.5%), Kaya (23.5%), Danayamaka (9.25%), Buruku (18.75%), Kufana (5.7%5), Kroasha (6.25%), Kadiri Gwari (9) and Kayarda (9%). The household survey was supplemented with a community-level survey using the focus group discussion (FGD) method.

Empirical model

Collected survey data were analyzed using descriptive statistics and econometric models. These models were analyzed using the statistical software packages SPSS and LIMDEP.

A Multinomial logit model was used to package all the various categories of technologies into a one-model scenario. The dependent variable in this model was a discrete variable taking the value 0, 1, 2 and 3 for cases of non-adopter, inorganic fertilizer only, BNMS-manure and BNMS-rotation respectively.

The estimated model was specified as follows:

$$Y_i = \beta_0 + \beta_{ii}AGE + \beta_2 HHSIZE + \beta_3 SOCKAP + \beta_4 OFFINCOME + \beta_5 LIVESTOCK + \beta_6 CREDIT + \beta_7 EDUCATION + \beta_8 PERCEPTION + \beta_9 EXTENSION + \beta_{10} FARMSIZE + \beta_{11} ASSET + \mu \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The multidisciplinary independent variables included farmer, farm and institutional factors postulated to influence technology adoption. These variables were age (*AGE*) of the household head in years, the household size (*HHSIZE*), measure of social interaction resulting from membership in farmers' organization (*SOCKAP*), off-farm income from non-farm activities (*OFFINCOME*) measured in Nigerian naira (N), livestock ownership of the households (*LIVESTOCK*) measured in Tropical Livestock Unit, access to credit (*CREDIT*), education of household head (*EDUCATION*) measured by the number of years of formal education, perception of the state of land degradation and depletion (*PERCEPTION*), effective extension contacts (*EXTENSION*) measured in dummies by the regularity of visits by extension agents, farm size (*FARMSIZE*), and asset (*ASSET*). Off-farm income and Naira value asset of ownership transformed in natural logarithm. Social capital, access to credit and extension were included in the model as dummy variables.

The rationale for inclusion of these factors was based on *a priori* expectation of agricultural technology adoption literature. The effect of age on BNMS technological adoption decisions may be negative or positive. Younger farmers have been found to be more knowledgeable about new practices and may be more willing to bear risk and adopt new technology because of their longer planning horizons. The older the farmers, the less likely they are to adopt new practices as they place confidence in their old ways and methods. On the other hand, older farmers may have more experience, resources, or authority that may give them more possibilities for trying a new technology. Thus for this study, there is no agreement on the sign of this variable as the direction of the effect is location- or technology-specific (Feder et al. 1985; Nkonya et al. 1997; Oluoch-Kosura et al. 2001; Bekele and Drake 2003). Education was hypothesized to influence the adoption of integrated soil fertility

technologies positively since, as farmers acquire more, their ability to obtain, process, and use new information improves and they are likely to adopt. Education increases the ability of farmers to use their resources efficiently and the allocative effect of education enhances farmers' ability to obtain, analyze and interpret information. Several studies reviewed by Feder et al. (1985) indicate positive relationship between education and technological adoption (Alene et al. 2000; Nkoya et al. 1997; Oluoch-Kosura et al. 2001

Institutional factors of social capital, extension contact and access to credit were hypothesized to influence the adoption positively as these support services facilitate the uptake of new technologies. Membership of associations, such as cooperative societies, has been found to enhance the interaction and cross-fertilization of ideas among farmers (Bamire et al. 2002). Farmers who are not members of associations are expected to have lower probabilities of adoption and a lower level of use of BNMS technologies. The extension contact variable incorporates the information that the farmers obtain on their production activities on the importance and application of innovations through counseling and demonstrations by extension agents on a regular basis. It is hypothesized that the respondents who are not frequently visited by extension agents have lower possibilities of adoption than those frequently visited (Adesina and Zinnah 1993; Shiferaw and Holden 1998; Oluoch-Kosura et al. 2001; Bamire et al. 2002). The variable was measured as dichotomous with respondents 'contact during the period scoring one, and zero for no extension contact on the use of BNMS technologies.

Access to credit takes cognizance of farmers' access to sources of credit to finance the expenses relating to the adoption of innovations. Access to credit boosts farmers' readiness to adopt technological innovations. It was hypothesized that the variable has a positive influence on the probability of adoption and use of land improving technologies (Zeller et al. 1998; Oluoch-Kosura et al. 2001; Bekele and Drake 2003). It was measured as a dichotomous variable with ''access'' being one, and zero for ''no access''. Measures of wealth such as livestock, off-farm income and the household's asset ownership are also hypothesized to influence adoption positively. They are generally considered to be capital that could be used either in the production process or be exchanged for cash or other productive assets. They are expected to influence the adoption of BNMS technologies positively (Shiferaw and Holden 1998; Zeller et al. 1998; Negatu and Parikh 1999). Livestock and household assets increase the availability of capital which makes investment in land-enhancing technologies feasible. Livestock, particularly oxen, are used as working assets to perform farm operations, including the use of BNMS technologies, which increases the possibility of timeliness effects.

To the extent that liquidity is a constraint to adoption, off-farm income will have a positive effect on adoption. The level of off-farm income, however, may not be exogenous but be affected by the profitability of the farming operation that in turn depends on technology adoption decisions. Thus, the adoption of BNMS

technologies and the level of off-farm income may be determined simultaneously. This arises due to the labor allocation decisions of the households about farm and non-farm activities. However, the off-farm income of the household surveyed is mostly derived from the remittances of family members in non-farm business activities and from employment in non-farm sector. As the skill requirements for these jobs are likely to be different from those of farming, the farm and non-farm employment may be considered as non-competitive activities. In this situation, the level of non-farm income would be largely exogenous to the adoption decision (Lapar and Pandey 1999).

Perception of the state of degradation of farmer's land (1, if the land was perceived to be degraded, 0, otherwise) was also hypothesized to influence adoption positively. Farmers who perceived their land degraded and soil depleted are more likely to adopt land-improving technologies (Shiferaw and Holden 1998). Household size, which includes all people living under the same roof and who eats from the same pot as the household head, has been identified to have either a positive or a negative influence on adoption (Manyong and Houndekon 1997, Zeller et al. 1998; Oluoch-Kosura et al. 2001; Bamire et al. 2002; Bekele and Drake 2003). Larger family size is generally associated with greater labor force availability for the timely operation of farm activities. The negative relationship of the variable with adoption has been linked to the increased consumption pressure associable with a large family. It is therefore difficult to predict this variable '*a priori*' in this study.

Previous studies have found a positive relationship between farm size and technological adoption (Manyong and Houndekon 1997; Negatu and Parikh 1999; Oluoch-Kosura et al. 2001; Bekele and Drake 2003). For this analysis, farm size is included as the total cropland available to the farmer. Operators of large farms are likely to spend more on land improving technologies. In many cases, large farm size is associated with increased availability of financial capital, which makes investment in ISFM more feasible. A positive relationship is hypothesized with adoption of land-enhancing technologies (Table 1).

Table 1: Explanatory variables for adoption evaluation

Variable	**Variable Descriptions**	**Units**
PERCEPTION	An ordinal variable measuring farmer's own views regarding the fertility status of their land. 1 if the soil is degraded, 0 if not.	
EDUCATION	Number of years of formal education completed by the household head.	Years
AGE	Age of the household head in years.	Years
EXTENSION	An ordinal measure of effective contact of extension agents. 1 if contact was made, 0 if not.	
SOCKAP	Farmer's involvement in social activities measured by membership in social organization. 1 if farmer was a member, 0 otherwise.	
HHSIZE	Number of people living together under the same roof and eating from the same pot.	
FARMSIZE	The total farmland possessed by the household.	Ha
LIVESTOCK	Livestock holdings of the household as probable source of wealth or manure.	Tropical Livestock Units

CREDIT	Access to credit measured by the farmer's access to a source of credit such as co-operative society at a reasonable cost. 1 if there was access, 0 otherwise.	
OFFINCOME	Income in Naira generated from off-farm activities.	Naira
ASSET	Value of household and farm assets possessed by the household	Naira

Source: Own computation, 2006

RESULTS AND DISCUSSION

Socio-economic characteristics of sample households

Survey results indicate that there was a variation in the demographic and socio-economic characteristics among adopters of BNMS technologies as well as between the adopters and non-adopters. The average age of all respondents in the study is 42.5 years. The farming population is relatively young in the BNMS project area; this is of immense importance to the availability of labor for agricultural activities in general and for testing of agricultural innovations. When the result was examined very closely, it was found that technology adopters are much younger than non-adopters. The average age of the adopters ranged from 40.8 to 44.5 years while the average age of non-adopters was 50 years. Many studies on the adoption of agricultural innovations in Africa found that age is a significant determinant of technology adoption among farmers. The overall average literacy rate is 46.3% and the literacy rate of technology adopters (43.3% to 48.4%) was higher than that of non-adopters (33.3%). Among the adopters, those adopting BNMS-manure had the highest level of literacy, followed by the adopters of inorganic fertilizer only and the adopters of BNMS-rotation. The average years of formal education completed by household head was 7.6. The average number of years of formal education completed by technology adopters (7.3–8) was higher than the average number completed by non-adopters (5). Altogether, technology adopters are younger and more educated than non-adopters (See Table 2). The average household size in the study area was large (11.5 persons/household). For all the adopters, average household size was more than 10 persons while for non-adopters it was below 10. Overall average number of adult males (>15) is 3.5 per household. Among the adopters, the average number of adult males (>15) was highest for the adopters of BNMS-manure (3.7 per household) followed by adopters of BNMS rotation (3.9 per household) and adopters of inorganic fertilizer only (3 per household). Non-adopters have fewer adult male (>15) per household compared with the adopters.

Table 2: Demographic and socio-economic characteristics of farmers (mean)

Variable	Non-adopters	Inorganic fertilizer only	BNMS manure	BNMS rotation	All sample
Age	50	40.8	44.5	43.5	42.5
Literacy rate (%)	33.3	46.3	48.4	43.3	46.3
Years of formal education of head	5	8	7.3	7.3	7.6
Household size	9.7	10.6	12.4	12.6	11.5
No. of adult males >15	2	3.3	3.7	3.6	3.5

Farm size	2.6	3.5	3.8	3.5	3.58
Total livestock unit	1.2	3	4.12	3.9	3.5
Farm distance (km)	3	4.5	4.8	5.4	4.7
Perception (% degraded)	33	82	94	72	83
Extension contact (%)	40	70	72	68	69.3
Off-farm income (N)	2500	11,717	17217	19,615	14,579
Access to credit (%)	0	16	24	12	17.5
Asset	3,420	57915	53,122	25,579	50,129
Membership of association (% belong)	50	50	58	49	55

Source: Own survey

The average number of TLU in the study area was 3.5. Adopters of BNMS-manure would require possession of livestock to produce manure, consequently findings showed that they had the largest number of TLU (4.12), followed by adopters of BNMS rotation (3.9) and adopters of inorganic fertilizer only (3). Non-adopters of BNMS technologies had the smallest TLU (1.2). Farm size of the respondents ranged from 2.6 ha for non-adopters to 3.8 ha for adopters of BNMS-manure. Access to credit in the study area was generally low (less than 25%). Fifty eight percent of the adopters of the BNMS-manure belonged to one association or another while about 50% of the farmers in other categories are members of either farmers' group, cooperative societies or religious groups. The table shows the values of farm and household assets possessed by the households. Non-adopters of any of the land-improving technologies had average total asset worth of N3400. An average BNMS-manure adopter on the other hand possessed N53, 122 worth of assets and the corresponding value for a BNMS-rotation adopter was N25, 579. The users of inorganic fertilizer had mean assets of about N58, 000. The table reveals the high values of farm and household assets.

As regards the perception of the state of land degradation, more than 70% of the adopters of land-enhancing technologies perceived that their lands were degraded and needed urgent replenishment while only 33% of the non-adopters had an appreciation of the extent of land degradation. Extension contacts were high in the study area with an average of 69% of the survey households having regular contacts with extension agents though the number was lower among non-adopters. Average off-farm income of farmers for the sample area is N14, 579; FGDs revealed that this off-farm income came from activities like "Okada" (motor cycle taxi service) practiced generally by young men. Other activities contributory to this income included small scale trading, food processing and sales, and manual jobs such as digging wells and bricklaying.

Multinomial logit model estimates

Adopting a particular technology in the Multinomial logit model should not imply that farmers exclusively looking for a single technology. They are rather looking for integrated soil fertility management technologies with a different intensity of preferences. This analysis is concerned with the factors that could motivate farmers to a higher rating or preference

for a specific technology. These factors are shown in Table 3.

Overall, the estimated Multinomial logit model was highly significant in explaining farmers' adoption decisions for ISFM technologies. The log likelihood ratio of -426.81 between the dependent variable and the set of explanatory variable indicates the fitness of the model. This together with Chi-squared value of 88.75 supports the adequacy of the model.

The key and significant variables determining the adoption decisions of integrated soil fertility management technologies were extension and perception. The results showed that extension and perception would increase the adoption of inorganic fertilizer only, BNMS-manure and BNMS-rotation. The findings agree with Wallys (2003) claimed that the technologies as good but being promoted as a basket of options from which the farmers can make a choice. As extensions visits to the household increased, the adoption of BNMS-manure and BNMS-rotation increased. As extension visit reduced, more inorganic fertilizer would be adopted.

Table 3: Multinomial logit model estimates of the determinants of adoption of ISFM technologies

Variable	Estimated coefficients for different adoption typologies					
	Inorganic fertilizer only		BNMS-manure		BNMS-rotation	
	Estimate	Marginal effects	Estimate	Marginal effects	Estimate	Marginal effects
CONSTANT	-3.058 (-0.430)	0.837	-6.766 (-0.960)	-0.652	-5.785 (-0.820)	-0.185
AGE	-0.065 (-1.440)	-0.005	-0.045 (-0.980)	0.003	-0.044 (-0.920)	0.002
EDUCATION	-0.042 (-0.250)	0.000	-0.033 (-0.190)	0.003	-0.061 (-0.360)	-0.003
SOCKAP	-0.864 (-0.710)	0.021	-0.880 (-0.720)	0.007	-1.084 (-0.870)	-0.028
LIVESTOCK	0.967 (1.440)	-0.009	1.000 (1.480)	0.005	1.013 (1.500)	0.005
EXTENSION	3.961** (2.340)	-0.081	4.203** (2.460)	0.028	4.452*** (2.600)	0.053
FARMSIZE	0.693 (1.370)	-0.007	0.737 (1.450)	0.009	0.692 (1.360)	-0.002
OFFINCOME	0.185 (0.570)	-0.038	0.278 (0.850)	0.007	0.461 (1.410)	0.032
ASSET	0.312 (0.470)	-0.015	0.368 (0.560)	0.009	0.375 (0.570)	0.006
CREDIT	30.111 (0.000)	0.024	30.281 (0.000)	0.064	29.499 (0.000)	-0.088
HHSIZE	0.048 (0.400)	-0.001	0.057 (0.470)	0.002	0.037 (0.300)	-0.002
PERCEPTION	4.808*** (2.750)	-0.126	5.995*** (3.350)	0.287	4.003** (2.260)	-0.160
Chi-squared 88.75						
Log likelihood function -382.44						
Restricted log likelihood function -426.81						

Note: *** = Significant at 1 percent, ** = Significant at 5 %, * = Significant at 10%, Figures in parentheses represent asymptotic *t*-ratios

Source: Field survey

This implied that farmers are fully aware of the importance of inorganic fertilizer and additional visits will lead only to the adoption of BNMS-manure and BNMS-rotation. Incidentally, the BNMS-technologies were still being seen in the study area as new technologies and intensified efforts from the extension agents will increase their adoption. This is in line with the results from data description, where extension service could lead to adoption of the BNMS technologies. But as perception decreased, adoption of BNMS-rotation and inorganic fertilizer increased. By and large, the age and the education of the household head, and social capital have opposite impact on the adoption of inorganic fertilizer only, BNMS-manure and BNMS-rotation. However, as farmers have more contacts with extension agents, adoption rate of the BNMS-manure and BNMS-rotation increased by over quadruple.

Perception of the state of land degradation and soil depletion is an important variable. As farmers got more perception of the state of their land degradation and depletion, the rate of adoption in of BNMS-manure increased by more than 5 times while that of BNMS-rotation was quadruple. The variable was significant for inorganic fertilizer only and BNMS-rotation and BNMS-manure. However, as perception increased, inorganic fertilizer only and BNMS-rotation were less used while BNMS-manure was adopted more.

With respect to other variables, none was statistically significant. Experience, as proxied by age, was negative and insignificant for all categories of technologies. Education and interaction provided by social capital were also statistically insignificantly negative. However, livestock, farm size, off-farm income, assets and household size were positive for all integrated soil fertility management technologies but were insignificant. The foregoing reveals that extension service and perception were the most important variable conditioning the adoption of integrated soil fertility management technologies. BNMS technologies were more responsive than inorganic fertilizer only to extension contacts. BNMS-rotation and inorganic fertilizer only had positive marginal effects with respect to perception.

CONCLUSION AND RECOMMENDATIONS

This study assessed the determinants of adoption of BNMS technologies in northern Nigeria. Results confirmed the importance of extension services and perception of the state of land degradation in the adoption and use intensity of BNMS technologies. By way of scaling the technology up and out, policies and strategies that improve access to extension services should be instituted. Towards this end, there is an urgent need for upgrading the quality and adequacy of the extension services in target areas (to disseminate the technologies and create greater awareness of the state of land degradation) via better training for technical and communication skills. This could be achieved through pre-service as well as in-service training with agricultural development strategy that places high emphasis on the adoption and usage of BNMS technologies. Apart from this, farmers should also be visited regularly at the point of introduction of the new technologies.

The same results could also be achieved through organization of field days as revealed by FGDs. Fields days provide the farmers, extension agents, and researchers with a chance to interact and share ideas and experiences on a given technology. Farmers have the opportunity to learn about the best way of using new technologies to benefit from them. They are able to share ideas about possible problems they might face in adopting and using these technologies.

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REFERENCES

Adesina, A.A. and Baidu-Forson, J, 1995, "Farmers' perceptions and adoption of new agricultural technology: evidence from analysis in Burkina Faso and Guinea, West Africa". *AgriculturalEconomics* Volume 13, pp 1-9.

Adesina, A. A. and Zinnah, M. M, 1993, "Technology characteristics, farmers' perceptions and adoption decisions: A Tobit model application in Sierra Leone". *Agricultural Economics*. 9, pp 297-311.

Alene, A. D., Poonyth, D. and Hassan, R. M, 2000, "Determinants of adoption and intensity of use of improved maize varieties in the central highlands of Ethiopia: A Tobit analysis". *Agrekon*(South African Journal of Agricultural Economics), 39(4), pp 633-643.

Alene, A. D. and Manyong, V. M, 2006, "Farmer-to-farmer technology diffusion and yield variation among adopters: the case of improved cowpea in northern Nigeria". *Agricultural Economics*, Volume. 35, pp 203-211.

Bamire, A.S., Fabiyi, Y.L and Manyong V. M, "2002. Adoption pattern of fertilizer technology among farmers in the ecological zones of South-Western Nigeria: A Tobit analysis". *Australian Journal of Agricultural Research*. Volume 53. pp 901-910.

Barrett, C.B. and Carter, M.R, 1999, "Microeconomically coherent agricultural policy reform in Africa". In: Paulson, J. (Ed), The reform experiences. African economies in transition, Volume. 2. Macmillan, London, UK.

Bekele, W. and Drake, L, 2003, "Soil and water conservation decision behavior of subsistence farmers in the Eastern Highlands of Ethiopia a case study of the Hunde-Lafto area". Elsevier Science Ltd. *Ecological Economics*, Volume 46, No 3. pp 437-451.

Chianu, J. N., Tsujii, H. and Kormawa, P, 2004, 'Agriculture in the savannas of northern Nigeria: Pressures, transformation, damage and coping strategies" *Outlook on AGRICULTURE*, Volume 33, No 4, pp 247-253

Croppenstedt, A. and Demeke, M, 1999, "Determinants of adoption and levels of

demand for fertilizer for cereal growing farmers in Ethiopia". *The Centre for the study of African Economics Working Paper Series*. Volume 39, pp1-12

Ersado, L. Amacher, G. and Alwang, J, 2004, "Productivity and land enhancing technologies in Northern Ethiopia: Health, public investments and sequential adoption". *American Journal of Agricultural Economics*. Volume 86, pp 321-331

Feder, G., Just, R.E. and Zilberman, D, 1985, "Adoption of agricultural innovations in developing countries: A survey". *The University of Chicago*. pp 255-299. USA.

Foltz, J. D. and Chang, H, 2002 "The adoption and profitability of rbST on Connecticut Dairy Farms". *American Journal of Agricultural Economics*. Volume 84, pp 1021-1032.

Greene, W. H, 1998, "Microsoft "Econometric software". LIMDEP

IITA, 1996, "Ecoregional program for the humid and sub-humid tropics of sub-Saharan Africa-EPHTA: Mechanism for sustainability and partnership in agriculture. International Institute of Tropical Agriculture (IITA)", Ibadan, Nigeria, pp 29

Iwuafor, E. N. O., Aikou, K., Vanlauwe, B, Diels, J., Sangiga, N, Lyasse, O Deckers, J, and Merckx,

R., 2002, "On –farm evaluation of the contribution of sole and mixed applications of organic matter and urea to maize grain production in the savanna". In: Vanlauwe, B., Diels, J.,

Sangiga, N., and Merchx, R. (eds). *Integrated Plant Nutrient Management in Sub-SaharanAfrica*. CABI Publishing, New York, pp 185-197

Jagtap, S. S, 1995, "Environmental characterization of the moist lowland savanna of Africa". In:

Kang, B. T., Akobunbu, I. O., Manyong, V. M.,Carsky, R. J.,Sanginga, N. and Kueneman, E.

A. (eds*), Moist savannas of Africa: Potential and constraints for crop production*.

Proceedings of an IITA/FAO Workshop held from 19-23 September 1994, Cotonou, Republic of Benin, pp .9-30

Jahnke, R, 1982, "Livestock production systems and livestock development in TropicalAfrica". Kieler Wissenschaftsverlag vauk

Lapar, M. L. A and Pandey, S, 1999, "Adoption of soil conservation: the case of the Philippine Uplands". *Agricultural Economics* 21, pp 241-256.

Manyong, V. M., Houndekon, A. V,1997, "Land tenurial systems and the adoption of mucuna planted fallows in the derived savannas of West Africa". Paper presented at the workshop on property rights, collective action and technology adoption. ICARDA. November 22-25. Aleppo, Syria.

Manyong, V.M., Makinde, K. O., Sanginga, N, Vanlauwe, B. and Diels, J, 2001, "Fertilizer use and definition of

farmers' domains for impact-oriented research in the Northern Guinea Savanna of Nigeria". *Nutrient cycling in Agroecosystems*, Volume. 59, pp 129-141.

Negatu, W. and Parikh, A, 1999), "The impact of perception and other factors on the adoption of agricultural technology in the Moret and Jiru Woreda (district)". Ethiopia *Agricultural Economics*. Volume 21, pp219-229.

Nkonya, E., Schroeder T. and Norman, D, 1997, "Factors affecting adoption of improved maize seed and fertilizer in Northern Tanzania." *Journal of Agricultural Economics*, Volume. 4, pp 1-12.

Rahm, M. R. and Huffman, W. E, 1984, "The adoption of reduced tillage: The role of human capital and other variables". *American Journal of Economics*, pp 405-413.

Oluoch-Kosura, W. A., Marenya, P. P. and Nzuma, M. J, 2000, "Soil fertility management in maize-based production systems in Kenya: current options and future strategies". Paper submitted at the Seventh Eastern and Southern Africa regional maize conference, Nairobi. pp 350-355

Shiferaw, B. and Holden S. T, 1998, " Resource degradation and adoption of land conservation technologies in the Ethiopian Highlands: A case study in Andit Tid, North Shewa".

Vanlauwe, B., Aihou, K., Aman, S., Iwuafor, E.N.O., Tossah, B.,Diels, J., Sanginga, N., Lyasse,O.,

Merckx, R. and Deckers, S, 2001, "Maize yield as affected by organic inputs and urea in the West African moist savanna". *Agronomy Journal*. No.93.pp 1191-1199.

Wallys, K., Tollens, E. and Manyong V. M, 2003, "Socioeconomic analysis of promising Balanced Nutrient Management Systems in northern Nigeria". An MSc. thesis, KU-Leuven

Zeller, M., Diagne. A. and Mataya C, 1998, "Market access by smallholder farmers in Malawi: Implications for technology adoption, agricultural productivity and crop income". *Agricultural Economics*. Volume. 19, pp219-229

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Economics of fish production and marketing in the urban areas of Tillabery and Niamey in Niger Republic

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Abstract: This study analysed the economics of inland fishing, aquaculture and fish marketing in Niamey and Tillabery areas of Niger Republic. Two-stage random sampling technique was adopted to select the respondents and structured questionnaire was administered to collect the data. The analytical techniques include descriptive statistics and budgeting. The results showed that both the aquaculture and inland fish production were profitable with a rate of return of 61% and 320% respectively while two types of fish marketing channels were identified. Aquaculture was found to be more capital intensive requiring more cash investment than inland fishing. A reduction in inputs cost especially the capital input would encourage more participation in fish farming as this would relieve fish supply pressure on inland fishing. Sensitization of fish producers and institutional support would also improve fish production and therefore the marketing.

Keywords: fish production, fish marketing, profitability, Niger

INTRODUCTION

Niger Republic is a continental country in West Africa which covers a land area of 1,267,000 km^2 (with two third of desert) and has an estimated population of 10,790,352 inhabitants (Projet NER/00/P51- RGPH, 2001). The climate is of Sahelian type characterized by two broad seasons: one dry season of about nine months (September/October to May/June) and a raining season from June to September. Important spacio-temporal variability is observed in the precipitations with increased incidence of drought and desertification.

In Niger Republic, fishing is practiced in the southern part of the country along the River Niger, the Komadougou Yobe, the Lake Chad and various Fossil Rivers (Dallols Bosso and Maouri) and streams with periodic flow (Goulbi N'kaba, Korama and Maradi). Fishery presents a lot of opportunities under good hydrology. It also improves the diet of people and contributes to the country's food security. The importation of 1,411 tonnes in 2008 (Institut National de la Statistique, 2010) indicates a deficit in local fish supply. Three types of aquaculture have been identified in the country: the semi-intensive pond, the intensive and the extensive aquaculture. The semi-intensive system started in 1974 and was funded by CARE International and the "Fond de Contre-Partie des Pays-Bas" in the River Valley. The extensive aquaculture has been developed from 1976 in order to improve the exploitation of permanent and semi permanent pools. Project of this type has been financed all over the country by many donors like OXFAN, UNICEF, FAC/France, World Bank, B.I.D, USA, etc. and resulting in increased productivity. The Intensive aquaculture was financed by "Cooperation Française" through the Project ADAN. Though, aquaculture in Niger faces lot of hydrographic constraints and fish farming is only possible under water

pump system. Since January 2002, Niger has set out a Poverty Reduction Strategy (SRP) which serves as basis for all economic interventions including the Strategy for Rural Development (SDR) with the objective of reducing poverty from 66 % presently to 52% by 2015. The strategy will focus on: (i) Developing aquaculture among fishing communities; (ii) promoting the use of adapted technologies and (iii) ensure sustainability of fisheries livelihoods through micro-finance institutions with emphasis on gender and pro-poor actions. Before Government intervention in the fishery development, the production of fish in Niger has been on the decline and total fish catches dropped from 16,400 tonnes in 1972 to about 4,156 in 1996 and 1,469 tonnes only in 2009 (Institut National de la Statistique, 2010 citing "Direction de la Pêche et d'Aquaculture"). This decline was due to a relatively high fishing pressure and mostly the Sahelian drought (Malvestuto and Meridith, 1986). In view of the national constraints faced by fisheries communities and the policies efforts of Government to eliminate poverty, it is important to analyze the economics of fish production and marketing and the problems encountered by the industry in Niger Republic.

Number of studies reported on the economics of fish production around the world. Hishamunda *et al.* (1998) in Rwanda estimated the cost and returns of aquaculture and agricultural crops such as sweet potatoes, Irish potatoes, cassava, taro, sorghum, maize, peas, beans, soybeans, peanuts rice and cabbage. With the exception of Irish potatoes, all enterprises showed positive income above variable cost and positive net returns to labour and management. Fish production generated the highest income and net returns if fingerlings could be sold. Islam *et al.* (2002) in a study in three selected villages of Ditpur union under Baaluka Upazila of Mymensingh district found that rice production with fish was more profitable than without fish in rice-cum-fish farming. Tokrisna *et al.* (1985) in Thailand showed that it would be profitable for fishermen with modern equipment to increase the size and engine power of their vessels, whereas those with more traditional equipment should increase their use of labour. Olomola (1991) in Nigeria found that the cost of capture fisheries were higher than those of aquaculture except for the opportunity cost of family labour. Therefore, capture fisheries were more labour intensive than aquaculture. The inputted cost of family labour in capture fisheries exceeded that of aquaculture by about 63%. The author also found that the short-term profitability of aquaculture is more promising than that of capture fisheries and that the gross revenue or value of fish output associated with aquaculture exceeded that of capture fisheries by about 35%. The findings of the study showed also that the net profit was negative in both systems, indicating that capture fisheries and aquaculture are not economically viable in the long-run as the returns being generated are not sufficient to cover the fixed cost of production. Yesuf et al. (2002) assessed the economics of fish farming in Ibadan Metropolis. The study revealed that most farmers with secondary education and above operate at small-scale level with an average of three (3) ponds. Fish farmers practiced poly-culture fish farming. Clarias spp is the most

raised fish species followed by Heteroclarias spp. The gross margin analysis revealed that medium scale farmers derived the highest return of N1.55 for every one naira expended. This is followed by large-scale farmers at N 1.52 for every 1 Naira compared with only N 1.34 for every 1 Naira spent by small-scale farmers. Ajao (2006), found that 80% of fish farmers in Oyo state, Nigeria, operated less than two (2) ha which could not capture economy of size. More than 90% of the respondents distributed their fish at the site while 60% had little access to extension agents. Meanwhile fish farming was found to be profitable.

From the literature review aquaculture is a profitable venture, but inland fishing profitability is still questionable. This study analyzes the inland fishing and fish farming profitability and the fish marketing system in Niger. The broad objective of this study is to assess the economics of fish production and distribution in the Urban Community of Niamey (CUN) and Tillabery. Specifically the study: identifies the socio-economic characteristics of inland fishermen and fish farmers, analyze costs and returns and inputs use intensity in fish farming and inland fish production in the area and identify fish marketing channels.

METHODOLOGY

The study area covered Tillabery Region and the Niamey Urban Community "CUN" both located in the southern part of Niger Republic along the River Niger. Tillabery region covers a land area of 104,739 square meters. It is limited by the departments of Ouallam to the East, Tera to the West, Kollo to the South and Republic of Mali to the North. Niamey the capital is surrounded by Tillabery and represents the Capital of the Country. The hydrographic network of CCU is made up of seventeen (17) permanent and semi-permanent pools, and the river Niger crossing the CCU on fifteen (15) km. The CCU gathers over 160 indigenous and foreign fishermen living in six localities which are Gaweye, Saga, Kombo, Goudel, Gamkale and Kirkissoye. Fishery activities take place on the river Niger or its affluent and the pools located at Sorey and Kongou Gorou. Species in the area include *Lates, Synodontis clarias Labeo, Tilapia, Unlunglanus*, etc. Despite the important hydrographic potential, fish production in Niamey is very low. The protein requirement of the population of Niamey is being compensated by the production from the areas of Tillabery and the imports from neighboring countries (Mali, Burkina Faso). For several years, due to the low production of fish caused by frequent drought, some inland fishermen have switched to agricultural activities (crops and livestock production) while other still use prohibited materials (Nets) to increase their production.

Data were collected with the administration of structured questionnaire. The sources of secondary data were Direction de la peche, PNEDP, ADA, COEDE and were on past production. The respondents were selected at random for interview. Data were collected on fish farmers' socio-economic background, production inputs- output, markets prices and the fish distribution channels. Two categories of fish producers were sampled: the ponds owners and the inland fishermen. Two-Stage Random Sampling Technique was adopted to select the respondents. Four (4) villages in Tillabery area

and two (2) localities in Niamey were randomly selected in the first stage. In the second stage 30 pond owners and 40 inland fishermen were randomly selected making a total of 70 respondents for the study. The sample distribution per selected village is as follows: Kollo (12 fishermen and 4 pond owners) Boubon (18 fishermen, 20 pond owners), Kokomani (3 fishermen, 2 pond owners) and Sona (0 fishermen, 4 pond owners) in Tillabery and Gamkaleye-Golle (4 fishermen, 0 pond owners) and Gamkalle-Gaweye (3 fihermen, 0 pond owners). Information on fish marketing was also gathered from two (2) selected wholesalers and forty (40) retailers from two major fish markets Djamadjie (with 15 retailers) and "Petit Marché" (with 25 retailers) markets respectively.

The methods adopted in analyzing data include descriptive statistics (mean, percentage) and budgeting technique. Profitability was assessed as follows:

Profit = TR – TC

TC = FC + VC

TR = Q*P

Gross Margin = TR - VC

With, TC = total cost; FC = fixed cost; VC = variable cost; TR = total revenue;

Q = output; P = price.

RESULTS AND DISCUSSION

From Table 1 both fish farmers and inland fish producers are male only (100%), meaning no female presence in fish production in the area. Fish producers were between 20-39 years of age for 40 % of fish farmers and 42.5 % of fishermen; between 40-59 for 50% and 45 % of fish farmers and fishermen respectively. Fish producers are therefore of middle age in both groups meaning age similarity. The education level was 87% and 50% for fish farmers and inland fishers respectively, but there is relatively high level of illiteracy among inland fishers with 47.5 % against 0% for fish farmers. There is also similarity in family size distribution with majority between 1 and 10 members; 73% for fish farmers and 75% for inland fishers. This would mean relative availability of family labour for fish production. Results also indicate that majority of farmers (93%) own between 1 and 9 ponds. This may mean a risk management strategy among pond owners.

Fish production shows a fixed cost of FCFA 1,952,561 for aquaculture against FCFA 34,600 only for inland fishing (Table 2 below) representing 29 and 79% of total cost for fish farming and inland fishing respectively. Variable costs were FCFA 4,631,844 for fish farming and FCFA 9,200 only for inland fishing that is 71 and 21% of the total cost of production respectively. There is therefore cost flexibility in fish farming relatively to inland fishing.

Table1: Socio-economic characteristics of fish producers

Characteristics	**Fish farming**		**Inland fishing**	
	Freq	**%**	**Freq**	**%**
Sex				
Male	30	100	40	100
Female	00	00	00	00
Total	30	100	40	100
Age (years)				
20-39	12	40	07	42.5
40-59	15	50	18	45.0
60-Above	03	10	05	12.5
Total	30	100	40	100
Education level				
None	00	00	19	47.5
Primary	26	87	20	50.0
Secondary	04	13	01	02.5
Total	30	100	40	100
Family size				
01 – 10	22	73	30	75

11 – 20	05	17	08	20
21 – Above	03	10	02	05
Total	30	100	40	100
Nb. of ponds				
01 – 09	28	93.34	-	-
10 – 19	01	03.33	-	-
20 – above	01	03.33	-	-
Total	30	100	-	-
Total	30	100	-	-

Source: Field Survey

The total revenue was FCFA 10,772,779 per ha and FCFA 184,400 per fisherman. The gross margin was FCFA 6,140,935 and 175,200 for both fish production systems respectively. The rate of returns on investment was high in inland fishing (320%) compared to fish farming (61%), both show therefore profitability in fish production.

From table 3 below, we found out that fish farming in the area is highly capital intensive at 95% of total cost while labor represents 5% only. The cost of feed alone represents 43.5% of the total cost while fingerlings and rent amounted respectively to 19 and 18%.

Inland fishing was also capital intensive with 79% of total cost while labour made 21% of total cost as shown in Table 3. The capital costs items in this venture comprised canoe, little fishing materials and harvesting. Both were capital intensive with fish farming involving in absolute terms more of cash and management effort.

Table2: Costs/Returns in fish farming and inland fishing

Items	**Fish farming (1 ha pond)**		**Inland fishing (per fisher)**	
	Value (FCFA)	**Percentage**	**Value (FCFA)**	**Percentage**
Fixed Costs	**1,952,561**	**29**	**34,600**	**79**
1- Rent	1,200,000	18	-	-
2-Canoe	377,370	5.5	10,600	24
3- Little materials	375,191	5.5	24,000	54
Variable costs	**4,631,844**	**71**	**09,200**	**21**
1- Fingerlings	1,271,277	19	-	-
2- Feed cost	2,914,026	43.5	-	-
3- Fuel	226,541	3.5	-	-
4- Sexing	20,000	0.3	-	-
5- Feeding	300,000	4.5	-	-
6- Harvesting	10,000	0.2	09,200	-
Total costs	**6,584,405**	**100**	**43,800**	**100**
Total revenue	10,772,779	-	184,400	-
Gross Margin	6,140,935	-	**175,200**	-
Profit	**4,078,374**	-	**140,500**	-
Rate of Return	-	**61**	-	**320**

Source: Data Analysis

Table 3: Factors intensity in fish farming (CFA francs)

Items	**Fish farming**		**Inland fishing**	
	Value	**Percentage**	**Value**	**Percentage**
Capital	**6,364,405**	**95%**	**34,600**	**79%**
Rent	1,200,000	18	-	-
Canoe	37,370	5.5	10,600	24
Little materials	375,191	5.5	24,000	55
Fingerlings	1,271,277	19	-	-
Feed	2,914,026	43.5	-	-
Fuel/lubricants	226,541	3.5	-	

Labour	**330,000**	**5%**	**9,200**	**21%**
Sexing	20,000	0.3	-	-
Feeding	300,000	4.5	-	-
Harvesting	10,000	0.2	9,200	21
Total	**6,694,405**	**100%**	**43,800**	**100%**

Source: Data Analysis, 2005

In view of the profitability and the relative scarcity of the local production more people could be encouraged to embrace fish farming. This would reduce pressure on inland fishing with dwindling resources.

Marketing of fish in the Area

The main fish markets in Niamey are Djamadjie for wholesalers and "Petit Marche" for retailers. The catches from River Niger are not enough to meet the demand of Niamey and Tillabery. To compensate for the shortage wholesalers travel within and outside the country. Therefore two types of fish marketing channels were identified: the local and the international channels. In the local fish marketing channel wholesalers buy fish from fish farmers at the farm gate. They also buy fish from inland fishermen at the unloading site alongside River Niger. Wholesalers also get fish from Abalak (Tahoua) and some smoked fish from the Lake Chad (Diffa). The totality of fish bought is disembarked at Djamadjie market where it is weighted under the control of a forestry agent before the sale to retailers. Retailers in their turn sell the product to consumers and some hotels and restaurants.

For the international channel the import wholesaler get fish from the Lake Chad (Nigerian side), Burkina Faso, Mali, and frozen fish from France. The most important fish market circuit is that of Ansongho (Mali) to Niamey. The import wholesaler travel from Niamey to Tillabery town, Ayorou, Labzengua and Ansongho along the River Niger. Fishes are collected and conserved in containers (non-functioning deep freezers) with ice for the preservation of the fish. This channel is followed once or twice every month depending on the period: flood or low water. The import wholesalers sell the commodity to retailers after weighing it at the forestry office. These retailers in turn sell to consumers and other food outlets. The frozen fish is bought by wholesalers from France and are sold to the retailers who in turn sell it to consumers. This study revealed that retailers at Djamadjie market are exclusively male and exclusively female at Petit Marche (Table 4). This indicates a gender division of the two urban retail marketers. This division of fish retail markets could be an indication of the sensitive nature of the fish distribution system probably due to its scarcity and economic nature of the commodity in the area. Therefore, there is a need for encouraging local production to improve on the marketing system and reduce importation.

Table 4: Sex Distribution of Fish Retailers at Djamadjie and Petit Marché markets

Sex	**Djamadjie**		**Petit Marche**	
	Freq	**%**	**Freq**	**%**
Female	0	0	25	100
Male	15	100	0	0
Total	15	100	25	100

Source: Data collection

CONCLUSION AND RECOMMENDATION

Inland fishing and fish farming are profitable ventures in the Tillabery and Niamey Areas of Niger Republic. Fish production in the

area should be encouraged through a reduction in fishing input costs and an improvement in extension services to fish farmers. Ways of involving women in fish production should also be sought. These measures would increase fish supply with attendant beneficial effect on market price. Formal cooperative system of fish producers should be put in place to improve fish marketing system in the areas.

REFERENCES

Ajao, A.O. (2006): Economic of Fish Farming in Oyo State, Nigeria. Ph.D. Thesis, Department of Agricultural Economics. Obafemi Awolowo University, Ile-Ife, Nigeria.

Hishamunda, N.; Thomas, M.; Brown, D.; Engel C. and Jolly C. (1998): Small – Scale Fish Farming in Rwanda: Economic Characteristics. No 124.

Institut National de la Statistique (2010). Annuaire Statistique. Available at http://www.stat-niger.org/statistique/articles.php?lng=fr&pg=686

Islam, N. S.; Murshed, M.; Moniruzzaman, M. and Abdul B. N. (2002): *Rice-Cum Fish Farming in Selected Areas of Nymensingh District*. Online Journal of Biological Sciences 2 (10): 715 – 718.

Malvestuto, S. and Meredith, E. (1986). Résultats de l'évaluation de la pêcherie du fleuve au Niger. Enquête d'évaluation des captures (EEC).

Olomola, A. (1991): Capture Fisheries and Aquaculture in Nigeria: A comparative Economic Analysis. Issues in African Rural Social Science Series. Research Report No. 13. Winrock International Institute for Agricultural Development.

Projet NER/00/P51- RGPH (2001): Situation Actuelle du Recensement General de la Population et de l'Habitat. Available online at: http://niger.unfpa.org/docs/Rap%20Afristat%20RGPH.pdf

Tokrisna, R.; Panayotou, T. and Adulavidhaya, K. (1985): Production Technology and Economic Efficiency of the Thai Coastal Fishery in:Theodore Panayotou (ed). Small-scale Fisheries in Asia: Socio-Economic Analysis and Policy. IDRC. 229e. International Development Research Center, Ottawa, Canada.

Yesuf, S.A., Ashiru, A.N., Adewuyi S.A. (2003): *Economics of Fish Farming in Ibadan Metropolis*. Tropical Journal of Animal Science. Vol. 5. No 2. Pp. 81-88

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Evaluation of Households Protein Consumption Pattern in Orire Local Government Area of Oyo State

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Abstract: The study was carried out to assess the protein consumption pattern of households in Orire Local Government Area of Oyo State. Systematic sampling technique was used to select two villages from five wards in the study area. A total number of 80 households were used for the survey. The data was analysed using descriptive and inferential statistics. The result confirmed the household heads were male, married, mature with large household size and no formal education. Larger percentage were farmers with monthly income less than N20,000. Protein is fairly available in the study area but not affordable especially the animal protein, they spent as much as N7,000 monthly to purchase protein meal and consumed protein meal in partial, once daily because of the cost. The adults consumed more protein in most of the households ignoring the importance of protein in the diet of babies and children. The findings also showed that educational level, household size and income of the household heads affect the amount spent on the protein consumption. It was therefore recommended that rural dwellers should be encouraged to engage in planting legumes and rearing of livestocks in order increase personal consumption and distribution to the urban centre. Educational programmes should be organized for enlightenment about the importance of protein in their diet. Finally, family planning progamme should be emphasized to rural households in order to reduce the large household size prevalent in the study area.

Keyword: Protein, households, consumption, income

INTRODUCTION

In Nigeria, food supply is not distributed equally throughout the country and sometimes within the households. A large proportion of the populace including children, do not receive balance diet to ensure physical health and development. Most people consume the minimum level of calorie but fail to get necessary protein and essential vitamins and minerals required for leading a healthy life (Bender and Smith, 1997).

Proteins are the major structural components of all cells of the body and amino acids are the building blocks of protein. Proteins can function as enzymes, membrane-carriers and hormones (Jensen, 1994). As far as the human body is concerned there are two different types of amino acids: Essential and Nonessential. Nonessential amino acids are amino acids that the body can create out of other chemicals found in the body. Essential amino acids cannot be created, and therefore, the only way to get them is through food. Protein contains approximately 22 amino acids, eight of which are essential because the body cannot produce them. Therefore, they must be obtained from our food.

The sulphur – containing amino acids: methionine, cystine and cysteine are particularly important for the health of the brain and nervous system (Addo, 2005). Protein is required for the growth, maintenance and repair of all body tissues. Protein is 90% of the dry weight of blood, 80% constituent of enzymes, hormones and antibodies (Fallon and Eing, 2001). Proteins encompass many important chemicals including immunoglobulin and enzymes. In short, they form the foundation of muscles, skin, bone, hair, heart, teeth, blood and brain and the billions of biochemical activities going on in our bodies every minute. When we fail to consume adequate amounts of protein, the blood and tissues can become either too acidic or too alkaline. Lack of dietary protein can retard growth in children and in adult, can be a contributing factor in chronic fatigue, depression, slow wound healing and the decreased resistance to infections (Iyangbe and Orewa (2009)).

It has been estimated that the daily minimum crude protein requirement of an adult in Nigeria varies between 65 and 85g per person. However it is recommended that 35g of this minimum requirement should be obtained from animal products (Oloyede, 2005; Britton, 2003). A review of the data of food supplies available for consumption in different countries shows that the per caput protein intakes in developing countries, Nigeria inclusive, is comparatively low. Not only is the total protein supply deficient but the quality of dietary protein available is inferior to that consumed in developed countries (Brawn,2005). Most of the foods consumed in Nigeria are carbohydrates which are obtained mainly in the form of starch (Lupien and Menza, 2004)

A hard-working adult farmer needs approximately 3,500 calories and 50grams of protein per day; a one-year-old child needs about 1,000 calories and 15grams of protein per day. Yet, these quantities of essential nutrients are missing in the diets of many rural Africans, which are based on staples of grains such as maize, without nutritional supplements, Africa's staples do not provide adequate protein of micro nutrients such as vitamins and iron. Thus, dependence on these staples or sometimes a lack of the staples themselves can cause widespread malnutrition, especially, among children (Robert *et al* 2000, Morna 1993).

The level of poverty in Nigeria is on the increase due to low level of income, high cost of food products particularly protein foods as well as its inadequate production of protein foods by farmers and lack of capital to establish on a large scale. The people in the rural areas need more attention in terms of their diet most especially protein so as not to ruin agricultural production. Aromolaran (2001) confirmed that Nigeria is still struggling to meet up with the minimum food and nutrient requirements. The evidence of poor nutrition is reflected particularly amongst low income groups. It has been estimated that 7,300 children die of malnutrition annually in Nigeria, before they reach the age of four years; while 73,000 to 84,000 infants born every year suffer from malnutrition. The pre-school children are not left out of the ill wind of malnutrition blowing in Nigeria (Ajayi and Chukwu, 2008).

Low nutrient intakes, leanness, low midarm circumferences and skinfold thickness

and stunting are good common features in malnourished Nigerian preschoolers. The presence of low height for age has been reported among school children and adolescents and this was attributed to inadequate intake of nutrients. The adults and the elderly ones have their own fair share of some degrees of malnutrition. Conditions such as gingivitis, angular stomatitis, loss of strength, low productivity, low morale, lethargy and retardation are common in this category of people. These conditions are directly or indirectly as a result of malnutrition. Pregnant and lactating women in Nigeria were reported to have low intakes of many nutrients such as protein, calcium, niacin and riboflavin. Figures on average crude protein consumption per day in Nigeria fall short of the recommendations of Food and Agriculture Organization (FAO) (Ene-Obony, 1990; Ajayi and Chukwu, 2008).

The deficiency of protein in the diet will invariably affect the income generating ability, manpower development and overall contribution to the nation's GDP. It is in view of these issues with protein intake that this study focused on determining the factors that affect protein consumption pattern in the study area as well as identify the socio-economic characteristics that influence protein consumption. Two hypotheses were tested as presented below.

Ho_1: There is no significant relationship between the socio-economic characteristics of the households and amount spent on protein consumption.

Food Consumption Pattern of Households

The nutritional status of a nation is difficult to assess because it can be related to social, educational and economic condition. It may be good, fair, or poor depending on the dietary essentials, relative needs for them, and body's ability to utilize them. Nutritional status of an individual depend solely on food intake in terms of quantity or quality, there is always interplay of many factors. In most cases in developing countries, the nutritional status of an individual is one of denutrition or malnutrition, only few understands the importance of balance diet, this have its root in the ignorance and poverty status of the people **(**Enwonwu 1979).

In Nigeria, dietary protein sources are more of plant based with varying levels of amino acid than animal. For instance, FAO recommendation for daily protein consumption is put at 60g per person out of which 35g is expected to be from animal source. However, it was reported that the average per capita protein intake in Nigeria was 51.7g from which only 8.6g came from animal sources, where as in developed countries, the average per capita protein intake was over 70g with more than 55g of animal protein (Ikeme 1990). This is confirmed by Abdulahi (1999) that average animal protein intake per head per day in North America, Western and Eastern Europe as 66, 39, 33 g per head per day respectively.

According to Olayide (1993), lack of sufficient food both in quantity and quality will account for low production which could lead to a decline in agricultural production, at the same time hindering development. Low protein composition of diet being consumed results in protein malnutrition which manifest itself in form of diseases such as marasmus, kwashiokor or retarded growth in many Nigerian children. Cyril *et al* (1998) discussed that all human

beings have common nutritional needs; there may be variations from one section of the community to another; and nutritional requirements changes from infancy through childhood to adolescence and adult hood. Apart form the fact that the consumption pattern differs with changes in the physiological state of the body, it also depends on various factors that are attached to different households.

Robert et al (2000) reported that the recommended amount of protein for tissue development, growth and performance differs in age and sex, for instance the adult males require more protein than their female counterparts in the same age group due to the fact that male use more energy for work while the pregnant and lactating females needs the highest quantities of protein due to the physiological state of their body. Among the factors that dictates consumption pattern are, household income, cost of food, environment, household size. The prices of foods particularly those of protein source affects its consumption since majority of the consumer are in low-income groups, they tend to appeal for the in-expensive food commodities which in most cases are the starchy food with low nutritional value, in essence, they opt for quantity rather than quality (Alderman, 1986).

The differences in personal taste, educational level, religion, custom and beliefs, may affect the consumption of protein since most of the rural dwellers engaged in one agricultural activities or the other and this makes the availability of other classes of food to be very high (Pitt 1983).

According to Koutsoyianis (2001), consumption pattern of a family is determined by family income, sexes in the family, household income, composition of age, price sales, taste, education status, religion etc. According to a FAO food survey (1985), household nutritional status has been observed to be influenced by socio-economic factors such economic factors which include prices of food items and non-food items, households' income and how it is shared among basic needs. In addition, we have socio-cultural variables like family size and composition, occupational groups, taste and preferences as well as the educational level of the household head. These factors punctuate the food composition and habits of households particularly the rural households, to the extent that households compensate for nutritional requirements in other foodstuffs by replacing consumption of protein foods which is generally believed to be expensive with carbohydrate which is less expensive, easy to prepare (Addo .A, 2005).

Olarinde and Kuponiyi (2005) affirmed that the average composition of rural households' food is usually about 79 percent carbohydrate, 17 percent protein and 4 percent vitamin per month. Comparing this with an earlier and related study on farming households in Oyo State (Adio, 2000), where food energy intake was found to be about 97% carbohydrate and about 28% protein , this implies a short fall of 18% and 11% in carbohydrate and protein intake respectively in four years. This situation depicts food insecurity and may worsen in the next few years.

METHODOLOGY

The study was carried out in Orire Local Government Area of Oyo State. It covers a total estimated land area of 2,040 km^2. It inhabits over 100 villages/ communities such as Tewure, Iluju, Apiko, Saamo amongst others. Orire Local Government Area is a derived savanna zone where common agricultural products such as yam, melon, cashew, mango, shea butter, cocoa, kola nut, palm-oil etc can be found. Therefore, most of the inhabitants engaged in farming as their major occupation while some are hunters, traders, fish farmers, etc. (Alalade, 2000)

The data used for the study were obtained from primary source through the use of a well structured questionnaire. Systematic random sampling was used to select five wards out of the 10 wards under the local government area, with two villages from each ward. A total number of eight respondents were randomly selected from each village to make a total of eighty households.

Descriptive and inferential statistical tools were used to analyze the data collected. Descriptive statistics such as frequency distribution table was employed to analyze the socio-economic factors, level of protein consumption and factors affecting protein intake by the households. Inferential statistics such as regression and correlation analysis were to determine the relation ship between dependent and independent variables. The hypotheses were tested using the model specified below:

$C = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + \mu$ 1

Where

C = Total amount spent on protein consumption (N)

X_1 = Household size of respondents (number of individuals)

X_2 = Income of household (N)

X_3 = Number of years spent in school (years)

X_4 = Marital status (married=0, single=1)

X_5 = Age of respondents (years)

μ = Error term

RESULT AND DISCUSSION

Table 1 presents the socio economic and demographic characteristics of the respondents. About 64 percent of the households were headed by male while the rest accented for female headed households. The numbers of female headed households were a little higher in the study area because most of them were either separated, widowed or divorced which can inversely affect the protein intake of such household. Twelve percent of the respondents were less than 30 years of age while those above 50 years accounted for over 47 percent. This directly affect protein intake as people tend to reduce the quantity of protein consumed as they grow older e.g. consumption of meat and egg. Only 2 percent of the respondents were single at the time the study was carried out. Sixty six (66) percent accounted for those that were married and 15 percent represent those that were once married but are now single as a result of separation, death of spouse etc. Since majority of the respondents were married, the tendency to consume more protein in the area is high.

About 24 percent of the household had between 1 and 3 household members while 38.8 percent accounted for household which has over 6 members in its family unit. While 30 percent of them had no formal education, 27 and 13 percent

of the respondents spent between 1-6 years and above 12 years in school respectively. The result further revealed that educational level was low in the study area, consequently importance of protein intake may not be well appreciated.

Respondents' religion may affect the level of protein taken as some religion restricts their faithful/worshipers from eaten some animals which are sources of protein e.g. all Islamic faithfuls are restricted from eating pork, etc. All these restrictions can affect the level of protein intake by the household. From the table, about 39 percent are Muslims while none of the respondents claim to be a traditional worshipper. About 36 percent of this rural household engaged in farming activities, 14 percent of them were artisans and 31 percent claimed to be in the civil service. The result indicates that not all the household engage in farming as a primary occupation and this consequently may reduce their protein intake due to its cost.

Eleven (11) percent of the respondents earned less than N10,000 per month while majority earned an average of N15,000 monthly (41%). Only about 12 percent earned over N30,000 as income per month. This implies that majority of the household earn below N30,000 (an equivalent of $260) per monthly, the low in income may reduce the level protein intake due to its cost.

Table 1: Socio-economic Characteristics of Respondents

Variables	Frequency	Percentage
Sex		
Male	51	63.7
Female	29	36.3
Age(yrs)		
< 30	10	12.5
31-40	18	22.5
41-50	14	17.5
> 50	38	47.5
Martial Status		
Single	2	2.3
Married	66	82.2
Widowed	12	15.5
Household		
size	19	23.7
1-3	30	37.5
4-6	31	38.8
above 6		
Education Level(yrs)	24	30.0
0	22	27.5
1-6	7	8.8
7-9	16	20.0
10-12	11	73.7
>12		
Religion		
Islam	31	38.7
Christian	49	61.3
Traditional	0	0.0
Occupation		
Farming	29	36.3
Trading	15	18.7
Civil service	25	31.1
Artisan	11	13.7
Income Level(₦)		
<10,000	9	11.3
10000-19999	41	41.2
20000-30000	20	25.0
>30000	10	12.5
Total	**80**	**100.0**

Source: Field Survey 2010

Table 2 presented the availability and household consumption of protein food items. About 27 percent claimed they source their protein food items from their various farms while 21 and 51 percent have access to protein foods through gift and from the market respectively. The result, however, suggest that the percentage of protein food items produced in the study area is low and therefore needs to be supplemented. This is evidenced with about 60

percent of the respondents claiming that protein is fairly available in the area.

Thirty seven (37) percent of the respondents spent as much as N7,000 and above on protein food items monthly, while only one percent spent less than N2,500 monthly on protein foods. Considering the income level of most household in the study area, it can be deduced that most of them spent much on protein foods and this might be due to the high cost of protein foods. On this basis, about 53 percent claimed that they usually combine protein meal with other type of meal (eg cabohydrate) once daily.

Table 2: Availability and Household Consumption of Protein Food Items

Variables	Categories	Frequency	Percentages
Source of protein consumed	Market	41	51.3
	Farm	22	27.5
	Gift	17	21.2
Protein availability in the area	Available	28	35.0
	Fairly available	48	60.0
	Not available	4	5.0
Monthly expenditure on protein food items (N)	< 2500	1	1.3
	2500 – 5000	14	17.5
	5000 – 7500	33	41.2
	>7500	30	37.5
	Undecided	2	2.5
Number of protein meals consumed daily (in partial meal)	1	43	53.8
	2	21	26.2
	3	16	20.0
		80	**100.0**

Source : Field Survey 2010

The consumption pattern of protein food items by household is presented in table 3. About 46 percent of the respondents indicated that protein foods were fairly affordable while 37 percent claimed that they were not affordable. To this extent, 30 percent of the respondents depended solely on plant protein which have incomplete amino acids and economically cheap compared to animal protein (10%). About 60 percent however claimed to consume both animal and plant protein even though animal protein is more expensive.

Ninety (90%) percent of the respondents were aware of the importance of protein in daily meal but 57% consumed less of protein because of its high price. Three percent however consume less of protein due to non availability and length of time it takes to cook. The level of protein consumption by household members shows that only 12 percent of the respondents agreed that babies needs more protein in their meal. About half of the population (50%) believed that adult should consume more protein. The result therefore implies that many household are not aware that babies should consume more protein than other members for growth and development.

Table 3: Consumption Pattern of Protein Food Items by Households

Variables	Freq	Percent
Affordability of protein foods		
Affordable	13	16.3
Fairly affordable	37	46.2
Not affordable	30	37.5
Type of protein often consumed Animal protein	8	10.0
Plant protein	24	30.0
Both protein sources	48	60.0
Awareness of importance of protein		

Yes	72	90.0
No	8	10.0
Reason for less protein consumption		
Taste	9	11.3
Cost of protein	46	57.5
Non-availability	3	3.7
Not easy to cook	3	3.7
Others	19	23.8
Household members that consumes more protein		
Babies	10	12.5
Children	9	11.3
Adult	40	50.0
Old	21	26.2
	80	**100.0**

Source: Field Survey 2010

Table 4 explained the relationship between amount spent on protein consumption (Y) by the respondents and their various socio-economic characteristics. The result revealed that income, educational level, household size are significantly related to amount spent on protein consumption at 1% level of significance. This implies that as these factors increase, amount spent by household on protein intake will also increase. However, household size is negatively related to protein intake. The result suggests that an increase in the number of household members will bring about a reduction in the amount spent on protein consumption by the household. The adjusted R^2 (64%), also explain the variation in the amount spent on protein consumption by households in the study area as explained by the independent variables. Since most of the socio-economic factors considered were statistically significant at I percent level of significant, the alternative hypothesis is accepted

Table 4: Result of Regression Analysis

Variables	**B**	**S.E**	**t- value**
Constant	1.280	1.482	0.864
Household size	-0.789***	0.072	-10.958
Income	4.566***	0.000	4.470
Education	0.576***	0.065	8.862
Marital status	0.103*	0.060	1.717
Age	0.130*	0.022	1.716

R = 0.720 = 72%
R^2 = 0.642 = 64%
F = 1.235
*Significant at 10% level of significance
**Significant at 5% level of significance
***Significant at 1% level of significance

CONCLUSION AND RECOMMENDATION

This study revealed that most of the household heads were male, married, mature with large household size and no formal education. Larger percentage were farmers with monthly income less than N20,000. The respondents said that protein is fairly available in the study area but not affordable especially the animal protein, they spent as much as N7,000 monthly to purchase protein meal and consumed protein meal in partial, that is in combination with other type of meals, once daily. They rarely consume whole protein meal. Most of households were aware of the importance of protein in the diet but they consumed less protein food items due to cost and availability. The adults consumed more protein in most of the households ignoring the importance of protein in the diet of babies and children.

The findings also showed that educational level, household size and income of the household heads affect the amount spent on the protein consumption.

It was therefore recommended that rural dwellers should be encouraged to engage in farming activities (planting legumes and rearing of livestocks) in order increase their production of protein food source, so that there will be enough for personal consumption and distribution to the urban centre. There is need for

pricing policy in order to bring down the prices of protein foods to make it affordable for the rural people. Also, more educational programmes should be organized so that the rural people will have more knowledge about the importance of protein in their diet. Finally, family planning progamme should be emphasized to rural households in order to reduce the large household size prevalent in the study area.

REFERENCES

Abdullahi, A.(1999). "Food Policy and Food Security in Nigeria", in: P. Kormawa and E. Aiyedun (eds): *Food Demand and Market Studies in the Drier Savanna of Nigeria.* Proceedings of a Methodology and Stakeholders' Workshop, 7-8, September, 1999, Kaduna, Nigeria.

Addo, A., (2005). Improving the Nutrition of the Nigerian Child through Dietary Modifications Paper presented at a Seminar on Child Nutrition by West Africa Milk Company (Nig) PLC

Alderman, Harold (1986), "The Effect of Food Price and Income Changes on the Acquisition of Food by Low-income Households". International food policy Research Institute, Washington DC.

Ajayi, A.R. and Chukwu, M.O. (2008): Soybean Utilisation Among Households in Nslia Local Government Area of Enugu State: Implications for the 'Women-in-Agriculture' Extension Programme. Department of Agricultural Extension, University of Nigeria, Nsukka. Virtual Library ISSN: 1118 –0021

Alalade, S. A. (2000): An Account of 365 days Stewardship in Office of Orire Local Government Area, Ikoyi-ile. Pp 10 & 30.

Aromolaran, A. B. (2001), "Research Project on Household Food Security, Poverty Alleviation and Women Focused Development Policies in Nigeria: Final Research Report:, African Economic Research Report, African Economic Research Consortium (AERC), Nairobi Kenya, July 2001.

Brawn, J.V., 2005. The World Food Situation: An Overview". International Food Policy Research Paper presented for CGIAR Annual General Food and Agriculture Meeting, Marrakech, Morocco, Dec 6th, 2005

Baje, A.O., 2008. "Food Crises Hits the World. Food business International, 1(5): 11-12.

Bender W. and Smith .M.(1997), "Population, Food and Nutrition" *Population bulletin 51(4)*, Population reference Bureau, Inc, pp.5 -25.

Britton A. (2003) Animal Protein issues, Speed way publishers.

Cyril, A.K, Eric, N and Normen, J (1982). Nutrition, Samson Wrights Applied Physiology, Oxford university Press, London, 13th ed, pp 484-487.

Enwonwu C.C (1979), A Review of Nutritional Requirement and Nutritional Status of Nigeria. National Conference on Food and Nutrition Policy for Nigeria. Conference Centre of the University of Ibadan, 1979 pp 10-12. Food and

Agricultural Organization (1985), "FAO Fifth World Food Survey: A Note on the Results food and Nutrition Vol. 11 (2): pp55-63.

Enwonwu, C.O. (1983). A Review of Nutrient Requirements and Nutritional Status of Nigeria, Aimo, T. (ed.) University of lbadan Press. Pp. 48 - 52.

Ene-Obony, H.N. (1990). "Home Economics in Nation Development", in The Challenges of Agriculture in Nutrition Development, Ikemc, A.I. (ed.), Faculty of Nutrition University of Nigeria, Nsukka, Pp. 436 - 445.

Fallon S. and Eing M.G. (2001) Animal Protein Vs Vegetable Protein, Copple House Books Inc.

Food and Agricultural Organization/ World Health Organization/ United Nations University. (1985): Energy and Protein Requirements. *Report of joint FAO/WHO/UNU Expert Consultation World Health Organization Technical report series* #724, Geneva, II, 1985.

Ikeme, A I (1990): Meat Science and Technology in Africa. Federal Publishers Ltd. lbadan. Pp 112-113

Iyangbe. C.O. and S.I. Orewa (2009): Determinants of Daily Protein Intake among Rural and Low-Income Urban Households in Nigeria. American-Eurasian Journal of Scientific Research 4 (4): 290-301,

Jensen B. (1994) Goat milk magic: One of life's Greatest healing foods, E.S Condido, California.

Koutsoyiannis, A (2001), Correlation Thoery of Econometrics, Palgrave Hound mills, Basing Stoke, Hampshire REG 216 X S & 175 fifth Avenue, New York, N.Y 10010.

Lupien, J.R. and V. Menza, 2004. "Assessing Prospects for Improving Food Security and Nutrition". FNA/ANA, 25 pp: 5-9.

Morna, C.L. (1993). Better Nutrition for Africa's Families. African Farmer, No. 8. The Hunger Project, One Madison Avenue, New York; pp, 8 - 15.

Olarinde L. O. and F. A. Kuponiyi (2005): Rural Livelihood and Food Consumption Patterns Among Households in Oyo State, Nigeria: Implications for Food Security and Poverty Eradication in a Deregulated Economy. Journal of Social Science Vol. 11 No. 2 127-132

Olayide O.A (1993): "Differences in Food Consumption of Academic and Non – Academic Staff in the University of Ibadan " Unpublished B.Sc. Thesis in the Department of Agricultural Economics, University of Ibadan.

Oloyede, H. O. B. (2005), All for the love of nutrients, The seventy eight inaugural lecture, Library and publication Committee, University of Ilorin

Oteku, I. T., J. O. Igene and I. M. Yessuf (2006): An Assessment of the Factors Influencing the Consumption of Duck Meat in Southern Nigeria. *Pakistan Journal of Nutrition* Vol.5 (5): Pp 474-477

Pitt, Mark M (1983), "Food Preferences and Nutrition in Rural Bangladesh", The Review of Economic and Statistics, 65 (Feb): 105-114

Robert, K.M, Daryl K.G. Peter A.M and Victor W.R (2000), Nutrition, Harper's Biochemistry text book, Appleton and Lange, United State of American, 25th Ed, Pp 656-661

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Nutritional components of Date palm and its production status in Nigeria

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Abstract: The Nigerian date palm industry has the potential to generate employment and promote economic development. Date palm is one of the greatest producers of food per hectare producing more than 3000 calories per Kg. The review shows that the highest producers of Dates are Egypt, Iran and Saudi Arabia with an annual production statistics of 1,326,000MT, 1,000,000MT and 982,000MT respectively as at 2008. In Nigeria annual Dates production in the country is over 21,000MT. Date are nutritious, assimilative and energy producing. Dates contain K, Ca, Mg, Fe, Cu, Zn, Mn and very low quantities of Si, S and fat content. Infact it is called a mine. It is grown in Nigeria from latitude 10^0 North in the Sudan Savanna to the Sahel regions, despite its nutritional importance the production of the crop is still restricted to compound and home-stead. There is also dearth of information on the statistics of Date production in Nigeria as well as low rate of awareness on its nutritional and economic importance. Therefore this paper unveils the statistics of Dates production in the country, as well as the nutritional importance of Date. This will enhance awareness creation of its potential and economic development in the country. However the concerned of private sectors are required for the accelerated development of the industry.

Keywords: Employment generation, calories per Kg, assimilative, dearth of information, unveils, accelerated development.

INTRODUCTION

The Date palm (phoenix dactylifera .L) is produced mainly in the hot arid regions of Southern Asia and North Africa. It is probably the most ancient cultivated tree crop in the world (Zaid and Wet, 1999). Date production in Nigeria started at about 17^{th} century ago but its cultivation and marketing has been subsistence level. Omamor et al (2000) reported that pilgrims brought Date palm in to Nigeria from North Africa during trans-Saharan trade and from the Middle East. Though Nigeria is not a major Dates producer in the world, the crop strives in Northern parts of the country particularly regions above latitude 10^0 North of the equator Okolo et al (2000). It is propagated by seed, offshoot and tissue culture. However, tissue culture has been found to be the best method of propagation for commercial planting and true to type of the characteristics of the mother plant. The Date palm is dioecious perennial, the females of which normally begin to bear Date fruits after four years depending on the agronomic practices. It is a monocotyledonous plant with no tap root but fibrous root system. The trunk is vertical and columnar of the same girth all the way up. The girth does not increase once the canopy of fronds has fully developed except the terminal bud experiences an abnormal growth caused by a nutritional deficiency or drought conditions,

which will lead to shrinkage of the trunk. Vertical growth of Date palm is ensured by its terminal bud called *phyllophor* and its height could reach 20m (Zaid and Wet 1999). The trunk and leaves of the Date palm are similar to those of Oil palm. The fronds (Leaves), with average length of 4 metres carry the spines and the leaflets. The fruit is single, Oblong, one-seeded berry with terminal stigma, a flesh *pericarp* and a membranous endocarp.

Despite the invaluable roles of Dates in human life, the Nigerian Date palm industry (production, processing and marketing) is beleaguered with the following problems:

1. Dearth of information on the status of the Nigerian date palm industry.
2. Lack of awareness on the nutritional importance of Dates.

Objective of the study:

The main objective of this study is to create awareness on the potentials of the Nigerian Date palm industry.

The specific objectives include:

1. To disclose the statistics of annual Date production in Nigeria and the world.
2. To unveil the nutritional components of Dates.

METHODOLOGY

Secondary data were used for this study. The data were collected from NIFOR annual report, NIFOR sub-station Dutse, FAO statistical data base and other related publications.

RESEARCH FINDINGS

Date production in Nigeria

The Date palm is believed to have been introduced into Nigeria in the early 17th century through the trans-Sahara trade route from North Africa and Muslim pilgrims on pilgrimage to the Holy cities of Mecca and Medina (Omamor et al 2000). Although Date palm has economic, social and religious values in the Sudan-Sahel Savanna region of Nigeria, its cultivation has remained restricted to compounds, homestead and few orchards in the northern parts of the country.

Date palm is grown in northern Nigeria including Kaduna, Katsina, Kano, Sokoto, Kebbi Jigawa, Yobe, Borno, Gombe, Bauchi and Adamawa States. Other states including Plateau, Taraba, Nassarawa, Southern Kaduna and Niger State could be classified as marginal areas for Date palm cultivation in the country. Dates production in Nigeria has two fruiting seasons (dry and wet seasons fruits), but only the dry season fruit is economically useful. Despite the abundant land resource the country is still increasingly dependent on dates import to meet local demand. The statistics of annual Dates production in the country from the studied states deduce so far is over 21,000 MT from the available data as shown in Table 1. This figure is insignificant compared to local demand in the country. As a result, the nation resorts to Dates import to meet local demand. This shows that the market prospects of Dates in Nigerian are very bright.

Table 1: Statistics on Annual Dates production in Nigeria

S/N	States	Annual production in Metrics Tone (MT)
1	Adamawa	200
2	Bauchi	6,000
3	Borno	1000
4	Gombe	1,500
5	Jigawa	5,000
6	Kano	6,000
7	Plateau	Insignificant
8	Taraba	Insignificant
9	Yobe	2,000
10	Kaduna	-

11	Nasarawo	-
12	Katsina	-
13	Zanfara	-
14	Kebbi	-
15	Sokoto	-
	Total	21,700 (MT)

Dates production in Africa.

Dates production in Africa was 2.2 million MT in 2001 and 2.4 million MT in 2006. Egypt is the highest Dates producer in Africa as at 2005 followed by Algeria and Sudan with annual production statistics of 1, 117,000 MT, 516,293MT and 328,200MT respectively (FAO Statistics) Table 2.

In West Africa, Mauritania is the highest Dates producer as at 2005 followed by Chad and Niger with annual production figures of 22,000MT, 15,000MT and 8,000MT respectively (Table 4: FAO Statistics 2008). Nigeria is not listed among the Dates producers at the international scene. This is attributed to dearth of information on the Nigeria Date palm industry.

Table 2: Major Dates Producers in the World in '000MT (1999 – 2008)

Country	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Egypt	1,113	1,113	1,113	1,090	1,122	1,166	1,170	1,329	1,314	1,326
China	120	120	120	133	123	128	134	125	130	135
Iran	875	875	875	879	885	990	998	1000	1000	1000
UAE	758	758	758	758	759	815	859	-	-	-
Iraq	650	650	650	866	868	875	404	432	440	440
Pakistan	630	630	630	625	427	622	497	426	557	680
Algeria	437	418	437	418	472	443	516	491	526	500
Sudan	330	330	330	330	328	336	328	328	-	-
Oman	239	239	298	239	220	231	247	259	256	256
Libya	140	140	140	200	200	150	180	170	175	175
Saudi A	818	818	818	830	884	941	970	977	982	982
Tunisia	113	113	113	120	117	122	125	125	-	-

Source: FAO Statistics Division 2008

World dates production

World Dates production (as shown in Table 2) was 5.1 million MT in 1999 and this increased to 6.7 million MT in 2006 (FAO,2008). The major Dates producers in the world are situated in the Middle East and North Africa. Date is probably the most ancient cultivated tree crop in the world (Zaid and Wet, 1999). FAO statistical data showed that the ten top producing countries as at 2008 were Egypt (1.3m MT), Iraq (0.4m MT), Iran (1.0m MT), Qatar (0.02m MT), Pakistan (0.6m MT), Algeria (0.5m,MT), Saudi Arabia (0.9 MT), China (0.1), Oman (0.2m MT) and Libya (0.1m MT). Egypt remains the largest World producer of Dates as at 2005 (fig.2). Information on major Date producers in the world as at 2008 is shown in Fig 1. Egypt is the highest Date producer in the world as at 2008 followed by Iran and Saudi Arabia with annual production statistics of 1,326,000MT, 1,000,000MT and 982,000MT respectively.

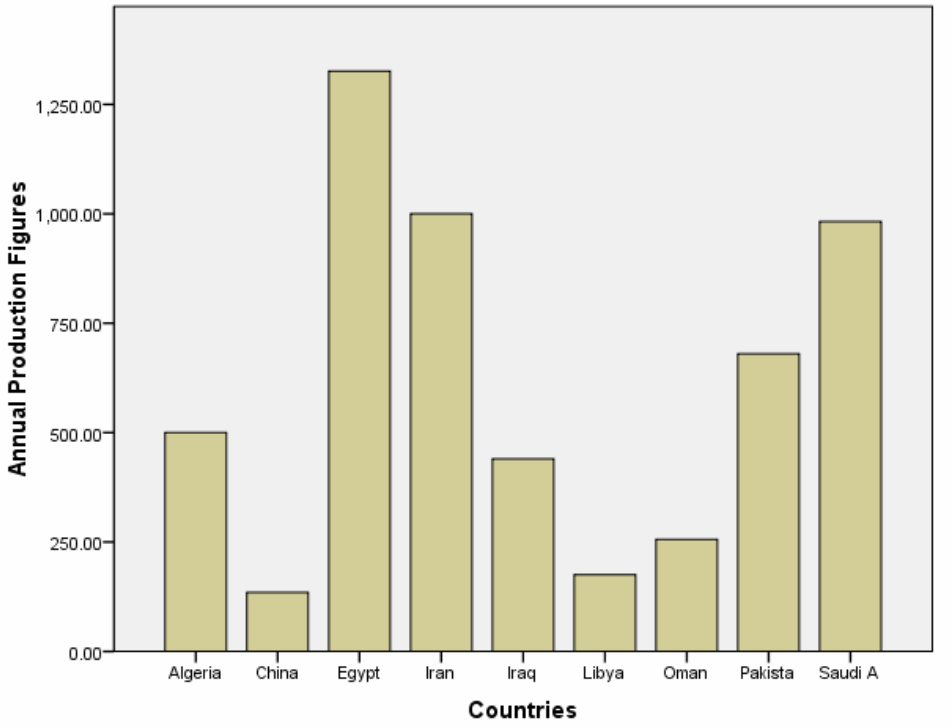

Fig: 1: Major Date producers in the World (2008)
Source: 1. FAO Statistics Division 2008
2. Nigerian Institute for oil palm research

World date exports and import

The total quantity of Dates exported in 2005 was 416,660 MT at an export value of three hundred and eight five million US dollar. ($385,000.000). When this figure is compared with total production during the period it was found that over 90% of Dates produced are consumed within the producing countries. The annual Dates exports fluctuate between 400,000MT – 600,000MT during the period 1999 – 2005 as shown in Table 3.

The total quantity of Dates imported in year 2005 was 626,160MT (Table 3) and the value was four hundred and thirty eight million US dollar ($438,000,000). The import price during the period was about seven hundred US dollar ($700/MT) per metric Tonne of Dates (FAO, 2008).

Table 3: World Dates Exports and Imports

Years	Export (MT)	Imports (MT)
1999	474,297	530,002
2000	359,370	510,710
2001	687,940	560,330
2002	588,440	588,920
2003	601,610	598,000
2004	384,640	671,480
2005	416,660	626,160

Source: FAO Statistics Division 2008

World market price of dates

World market price of Dates increased from about 400 US dollar per metric tonne in year 2001 to about 800 US dollars per metric tonne in year 2005 as shown in Fig 3. This shows insufficient supply of Dates at the international market.

Nutritional importance of date palm

Date palm is one of the greatest producers of food per hectare, Compared to

cooked rice 1800 calories/kg; Meat (without fat): 2,245 calories/Kg; Banana: 970 calories/Kg; Orange: 480 calories/Kg;Dates gives more than 3000 calories/kg. The Date fruits consists of 70% carbohydrate (mostly invert sugar e.g. glucose and fructose) important for persons who cannot tolerate sucrose and it is easily absorbed by the human body without being subjected to the digestion that ordinary sugar undergoes. Dates contain potassium (K), calcium (Ca), magnesium (Mg), iron (Fe), copper (Cu), zinc (Zn), manganese (Mn) and very low quantities of silicon (Si), sulphur (S) and with very low sodium and fat content. Moderate quantities of chlorine (Cl), sodium (Na) and phosphorus (P) are found in Date fruit. Its phosphorus content is similar to that found in the same quantities of apricots, pears and grapes put together. The iron content of 3mg per 100mg is almost a third of the recommended dietary allowance for an adult male. Its high contents of magnesium (600mg per kg) of Dates could also be very beneficial in preventing cancer. Dates consumers in Sahara areas are known to have the lowest rate of cancer; a fact attributed to Magnesium found in Dates. Infact it is called a mine in itself because it is very rich in minerals (Zaid and Wet, 1999). It has 2% protein and less than 2% pectin substance. Dates have 1Mg of Na per 100kg, thus a good food for those on low sodium diet. Dates also contain 2.5% fibre, which is important for diet to aid digestion and evacuation. Date foods are good sources of vitamins A, B_1 (Thiamine), B_2 (riboflavin) and B_7 (nicotinic acid or niacin). Dates are suitable for the manufacture of jam, syrup, pastry, bakery, confectionaries etc (Zaid and Wet, 1999). In addition Dates are used in the manufacture of the following products:

- Snacks, salads and appetizers
- Date flour (dietetic baby food)
- Breakfast foods (Date with other dry fruits cereals and nuts)
- Date nut roll
- Chocolate, Date butter or creams
- Liquid sugar (low calorie sweetener for soft drinks) and vinegar.

These are indications that the Date palm industry has the potential to provide employment to both skilled and unskilled labour thereby generating income and alleviating poverty.

Other importance of date palm includes manufacture of local fan, ropes, Baskets, foot mats, bags, beds, bird cages, traps, blankets, chairs, cushion, doors, window frames, fences, fire wood, life belt (FAO, 1982). The Date palm in the midst of the deserts and savannah, serve a useful purpose in the area of shade provision. Desert travelers do take advantage of its shade. It is also known to function as wind breaks and checks wind erosion. The Date palm can be used to check desert encroachment in the northern parts of Nigeria and for ornamental purposes in the South.

Table 4: Major Dates Producers in West Africa

Country	1999	2000	2001	2002	2003	2004	2005	2006
Benin	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Chad	18,000	18,000	18,000	18,000	18,000	16,268	15,337	18,000
Niger	7,700	7,700	7,700	7,700	7,800	7,844	7,896	7,896
Mauritania	20,000	20,000	20,000	24,000	20,000	24,000	22,000	-
Nigeria	Na	Na	Na	Na	Na	Na	Na	Na

Source: FAO Statistics Division 2008
Na = Not available

Date palm seedlings

This is one of the commercializable technologies in The Nigerian Institute for Oil palm Research (NIFOR).The technology involves the raising of Date palm seedlings for 9 - 12 months. Entrepreneur/ farmers are invited to study and adopt this innovation for commercialization. This will help to generate employment and income for others.

CONCLUSION AND RECOMMENDATION

The Nigerian Date palm industry is a sleeping giant that is yet to be woken up. The potentials of the industry to enhance economic development in the country are enormous. The abundant land resource, the nutritional and economic importance of the Date palm, high market prospects, with favorable environmental and climatic conditions are indicators of such potentials. This however calls for the Date Palm farmers to invest more in its cultivation in order to rip its full potentials. Adequate concern with co-operation of government and private sectors is also required for accelerated development of the Nigerian Date palm industry. Available statistics on annual Dates production in Nigeria shows a figure of over 21,000MT. Linkage of agricultural production with manufacturing is recommended for speedy development of the Nigerian Date Palm industry. Economic Utilization of wet season fruits is an area for further research.

REFERENCES

FAO (2008): FAO Statistical Data base (production data) Rome: FAO.

FAO (1982): Date Production and Protection. Rome: FAO.

Gold, I. L. (2002): Date Drink Technology. In Eneh (ed.) Commercializable Technologies by The Nigerian Institute for oil Palm Research.

NIFOR, (2000): Nigerian Institute for Oil palm Research (NIFOR) 37th Annual Report.

Okolo, E.C. Okwagwu, C.O. and Ataga C.D. (2000): "Flowering and Fruiting Pattern of Date in Nigeria" In: Proceedings of the Date palm International Symposium, Wind Hoek Namibia 22 – 25 February.

Omamor, I.B. Aisagbonhi, C.I. and Oruade Dimaro, E. A. (2000): Present Status oDate palm Diseases, Disorders and pests in Nigeria" In: proceedings of the Date palm international Symposium, Wind Hoek, Namibia 22 – 25 February P. 237.

Zaid A. and Wet, P. F. (1999): Origin, Geographical Distribution and Nutritional Value of Date palm. In Zaid, A, (ed.) Date palm cultivation. FAO

plant production and protection paper 156, P.39

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Price Analysis of Tomato in Rural and Urban Retail Markets of Oyo State

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Abstract: Prices are the most readily available and often the most reliable information on developing country marketing systems. The study examined the level of market integration in tomato markets in rural and urban markets of Oyo State, Nigeria. Secondary data on tomato price spanning *2003 –2010* were sourced from Oyo State Agricultural Development Programme (OYSADEP). The data were analyzed using Augmented Dicker Fuller (ADF) test. Indices of market concentration were also used to measure the degree of market integration. Results indicated that the maximum rural price of tomato was ₦131.74/kg in May, 2009 while the minimum price was ₦43.23/kg in August, 2004. In the urban areas, the maximum price was ₦132.13/kg in May, 2009 while the minimum price was ₦40.98/kg in September, 2004. The results also revealed that prices of tomato were stationary at their level. Urban tomato market does not granger cause rural tomato market ($P > 0.05$), while rural tomato market granger cause urban tomato market ($P< 0.05$). None of the markets links exhibited bi -directional granger causality or simultaneous feedback relationship. The Index of market connection (IMC) indicates that the markets exhibit low short run market integration. It is recommended that there should be efficient flow of information, good access road and infrastructural development to improve market performance.

Keywords: Tomatoes, Urban and Rural Market, Price Analysis, Oyo State

INTRODUCTION

Tomato is one of the most important vegetables. It supplies vitamins, minerals, fibres and is of high nutritional values. It also contains health benefit anti-oxidants such as lycopene for cancer prevention especially those of the prostate gland, lung and stomach (Ihekeonye et al, 1985). Cultivation on a large area can generate employment both at the urban and rural levels. Tomato is cultivated almost throughout Nigeria and the most important areas lie between 7.5^0N and 13^0N mostly around urban areas in the Northern and Southern-western parts of the country. The principal areas of tomato production include Zaria, Kaduna in Kaduna state, Jos in Plateau state, Gombe in Bauchi state, Ilorin in Kwara state, Sokoto in Sokoto state, Maiduguri in Borno state, Ogbomosho and Ibadan in Oyo state.

Tomato marketing is characterized mainly by the problem of seasonality and perishability amongst others. Efficient harvesting, handling, transportation and marketing techniques are extremely important in tomato production because it is seasonal and highly perishable in nature. A familiar problem in a metropolitan state such as Oyo State is the inter- and intra-pricing variations among her urban and rural retail markets due to the forces of demand and supply. There are price differences

between these markets which are significant in gaining marked intelligence with respect to tomato. Many consumers do not have price information on tomato in various retail markets in Oyo state which might be responsible for exploitation due to insufficient price statistics.

Spatial Market Integration refers to co-movements of prices, and more generally, to the smooth transmission of price signals and information across spatially separated markets (Okoh and Egbon, 2005). Market Integration provides the basic data for understanding how specific markets work. Market integration refers to the co-movement of prices and more generally to the smooth transmission of price signals and information across spatially separated markets. Link among spatially separated market will lead to efficient price formation. Dittoh, (1994) indicated that the federal, state and local governments of Nigeria paid little attention to the marketing of vegetables such as pepper, tomatoes, onions, okra and leafy vegetables despite the fact that they need spatial marketing facilities. Amusa, (1997) in her study of the trend analysis of agricultural food prices in Nigeria reported that food items such as vegetable oil, garri, brown beans, ripe plantains, fresh tomatoes, green vegetables, onion bulbs, shelled melon seeds, experienced increases and fluctuation in their prices.

Oyo state is among the tomato producing states in Nigeria and it becomes very important to improve upon its marketing and the various marketing channels of the commodity. There are arrays of competitive prices on tomato produce within and across the two categories of market.

Therefore, it becomes imperative to conduct a study to determine variations in price series over the years so as to gain useful information as a prerequisite for maximizing returns. The general objective is to analyze price differences of tomato in the rural and urban retail markets of the study area. However, the specific objectives are to:

- Examine the trends of the monthly prices of tomato in the rural and the urban retail markets of the study area.
- Examine the extent of integration in the rural and the urban retail markets of the study area.
- Determine the leading markets between urban and rural markets

Hypotheses

Ho: Price of tomato in the rural market does not determine price in the urban market.

H_1: Price of tomato in the rural market determine price in the urban market.

METHODOLOGY

Study Area - The study area is Oyo State. It is located in the South-Western part of Nigeria and lies between 7^0 and 9.3^0N and longitude 2^0 and 4^0E. The state is made up of 33 local government areas with a total population of 5,591,585 (NPC, 2006). The Oyo state rural retail markets are representing different communities and villages in the rural areas while the urban retail markets are representing different towns and cities in the urban areas.

Source of Data - Secondary time series price data (2003 -2010) was obtained from Oyo State Agricultural Development Programme. This contains monthly retail price per kilogram of fresh tomato from the selected rural and urban

retail markets of the state. These markets are classified into four different zones. The urban markets in Ibadan zone are Bodija, Oje, Oritamerin, Olomi, Olorunsogo while the rural markets are Omi adio, Ijaye-orile, Egbeda, Towobowo and Anko-eruwa for Ibadan zone. For Ogbomoso zone, the urban markets is odo oba while the rural markets are gambari, arowomole, iluju, oko-oba. For Oyo zone the urban markets are ilora, akesan, sabo, oluwole while the rural are irepodun and obada ipaapo. In zaki zone, the urban markets are sango, gbonje, yante while the rural markets are oja-oba, ago are.

Methods of Data Analysis - The analytical methods used are descriptive statistics, unit root test, co integration and granger causality test.

Test of Stationarity - This was carried out to check for stationarity of the variables or price series using Augmented Dickey fuller test. A price series is stationary if its mean and variance are constant over time. Long time will take up to 30 years. Non stationary stochastic series have varying mean or time varying variance. The price series in this study were first tested for stationarity. The purpose was to overcome the problems of spurious regression. The augmented Dickey Fuller (ADF) was adopted to test for stationarity. This involves running a regression of the form:

$$\Delta P_{it} = \partial P_{t-1} + \sum_{i=1}^{P} \beta_1 \Delta P_{t-1} + \ell_{it} \quad \text{.....(1)}$$

Where Δ = first difference operator, ∂ = 0, implies the existence of a unit root in $P_{i\,t}$ or that the price series is non-stationary, i = commodity price series, i.e. tomatoes, t = time indicator, e_{it} is the error term . The process is considered stationary if $/\partial$ / < 1, thus testing for stationarity is equivalent with testing for unit roots (∂ <1). Therefore:

H_o: ∂ = 0 the price series is non stationary or existence of unit root

H_1: ∂ < 0 the price series is stationary

Test of Cointegration - Johansen Tests were carried out using a linear deterministic trend in order to know the number of co-integrating vectors. The Johansen testing procedures have the advantage that they allows for the existence of more than one co integrating relationship (vector) and the speed of adjustment towards the long-term equilibrium is easily determined (Bakucs and Ferto, 2005).

The model is presented thus:

$$\Delta X_t = \mu_t + \sum_{i-1}^{k} \Gamma X_{t-1} + \Pi X_{t-k} + \varepsilon_t \quad \text{..... (2)}$$

Where X_t = an n x 1 vector containing the series of interest (tomatoes spatial price series), Γ and Π = matrices of parameters, K = number of lags, and should be adequately large enough both to capture the short-run dynamics of the underlying VAR and to produce normally distributed white noise residuals, ε_t = vector of white noise errors. The Johansen test will give an insight into the number of estimation equations to be fitted. The presence of one cointegration relationship is necessary for the analysis of long run relationship of the prices to be plausible.

Granger Causality Tests - The Granger causality test was carried out to determine the direction of causality. When two price series are co-integrated and stationary, one may proceed to carry out the granger causality

test. This is because one granger causal relationship must exist in a group of co integrated series (Chirwa, 2000). When Granger causality run one way (uni-directional), the market, which Granger-causes the other is tagged the exogenous market. Exogeneity can be weak or strong. Hendry (1986) observed that weak exogeneity occurs when the marginal distribution of $P_{i\ (t-1)}$ and $P_{j(t-1)}$ was significant, while strong exogeneity occurs when there is no significant Granger-causality from the other variable. It could also be bi-directional which indicates that both series influence each other (X causes Y, and Y also causes X). The Granger model used in this study can be represented by:

$$\Delta P_{it} = \sum_{i=1}^{m} a_i \Delta P_{j(t-1)} + \sum_{j=1}^{n} a_j \Delta P_{j(t-1)} + \ell_t \quad \ldots\ldots (3)$$

Where m and n are the numbers of lags determined by a suitable information criterion. Rejection of the null hypothesis indicates that prices in market, j Granger-cause prices in market i.

Index of Market Concentration Analysis - Index of Market concentration (IMC) is used to measure price relationship between integrated markets and following formula was used to calculate IMC:

$P_t = \beta_o\beta_1 P_{t-1} + \beta_2 (R_t - R_{t-1}) + \beta_3 R_{t-1} + e_t$

Where:

R_t = Urban or reference price

P_t = Rural price

R_{t-1}= Lagged price for urban markets.

$R_t - R_{t-1}$ = Difference between urban price and its lag

e_t = error term or unexplained term.

β_o = constant price

β_1 = coefficient of rural lagged price

β_2=coefficient of $R_t - R_{t-1}$

β_3 = coefficient or urban lagged price

$IMC = \beta_1/\beta_3$ where $0 \leq IMC \leq \infty$

where

IMC < 1 implies high short run market integration

IMC > 1 implies low short run market integration

IMC = ∞ implies no market integration

IMC = 1 high or short run market integration.

RESULTS AND DISCUSSION

Trend Analysis of Tomato Prices

The trend analysis of the tomato price in the rural and urban retail markets shows that there are fluctuations and changes in the produce price over the period of seven years (2003-2010). The maximum price of tomato per kilogram was ₦164.29/kg in rural market in May, 2010 while the minimum price in the rural market was ₦43.23/kg in August, 2004. Similarly in the urban areas, the maximum price was ₦132.13/kg in May, 2009 while the minimum price was ₦40.98/kg in September, 2004. The prices were not stable across seasons and this could be attributable to the fact that tomato yield is very low during the rainy season (Figure 1). The peak of the price was always in the second and third quarters of the year while the least price was observed in the first quarter of the year. The reason for the variation in price can be attributed to the economic principle of supply and demand. Also, the second and third quarters coincide with the period of high rainfall and tomato doesn't do well during this period and therefore the supply will be greatly reduced in the markets. Thus, these quarters of the year are regarded as off season and the resultant effect is the high prices

of tomato fruits. The first and fourth quarters are the harvesting season of tomatoes which justifies the reason for the low price.

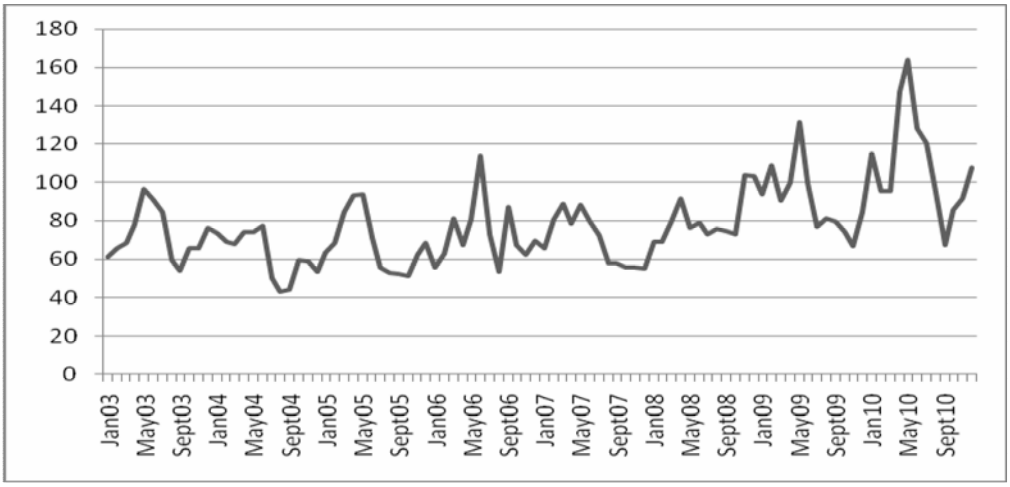

Fig 1: Prices of tomatoes in rural market (2003-2009)

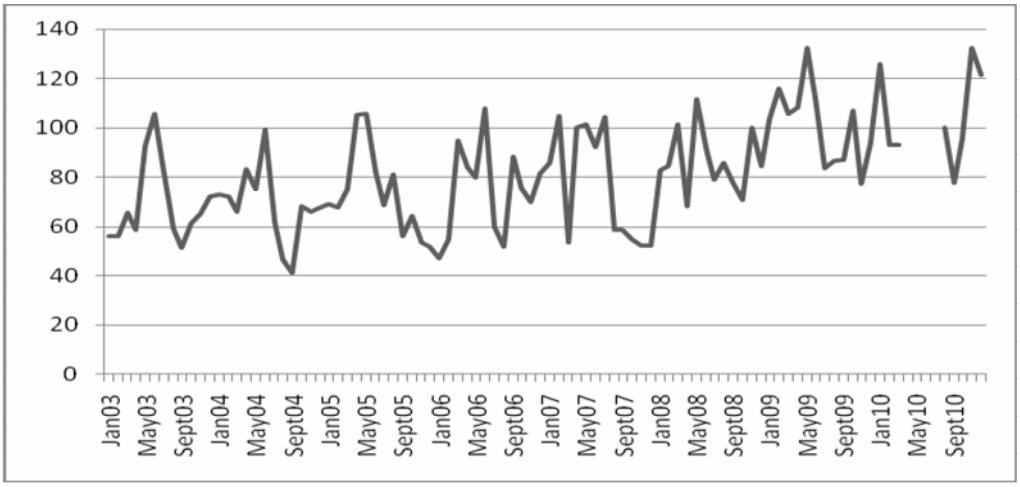

Fig 1: Prices of tomatoes in urban market (2003 – 2009)

Stationarity test of tomato prices in Nigeria - The result (Table 1) shows the stationarity test for tomato using ADF procedure. The results indicate that all the variables are stationary at their level. Therefore, the null hypotheses of non stationary were rejected for all the variables at their level. This did not conform with the findings of Alexander and Wyeth (1994), Chirwa (2000), Yusuff *et al* (2006) that commodity prices are stationary at the order of first difference. Thus, the test of co integration could be applied as all the tomato price data series were integrated of the same order, i.e. I(1) and did not have unit root.

Table 1: ADF test results for rural and urban prices of tomatoes

Variable	ADF at levels	ADF at first difference	Remarks
Rural Price	-3.85**	-9.29***	Stationary at level
Urban Price	-5.26***	-12.59***	Stationary at level

** Sig at 5% *** Significant at 1%.

Co integration and Granger Casualty Test for Tomato

In Table 2, The maximum Eigen value test shows that the two tomato market pairs investigated are cointegrated at 1% level of significance. The trace test shows that the tomato market pairs are cointegrated at 1% level of significance. Therefore using the trace statistics, it could be inferred that the tomato markets investigated are cointegrated of the order (1, 1). This is the proportion of tomato market pairs which prices are tied together in the long run.

Table 2: Johansen tests for co integration for rural prices and urban prices of tomatoes

Rural and urban prices	Trace test	Max test
r = 0	47.36***	15.49***
r=≤1	16.36***	3.84***

***Sig at 1%

Granger causality test for Tomato in Nigeria

Two tomato market links were investigated for evidence of granger causality (table 3). From the result of the analysis, urban tomato market price does not determine the rural market price. Although, rural market price determine the urban market price, none of the market links exhibited bi directional granger causality or simultaneous feedback relationship.

Table 3: Granger causality test results for Rural and urban prices of tomatoes

Variable	F-statistic	Probability
Urban does not granger cause rural	0.38473	0.68193
Rural does not granger cause urban	6.46427	0.00254***

***Sig at 1%

Index of Market Concentration

The indices of market concentration (IMC)

For tomato prices in the rural and urban markets, the IMC obtained were 0.69. The IMC for these market pairs was less than one thus indicating high short run market integration. The result shows that price changes in the rural market does cause immediate change in the prices in the urban market.

CONCLUSION

The study examined price behavior in tomato rural and urban markets in Oyo State, Nigeria. The trend analysis showed that the prices of tomato in the markets studied moved in an upward trend from April to August of each year. This is due to the fact that prices were higher in those months compared to other months of the year. The stationary test indicated that the prices were stationary at level form. The result of the granger causality test confirmed that rural prices of tomato determine the urban prices in Oyo State.

Policy Recommendations

Based on the results of the study, the following are recommended

- Market information centers should be established to facilitate adequate communication and flow of information between markets.
- improvement in the transportation system, this will prevent product spoilage during transportation from the food surplus market to the food deficit/shortage market.

REFERENCES

Amusa, A.M (1997): Trend Analysis of Agricultural Food Prices in Nigeria (1985-1995) (ACase Study of Ibadan). Unpublished M.Sc Project, Department of Agricultural Economics, University of Ibadan, Ibadan, Nigeria.

Alexander, C. and Wyeth, J. (1994): Co-integration and Market Integration: An Application to the Indonesian Rice

market, *Journal of Development Studies*, 30, 303-328.

Bakucs, L.Z and Ferto I (2005): Marketing margins and Price transmission on the Hungarian Pork meat market Agribusiness Vol 21 (2) 273-286.

Chinwa, E.W (2000): Liberalization of Food Marketing and Market Integration in Malawi. Final Report of an AERC Sponsored Research Work Presented at the Biannual Economic Research Workshop, Nairobi, Kenya. May 27, 2007.

Dittoh, J.S (1994): Market integration: The case of dry season vegetable in Nigeria. Issues In African Rural Development, 2: 89–101.

Erinle, I.D. (1989): Present Status and Prospect for Increased production of Tomato and Pepper in Northern Nigeria. Proc. Int. Symp. Integrated Manage. AVRDC Tainan, Taiwan.

Hendry, D.F (1986): Econometric modeling with cointegrated variables: An overview oxford bulleting of Economics and statistics 48, 201-212.

Ihekeonye et al (1985): Economic importance of Fruits and Vegetables. In Ifidon, A.B. (1999). Unpublished M.Sc. Project, Department of Agricultural Economics, University of Ibadan, Ibadan.

National Population Council (NPC), 2006: Nigeria 2006 Population Census

Ogunkola, O.O (2003): A Statistical Analysis of Price Spreads for Some Nigerian Agricultural Commodities. Unpublished M.Sc Project, Department of Agricultural Economics, University of Ibadan, Ibadan, Nigeria.

Okoh, R.N and Egbon, P.C (2005): The Integration of Nigeria's Rural and Urban Foodstuffs

Markets. AERC Research Paper 151, Africa Economic Research Consortium, Nairobi.

Yusuf S. A., Akanbi O. A. and O. I. Y. Ajani (2006): Spatial Price Analysis of Cassava and its Products in Kwara State Nigeria, (1994-2006). Journal of Economics and Rural Development Vol 15 No.2. Pp 103-112

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Socioeconomic determinants of cocoyam production among small holder farmers in Ekiti state, Nigeria

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Abstract: This study investigated the determinants of cocoyam production among small holder cocoyam farmers in Ekiti State. The study employed stratified random sampling technique to select 90 cocoyam farmers from six communities across the three agricultural zones in the State. Data collected from the respondents were analysed using descriptive statistics, multiple regression and factor analysis. The results obtained from the analyses showed that the average age of cocoyam farmers in the area was 54 years, with majority of them (about 70%) being males. On the level of education of the respondents, about 30% of the farmers had no formal education, while majority (41%) stopped at the primary school level. Virtually all the respondents intercropped cocoyam with crops such as cassava, maize and vegetables The major household level socioeconomic determinants of cocoyam output as revealed by the regression analysis include gender, household size, farm size, farming experience and land ownership status of the farmers. At the societal level, the results of the factor analysis show that the major constraining factors to cocoyam production were economic/institutional factor such as high cost of farm inputs and inadequate extension contacts, techno-infrastructural such as poor storage facilities and lack of access to mechanized services, and socio-financial factor such as land tenure problem and inadequate finance. The foregoing suggests that enhancing access of cocoyam farmers to cultivable land through favourable policies will increase production. In addition, credit facilities should be made available to them in form of soft loans to enable them procure necessary inputs for production. Provision of required infrastructural facilities and education of the farmers through extension services should be made a priority by government for sustained food production.

Keywords: Cocoyam, small holder farmers, constraints, factors, food crops, Ekiti State Nigeria

INTRODUCTION

Nigeria, like some other developing countries is principally an agrarian nation who still face an ever increasing food crisis as the level of food production is yet to keep pace with demand. There is worsening food insecurity, even with massive food importation as evidenced by rising food import bill (Okoye, *et al*, 2008). Akinsanmi (2009) reports that Nigeria is one of the worst hit countries globally given her unprecedented level of acute food shortage and its accompanying ravaging malnutrition. Though endowed with vast expanse of arable land for crop production and fresh waters for fish breeding, reports still show that Africa's largest country cannot produce food crops her population requires and had thus been depending on food importation to meet her domestic demands (Adepoju and Awodunmuyila, 2008).

Cocoyam is an important staple in Nigeria and ranks third in importance after cassava and yam among the root and tuber crops

cultivated and consumed (Echebiri, 2004; Okoye, Asumugba, Okezie, Tanko and Onyeaweaku, 2008). It (either white or pink) is nutritionally superior to cassava and yam, containing 70 - 80% water, 20 – 25% starch and significant amount of vitamins and particularly compatible with the diet requirement of diabetic patients. In addition, its protein content is very high when compared with that of other tropical tuber crops (Onwueme, 1991). It also plays a significant role in bridging the food gap between the time of plenty and scarcity, with all the vegetative parts of used as food in one form or the other.

Cocoyam (*taro*) has broad leaves with long stem attached to a corm which grows into the soil with some cormels (Uguru, 1996). It belongs to two members of the *Araceae* family that are staple foods for many people in developing countries in Africa, Asia and the Pacific (Agueguia, Fatunku and Halm, 1992). It is the most widely grown crop in both western and eastern regions of Nigeria in terms of area cultivated and number of producers, and it is not only a major source of food but also income, especially in the rural areas (Oguniyi, 2008). The two varieties mainly produced in Nigeria according to Edet and Nsikak (2007; and National Root Crop Research Institute 'NRCRI' (2008) are *Colocasia escilenta* (L) Scott (taro) and *Xanthosoma sagittifolium* (L) Scott (tannia). Available data as reported by FAO (2006) and Okoye, Onyeaweaku, Ukoha, Asumugba and Aniedu (2008) show that Nigeria is the world's leading producer of cocoyam with an estimated 3.5 million metric tonnes in 2003. This was about 40% of the world's cocoyam production (Eze and Okorji, 2003).

As a food crop, cocoyam has some inherent characteristics, which makes it attractive to consumers in Nigeria. It has a multiplicity of end uses; for example, it can be used for making starch, flour, soup, confectioneries and so on, in addition to its being consumed in various other forms in which other starchy staples can also be consumed. It is available all the year round, making it preferable to most other root and tuber crops. It is also resistant to drought, pest and diseases, and tolerant to a variety of climatic and soil conditions (Ogunniyi, 2008). The market for cocoyam, particularly in the urban areas is therefore expanding rapidly.

However, as noted by Onyenweaku and Eze (1987) and Zuhair and Hunter (2000), the production of the crop is not encouraging as the yield per hectare is still low. This is particularly, because, the bulk of cocoyam production in Nigeria is in the hands of rural resource poor farmers, who are characterised by small holdings (usually from 0.05 – 3.0 hectares per farmer), low capitalization and low yield per hectare (Olayemi, 1994, Adepoju and Awodunmuyila, 2008).

Expansion in cocoyam production has therefore the potential of bridging the wide demand and supply gap, and enhancing the income (thereby reducing poverty) of the rural farmers, particularly the vulnerable group. Opata (2010) reports that many rural people, particularly women have gained interest in the production, processing and marketing of cocoyam, essentially because of the rapid increase in its share of the urban market in

Nigeria. Previous research efforts on cocoyam were focused on marketing and profit efficiency of the commodity. This is evident in Adepoju and Awodunmuyila (2008) and Ogunniyi (2008). This study therefore estimates the determinants of cocoyam production in the area.

METHODOLOGY

Study Area: The study was carried out in Ekiti State, Southwestern Nigeria. The state is located between longitudes 4^0 45^1 and 5^0 45^1 East of the Greenwich meridian and latitudes 7^0 15^1 and 8^0 15^1 North of the equator. Ekiti State is in rainforest belt with a temperature range of 21^0c to 28^0c and high humidity. Topographically, the state is mainly an upland zone rising above 250 meters above sea level (Ekiti State Government, 2008).

The population of Ekiti State as reported by National Population Commission 'NPC' (2006) is 2,384,212 people with more than 80% of the population engage in farming as main source of livelihood (Olaitan and Oladipo, 2002). It has 16 administrative local government areas divided into three (3) agricultural zones namely: Zone A, B and C. It is suitable for livestock rearing, production of cash crops such as cocoa, coffee, cola nut and food crops such as yam, cassava, cocoyam, plantain and so on (Kuponiyi and Bamigboye, 2009).

Sampling and Data Collection Procedure: Multistage random sampling technique was used in selecting the respondents. Two local government areas were randomly selected from each of the three agricultural zones making six local government areas. From each of the local government area, one community was selected making six communities. With the assistance of key informants, the list and location of cocoyam farmers in each community were compiled from which the sample for the study was drawn. Fifteen (15) farmers were sampled from each of the six communities across the state totaling 90 cocoyam farmers in all. Structured questionnaire was used for data collection. This focused mainly on socio-economic characteristics of the farmers, output of cocoyam in tons, cropping system and constraints militating against cocoyam farmers in the study area. The data for the study was collected in January, 2010.

Measurement of output and area of land: A full basket of cocoyam as a standard unit of measurement in the study area weighs 25kg; therefore, 40 baskets of cocoyam is 1000 kg which is one ton. The area of a heap of cocoyam stand, which is the cultivation method in the study area is 1 x 1 meter. Therefore, since the area of a hectare is 10,000 square meters, a farmer with 1000 heaps of cocoyam has 0.1 ha.

Estimation Procedure: The data collected were analyzed using descriptive statistics, Ordinary Least Squares method and factor analysis as detailed below.

Household socio-economic factors affecting the output of cocoyam was estimated using OLS method. The following is the implicit form of the model:

$Y = (x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8\ e)$.

Where y = output of cocoyam (in tons).

X_1 = Age of the farmers (in years).

X_2 = Sex (Gender) of the household head (male = 1, female = 0).

X_3 = Household size (in number).

X_4 = Years of education of household head (in years).

X_5 =Farm size (in hectares)

X_6 = Farming experience of household head (in years).

X_7 = Land ownership status (owned = 1, otherwise = 0).

X_8 = Unit (a full standard basket) price of cocoyam (in N)

e = Radom error term.

The explicit form of the linear model is as follows:

Yc = b0 + b1x1 + b2x2 + b3x3 + b4x4 + b5x5 + b6x6 + b7x7 + b8x8 + e

Three functional forms: linear, semi-log and double-log were estimated using the Ordinary Least Square (OLS). This was considered necessary in order to select the functional form with the best fit. In the semi-log and double log forms, 0 values in the dummies were replaced with 0.0001. This is because, the number 0 is undefined for log.

Factor Analysis - Exploratory factor analysis was employed in identifying societal factors constraining cocoyam production in the area. Principal component factor analysis with varimax-rotation and factor loading of 0.30 was used. Therefore, variables with factor loading of less than 0.30 and variables that loaded in more than one factors were discarded (Ashley, *et.al* 2006; Madukwe, 2004).

The principal component factor analysis model is stated thus:

$Y_1 = a_{11}X_1 + a_{12}X_2 + * \ * \ *+ a_{1n}X_n$

$Y_2 = a_{21}X_1 + a_{22}X_2 + * \ * \ * + a_{2n}X_n$

$Y_3 = a_{31}X_1 + a_{32}X_2 + * \ * \ * \ * + a_{3n}X_n$

* = *

* = *

$Y_n = a_{n1}X_1 + a_{n2}X_2 + * \ * \ * + a_{nn}X_n$

Where

$Y_1, Y_2 \ldots Y_n$ = observed variables / constraints to cocoyam farmers in the study area.

$a_1 - a_n$ = factor loadings or correlation coefficients.

$X_1, X_2, \ldots X_n$ = unobserved underlying factors constraining cocoyam farmers in their production activities in the study area.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

Majority (62%) of the respondents were aged between 41 – 60 years, about 11% fell within 20-40 years; while 27% of the respondents were above 60 years of age (table 1). On the average, the farmers were aged 54 years. This showed that the cultivation of cocoyam was carried out by relatively old farmers. This could be as a result of increased rate of rural-urban drift and the involvement of the youths in commercial motorcycling, popularly known as *okada* in the state; thereby living agricultural production in the hands of old farmers. Evidence from a study conducted by Adetunyi, Olaniyi and Raufu (2007) showed that about 53.3% of farmers in Oyo state, southwest Nigeria were above 50 years of age.

On gender of the respondents, majority (69%) of the farmers were male while 31% were females. This is not an indication that women were less involved in cocoyam production because they are often perceived as subordinate to male authority in male headed households

(Eboh and Ogbazi, 1990, Fakoya, Apantaku and Aderti 2006).

About 30% of the respondents had no formal education while majority (41%) had primary education. About 23% and 6% of them had secondary and higher education respectively. Thus, a greater percentage (71%) of the farmers had either primary or no education. Adepoju and Awodunmuyila (2008) had a similar finding that a total majority of about 60% of cocoyam farmers in Ekiti State had primary and no formal education.

Majority of the respondents (60%) had household sizes ranging from 6 – 10 persons; about 32% of them had between 1-5 persons while 8% fell within the size of 11-15 persons. None of the households had up to 16 persons or above. Amusa (2004) had similar observation while assessing the demand for fuelwood substitutes in Ekiti State that, majority of about 64% of the sampled households in the State had population size ranging from 6 – 10 persons. On farming experience, 30% of the respondents had between 10 - 20 years, while 29% had between 21 - 30 years of farming experience. The farmers that fell within the range of 31-40 years of farming experience represented 24% of the respondents. About 12% fell between 41-50 years, while only 4% of them had over 50 years of experience. On the average, the number of years of farming experience of the respondents was 30 years. Olaitan and Oladipo (2002) noted that Ekiti people depend on land because over 80% of the population was engaged in farming and that their general belief was that farming is the only source of food, wealth, financial security and protection from hunger.

Table 1: Frequency and Percentage Distribution of Socio-Economics Characteristics of the Respondents

Variable	Frequency	Percent
Age		
20-30years	1	1.1
31-40 years	9	10.0
41-50 years	30	33.3
51-60 years	26	28.9
61 and above	24	26.7
Gender		
Male	62	68.9
Female	28	31.1
Education		30.0
No formal education	27	
Primary school education	37	41.1
Secondary school education	21	23.3
Tertiary education	5	5.6
Household size		
1 – 5	29	32.2
6 – 10	54	60.0
11 – 15	7	7.8
Farming experience		
10 – 20years	27	30.0
21 – 30 years	26	28.9
31 - 40 years	22	24.4
41 - 50 years	11	12.2
51 and above	4	44
Total	**90**	**100**

Source: Field Survey 2010

Cropping System

Majority of the respondents (97%) diversified production by having other food crops interplanted with cocoyam in their farms. Most farmers diversify production through intercropping, because of the risks and uncertainties involved in farming (Adegeye and Dittoh 1985; Bishop and Toussaint 1958). About 97% of the farmers interplanted vegetables such as tomatoes, pepper, okra and various species of leafy vegetables with cocoyam while 94%, 91% and 34% of the farmers interplanted maize, cassava and cowpea respectively (figure 1). Only 23% of the farmers interplanted white yam (*Dioscorea rotundata*), while about 28%, 41% and 39% had yellow yam (*Dioscorea cayenensis*), Chinese yam (*Dioscorea opposita*)

and water yam (*Dioscorea alata*) respectively incorporated in their cocoyam farms. The bar chart (Figure 1) further illustrates the pattern of cropping system among cocoyam farmers in the area, showing that yams (*Dioscorea* spps) and cowpea were not commonly interplanted with cocoyam while cassava, maize and vegetables were the food crops mostly intercropped with cocoyam. Maize and vegetables were usually planted about the same time with cocoyam while cassava was introduced latter to avoid shading which could grossly reduce the yield of other crops in the system.

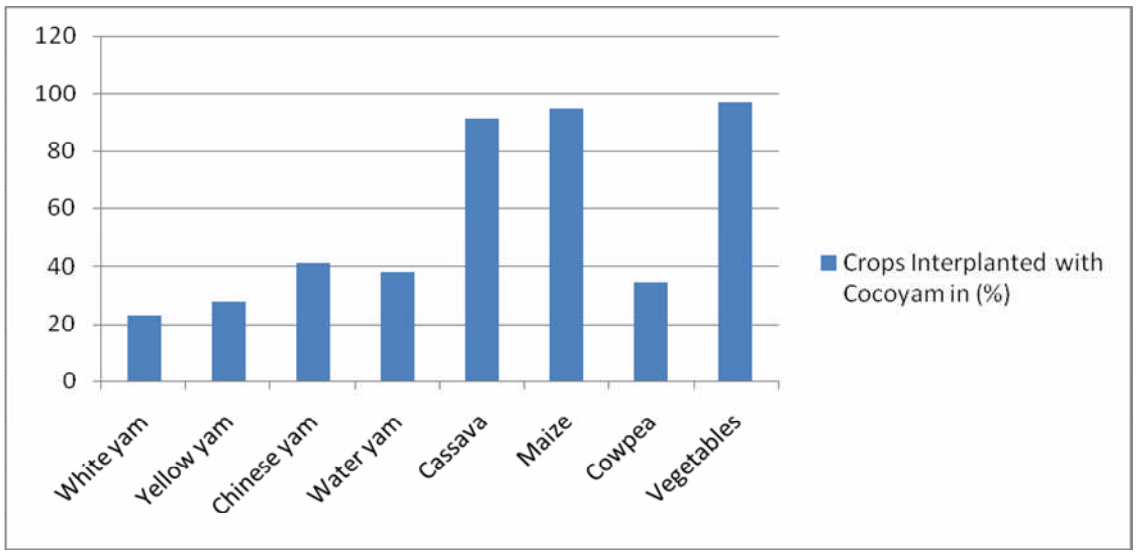

Figure 1: Percentage distribution of Respondents by Crops Intercropped with Cocoyam

Household Socioeconomic Factors Influencing Cocoyam Production

Table 3 presents the results of the regression analysis and it shows that the linear functional form had the best fit, based on the values of R^2 (0.93), level of significance of explanatory variables and their signs. The F-value of (131.646) indicated that the overall equation was significant at ($p<0.01$) while Durbin-Watson (DW) of 1.996, showed the absence of autocorrelation.

Out of the eight explanatory variables specified, five were statistically significant; these were sex, household size, farm size, years of farming experience, and land ownership status of the farmers. Sex of the household head significantly and negatively affected output of cocoyam at ($p<0.01$). This suggests that male farmers perhaps de-emphasize cocoyam production in favour of other food crops such as yam and cassava in the area. The household size was positively and significantly ($p<0.01$) related with cocoyam output. Elasticity of production suggests that a 10% increase in household size will increase production by 3.12% every other thing being equal. As earlier stated, the high rate of rural-urban migration in search of paid employment, or *okada* riding, results in cases of farm labour shortages; such that large households become boost for improved production; easing labour bottlenecks. This finding is in agreement with that of Babatunde, Omotesho and Sholotan (2007) on socio-economic characteristics and food security status

of farming households in Kwara State, North-Central Nigeria where household labour availability improved farm productivity. Oguniyi (2008) in a study on profit efficiency among cocoyam producers in Osun State Nigeria found that households with increased family size exhibited significantly less loss of farm profit than farmers with less family size.

Farm size was found to be significant and positively related to the output of cocoyam in the area ($p<0.01$). This conforms with *a priori* expectations as households with large farm size are more likely to have increased output when compared with households that are constrained by land availability. Elasticity of production suggests that if fame size is increased by 10%, output of cocoyam will increase by 4.03% *ceteris paribus*. Oluyole and Sanusi (2009) had similar findings on a study carried out in Cross River State, reporting that with the desired agronomic/management practices, increased farm size will improve farm output.

Farming experience was also positive and significant ($p<0.01$). This suggests that farming experience is an important determinant of level of output. Farming involves a lot of risks and uncertainties; therefore to be competent enough to handle all the vagaries of agriculture, farmers must have stayed in farming business for quite some time (Ogundele and Okoruwa, 2006).

Ownership of land was positive and significant at 1% level of probability. This is consistent with *a priori* expectation that as farmers own more land, their output is likely to increase all things being equal. Elasticity of production suggests that if farmers' ownership of cultivable land is increased by 10%, output of cocoyam will be increased by 1.39%. The degree of control over land for agricultural production according to FAO (2005) is a central factor affecting farmers' decisions on farm expansion and investment. Adequate availability of cultivable land to farmers has been reported by many authors to have positive relationship with output (Fabiyi *et. al*, 2007).

Table 3: Result of the Multiple Regression Analysis for Socio-Economic Determinants of Cocoyam Output

Coefficient/Variables	Linear {a}	Semi-log	Double-log
Intercept	-0.895 (0.845)	-3.930 (6.137)	-0.367 (0.377)
AGE	0.002 (0.011) b = 0.009	0.734 (0.714)	0.033 (0.101)
SEX	-0.525 (0.188)*** b = -0.101	-0.127 (0.030)***	-0.010 (0.004)**
HHOLD SIZE	0.317 (0.061)*** b = 0.312	1.748 (0.534)***	0.269 (0.076)***
EDU	0.022 (0.024) b = 0.942	0.010 (0.024)	0.002 (0.003)
FMSIZE	4.251	1.538	0.235

	(0.594)***	(0.287)***	(0.041)***
	b = 0.403		
EXPR	0.048	0.851	0.296
	(0.014)***	(0.445)*	(0.063)***
	b = 0.241		
LDOWNERSHIP	0.685	0.111	0.023
	(0.242)***	(0.037)***	(0.0005)***
	b = 0.139		
UNITPRICE	0.001	0.326	0.162
	(0.000)	(0.752)	(0.106)
	b = 0.041		
R^2	0.929	0.861	0.924
Adjusted R^2	0.922	0.847	0.914
F-Value	131.646	62.776	122.598
Durbin-Watson (DW)	1.996	1.919	2.065
Observation	90	90	90

Source: Field survey, 2010
Note: Figures in parentheses are standard errors.
*** denotes p<0.01; ** denote 0.01<0.05; while * denotes 0.05 <p<0.10
{a} is the lead equation based on fitness.

Major Societal Factors Militating Against Cocoyam Production in the Area

Table 4 presents the varimax-rotated factors militating against cocoyam farmers in the area. Three (3) factors were extracted based on the response of the respondents. Only variables with factor loading of 0.30 and above at 10% overlapping variance (Ashley, Amber, and Anthony, 2006) were used in naming the factors. Variables that loaded in more than one factors as in the case of variables 4, 11, 18 and 20 were discarded while variables that have factor loadings of less than 0.30 were not used (Enete and Amusa, 2010). In naming the factors, Kessler (2006) stated that each factor is giving a denomination based on the set of variables or characteristics it is composed of. This procedure was adopted in grouping the variables into three major factors as: economic/institutional factor – factor1, Techno-infrastructural factor – factor2 and socio-financial factor – factor3.

Under factor 1 (economic/institutional factor), the specific variables militating against cocoyam farmers in the area were: high cost of farm input (0.598); inadequate extension contacts (0.371), inadequate access to inputs (0.424), high labour cost (0.443) and poor soil fertility for cocoyam production (-0.453). Fadayomi (1988) stated that high cost of inputs; farm labour and associated low level capital investment in agriculture due to low farm income are some of the major challenges facing most African farmers. Inadequate extension contacts by farmers is one of the institutional challenges facing farmers as Madukwe (1996) noted that ineffective transfer of agricultural technology through extension agents is a major problem facing agricultural development in Nigeria. The challenge of poor soil fertility could still be as a result of financial constraints which limits their application of soil maintenance inputs such as fertilizers.

Variables that loaded under factor 2 (Techno-infrastructural factor) include poor storage facilities (0.352), inadequate or lack of access to mechanized services (0.530); poor technical know-how of most farmers (0.622) and

poor road network in the area (0.326). The problem with Nigerian agriculture is not primarily with production but shortage of infrastructural facilities such as good road to ensure effective distribution of agriculture produce, inadequate storage and processing facilities. Ajibade (2000) confirmed that poor storage and processing facilities are some of the major problems of agriculture in Nigeria. Moreover, Ndubizu (1990) reported that some of the factors that affect crop farmers in Nigeria were inadequacy of modern farm tools and machinery and poor technical knowledge.

Under factor 3 (socio-financial factor) were: land tenure problem (0.750), relatively old age of the farmers (0.409), inadequate finance (0.603) and lack of access to fund to secure farm inputs (-0.464). It has been noted by several authors that socio-cultural beliefs and socio-economic characteristics of farmers play significant role in agricultural production. For instance Ajibade (2000) stated that the type of land tenure system practiced in most Nigerian societies discourage farmers from acquiring lands for agricultural production. The author (Ajibade 2000) reported further that poor financial status of Nigerian farmers is a major limiting factor in agricultural production. The relatively old age of the farmers as one of the major challenges against production in the area could be linked with the reported cases of increased rural-urban migration of youths thereby living agriculture in the hands of their old parents. Okoruwa and Ogundele (2006) stated that as farmers grow old, their productivity tends to decline and this constitutes a major limiting factor to most Nigerians farmers.

Table 4: Varimax-rotated factors militating against cocoyam farmers in the study area

S/N	Constraining variables	Factor 1 Economic/ institutional factor	Factor 2 Techno-Infrastructural factor	Factor 3 socio-financial factor
1	High cost of cocoyam production inputs.	**.598**	-.022	-.196
2	Land tenure or ownership problem.	-.017	.038	**.750**
3	Old age of most cocoyam farmers.	-.041	.240	**.409**
4	Low and fluctuating price of cocoyam in the market	.223	.532**	-.382**
5	Prevalence of pest and cocoyam disease problem.	-.256	-.252	.037
6	Inadequate or lack of extension contacts with the farmers.	**.371**	-.223	-.131
7	Inadequate finance to expand cocoyam farming.	-.209	-.093	**.603**
8	Poor storage facilities.	-.012	**.352**	-.006
9	Low recognition for cocoyam as poor man's food.	-.196	-.205	-.036
10	Inadequate or lack of access to mechanized services.	.121	**.530**	-.094
11	Poor credit accessibility to resource poor farmers.	.378**	-.123	.364**
12	Inadequate access to fertilizer, farm tools, chemicals etc.	**.424**	-.046	-.085
13	High cost of labour supply for	**.443**	.105	-.250

	cocoyam production			
14	Poor technical-know-how in using improved farm methods.	-.020	**.622**	.204
15	Poor soil fertility for cocoyam production in the area.	**-.453**	.074	.261
16	Prevailing unfavourable weather condition against cocoyam production in the area.	.108	.179	.053
17	Lack of access or fund to secure improved planting materials.	.060	-.171	**-.464**
18	Physical problems like erosion and frequent fire disasters.	-.002	-.532**	.576**
19	Poor road network that prevents smooth distributive trade of cocoyam.	-.243	**.326**	-.007
20	Far distance of cultivable land from residential areas.	.334**	-.609**	-.275

Note: Factor loading of **0.30** is used at 10% overlapping variance.
Variables with factor loadings of less than **0.30** were not used.
**Variables that load in more than one factor were discarded

Conclusion and Recommendations

The paper estimated the determinants of cocoyam production among small-holder farmers in Ekiti State Nigeria using multiple regression and factor analysis. Cocoyam farmers in the area had a mean age of 54 years of which majority (70%) were males, with an average of 30 years of farming experience. The major household level socio-economic determinants influencing cocoyam output in the area were gender, household size, farm size, farming experience and land ownership status of the farmers. At the societal level, the identified factors militating against cocoyam production include: economic/institutional factor such as high cost of farm inputs and inadequate extension contacts, techno-infrastructural such as poor storage facilities and lack of access to mechanized services, and socio-financial factors such as land tenure problem and inadequate finance. The foregoing suggests that enhancing access of cocoyam farmers to cultivable land through favourable policies will increase production. In addition, credit facilities should be made available to them in form of soft loans to enable them procure necessary inputs for production. Provision of required infrastructural facilities and education of the farmers through extension services should be made a priority by government for sustained food production.

REFERENCES

Adegeye, A.J and J.S. Dittoh, (1985). Essential of Agricultural Economics (New edition). Ibadan: Impact Publishers Nig. Ltd.

Adepoju, A.A. and Awodunmuyila, D.J (2008). Economics of Cocoyam Production and Marketing in Ekiti East Local Government Area, Ekiti State, Nigeria. Research Journal of Applied Sciences 3(2): 95-98.

Adetunji, M.O., O.A Olaniyi and M.O, Raufu (2007). Assessment of Benefits Derived by Cocoa Farmers from Cocoa Development Unit Activities of Oyo

State. *Journal of Human Ecology* 22 (3): 211 – 214 (2007).

Ajibade, A.S. (2000). Productivity of the Nigerian Agriculture. In: Ekemode, K.O (Ed) Introduction to Agriculture for Sustainable Development. Lagos: The Nigerian Association of Agricultural Educators (NAAGRED). Pp 28-35.

Akinsanmi, G (2009) Nigeria: Food Security - Transforming Potentials to Empowerment. *Thisday National Daily*. Retrieved September 16, 2010 from http://www.allafrica.com/nigeria/

Amusa, T.A. (2004) Analysis of the Demand for Fuelwood Substitutes in Ekiti State. *B. Agric Project* Submitted to the Department of Agricultural Economics, University of Nigeria, Nskka.

Ashley, B., S. Amber and F. Anthony. (2006). Education by Nation: Multivariate analysis. Retrieved April 22, 2008, from http://www.users.muohio.edu/porterbm/Sunj/2006/start.s

Babatunde, R.O.; Omotesho, O.A. and Sholotan, O. S. (2007) Socio-Economic Characteristics and Food security status of farming Households in Kwara State, North-Central Nigeria. Parkinstan Journal of Nutrition 6(1):49-58.

Bishop, C.C and W.D Toussaint (1958). Introduction to Agricultural Economic Analysis. New York: John Wiley & Sons.

Eboh, E.C and J.U, Ogbazi. (1990). The Role of Women in Nigerian Agricultural Production and Development. In Ikeme, A.I.(Ed) *The Challenges of Agriculture in National Development*. pp. 117 – 126.

Echebiri, R.N (2004) Socio-economic Factors and Resource Allocation in Cocoyam Production in Abia State, Nigeria. *Journal of Sustainable Tropical Agricultural Research* 9: 9 – 73.

Edet, J.U and Nsikaka, A.A.E (2007) Cocoyam Farms in Akwa Ibom stae, Nigeria: A Stochastic Production Frontier Approach. Retrieved December 10, 2008 from http://www.verypdf.com/

Ekiti State Government (2008). The People of Ekiti State. Retrieved August 13, 2008 from http://www.ekitinigeria.net/

Enete, A. A. and Amusa, T. A. (2010). Determinants of Women's Contributions to Farming Decisions among Cocoa-based Agroforestry Households in Ekiti State, Nigeria. FACTS Reports, Vol 4 No 1.

Enete, A. A. and Okon, U. E. (2010 Economics of Waterleaf (*Talinum triangulare*) Production in Awka Ibom state, Nigeria. FACTS Reports, Vol 2 no 1.

Eze, C.C and Okorji, E.C (2003) Cocoyam Production by Women Farmers Under Improved and Local Technologies in Imo State, Nigeria. *African Journal of Science*, 5 (1): 113 – 116.

Ezedinma, C.I (2000). Farm Resource Allocation and Profitability of Arable Crop Enterprises in the Humid Forest Inland Valley Ecosystem: A Case Study of Ozu Abam in Southern Nigeria. *UNISWA Journal of Agric*., 9: 48-56.

Fabiyi, E.F., B.B Danladi, K.E, Akande and Y, Mahmood. (2007). Role of Women in Agricultural Development and Their Constraints: A Case Study of Biliri Local Government Area of Gombe State, Nigeria. *Pakistan Journal of Nutrition* 6 (6): 676 – 680.

Fadayomi, T.O (1988) Rural Development and Migration in Nigeria. Ibadan: Nigerian Institute of Social and Economic Research (NISER)

Fakoya, E.O., S.O Apantaku and F.O, Adereti (2006). Gender Involvement in Arable Crop Cultivation and its Contributions to Household Food Security in Ogun State, Nigeria. *Research Journal of Social Sciences* 1 (1): pp 1 – 4.

FAO (2005) Framework for Farm Household Decision making. Retrieved March 10, 2010 from http://www.fao.or.docrep/.

FAO (2006) Food crop and storage. Corporate Document Repository and Database. Rome: Food and Agricultural Organization.

International Institute of Tropical Agriculture IITA (2007) Growing Cocoyam in Nigeria: Commercial Production Guide Series. *International Institute of Tropical Agriculture*. Ibadan: IITA.

Kessler, C. A. (2006). Divisive Key–Factors Influencing Farm Households Soil and Water Conservation Investment. *Journal of Applied Geography* 26: 40 – 60.

Kuponiyi, F. A. and Bamigboye, E. O. (2009) The use of Indigenous Knowledge System (IKS) in rice production by farmers in Ekiti State, Nigeria. International journal of Agricultural Economics and Rural Development - 2(2): pp 67-74

Madukwe, M. C. (1996) Restructuring Field Agricultural Extension Services in Nigeria: Issues and Options. In: Adedoyin, S.F. and Aihonsu, J.O.Y (Eds) Sustainable Development in Rural Nigeria. *Proceedings of the Eighth Annual Conference of the Nigerian Rural Sociological Association*. Ijebu-Igbo, Nigeria: Segeto and Company Publishers. Pp 314-320.

National Population Commission "NPC" (2006) Provisional Figures for 2006 Nigeria's Census. Retrieved October 16, 2007, from http://www.nigerianmuse.com

Ndubizu, T. O. C. (1990) The Subsistence Crop Grower. In: Ikeme, A.I. (Ed) *The Challenges of Agriculture in National Development*. Enugu: Optimal Computer Solutions Ltd. Pp 23-49.

NRCRI, (2008) Cocoyam Programme. *National Root Crops Research Institute.* Umudike: NRCRI.

Ogundele, O. O. and V. O. Okoruwa. (2006). Technical Efficiency Differentials in Rice Production Technologies in Nigeria. *AERC Research Paper 154*, Nairobi, Kenya. Retrieved October 10, 2006 from http://www.aecrafrica.org/documents/rp154.pdf

Ogunniyi, L. T. (2008) Profit Efficiency among Cocoyam Producers in Osun State, Nigeria. *International Journal of*

Agricultural Economics and Rural Development 1(1): 38-46.

Okoye, B. C., Asumugha, G. N. Okezie, C. A., Tanko, L. and Onyenweaku, C. E. (2008). Econometric Assessment of the Trend in Cocoyam Production in Nigeria,1960/1961 – 2003/2006. *Agricultural Journal* 3 (2): 99-101.

Okoye, B.C; Onyenweaku, C.E; Ukoha, O.O; Asumugha, G.N and Aniedu, O.C (2008) Determinants of Labour Productivity on Small – Holder Cocoyam Farms in Anambra State, Nigeria. *Journal of Scientific Research and Essay*. Vol 3, pp 559 – 561.

Olaitan, S.O. and Oladipo, I (2002). Omuooke-Ekiti Yesterday and Today. Bauchi: League of Researchers in Nigeria (LRN).

Olayemi, J.K. (1994). Policies and Programs in Nigeria Agriculture. A Publication of the Department of Agricultural Economics, University of Ibadan.

Olayide, S.O and Heady, E. (1982). Introduction to Agricultural Production Economics. Ibadan: University Press Ltd.

Oluyole, K.A. and Sanusi, R.A. (2009) Socio-Economic Variables and Cocoa Production in Cross River State, Nigeria. Journal of Human Ecology, 25(1):5-8.

Onwueme, I. C. (1991) An Analysis of the Constraints in the Delivery Systems for Tropical Root and Tuber Crops in Developing Economy. *Proceedings of the Ninth Symposium*, Accra, Ghana, pp. 52 – 53.

Onyenweaku, C. E. and N. O. Ezeh (1987) Trends in Production, Area and Productivity of Cocoyam in Nigeria 1960/61–1981/84. National Root Crop Research Institute (NRCRI), Umudike, pp 94 – 100.

Uguru, M. I. (1996). *Crop Production: Tools, Techniques and Practice*. Nsukka: Fulladu Publishing Company.

Zuhair, M. and D. G. Hunter (2000) Taro Cultivation and Use in the Maldives. *1PGR I Session. 12th Symposium of ISTRC*, Tsukuba, Japan.

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