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ASSESSMENT OF YOUTHS' PARTICIPATION IN RURAL DEVELOPMENT INTERVENTIONS IN SOUTHWESTERN NIGERIA

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Abstract: In view of the need to harness the potentials of youths in developing rural areas. this study assessed youths' participation in rural development interventions in South Western Nigeria. The study was designed to identify programmes that have taken place, youths' participation in such programmes, their major constraints and their attitude towards rural development interventions. Three states were randomly selected from the six states of southwestern Nigeria. Two Local Government Areas were selected from each state and a community was selected from each Local Government Area, while 20 respondents were selected from each rural community making a total of 120 respondents. Data were analyzed using descriptive and inferential analysis. Results indicate that; Youths participate more in agricultural related rural development programmes. Youths' constraints to participation in rural development programmes are low financial status (42.5%), lack of cooperation among the youths (15.8%) and poor educational background (30.8%). Inferential analysis showed that age ($X^2 = 34.502$, $P = 0.001$), sex ($X^2 = 21.981$, $p = 0.034$) and income ($r = 0.631$, $p = 0.021$) can influence youths participation in rural development programmes. There is a positive and significant relationship between youths attitude and participation in rural development interventions ($r = 0.541$, $p = 0.004$).

Keywords: Rural youths, Participation, Development Interventions, Attitude

INTRODUCTION

Every nation across the globe regardless of classification by international organization is craving for development. Nigeria as a nation is not an exception to this. Development is growth plus change. Growth is a sustained qualitative increase in country's per capita output accompanied by expansion in its labour force, capital and value of trade (Jhingan, 2001). Development is a qualitative change in economic worth, goods and productivity and the upward movement of entire soci*et al*system (Awe, 2006). It is also derived from the effort or abilities of man to harness the resources of nature (Land) using his inventiveness bearing the risk not only for current sustenance but also for the improvement of living standard (Nnadi, 2006).

Most of the major development that have taken place in the south western rural areas of the country were accomplished by the government, but most of these developmental activities were fast tracked and catalyzed by the mobilization of the rural youths. Apart from the action of youths in informing the government about the major problems that hampered the development of their regions, they were also involved and took active parts in some minor developmental activities in their localities (Jibowo, 2005) such as building town halls, formation of vigilante group, erecting pipe borne water facilities, digging of drainage channels etc.

A case of study is that of the construction pedestrian bridge by the youths of Tede and Irawo Owode in Shaki East Local Government Area of Oyo State. This bridge has been reported to hasten economic activities of the two regions (Nigeria Tribune, 2009).

Rural youths, sometimes are involved in minor developmental programmes in their areas and on

the other hand complement government's programmes by providing labour for a wide variety of activities. They receive farm information and in some cases, assist rural dwellers in analyzing innovations. Israel and Ilvento, (1992) reported that if rural youths are omitted from being involved in rural development interventions on the basis of their age it will unnecessarily limits a community's capacity to solve local problems. By increasing rural youths' participation in decision-making, the traditional relationships between adults and youths working together as active members of a team can be enhanced (Adeyemi, 1991). Balogun (2006) reported that school-based community development project can meet the information needs of the community, and lay the foundation for development involved and effective citizen participation. The question now is 'who are the youths?'

Youth is the state of being young. It is a transitional period in personality development that bridges the years between late childhood and adulthood (D' souza, 1970). The age bracket varies among authorities. It can be from ten to twenty years (Shingi *et al.*, 1980) and ten to thirty years. In some societies, as long as one remains a bachelor or spinster, one is a youth! Youths possess unique capabilities, dynamism, strength, adventure and ambition (Udah, 2001; Waldie, 2004, Akwiwu *et al*., 2005).

Though youths have contributed greatly to rural development, the fold and scope of their involvement have not been scientifically ascertained. More so, studies in the past have not addressed the determinance of rural youths' participation in rural development, rather, efforts were made at examining how to harness their potentials.

Despite the bounty natural resources that are found in the rural areas, most of them are yet to be harnessed. For instance, most of the lands that are rich in nutrients are yet to be cultivated due to poor involvement of rural youths in agriculture.

Youths' participation in rural development in south western Nigeria should be a major concern. Government always shows nonchalant attitude towards developing rural areas which has resulted into massive migration of rural youths to urban centers. This is because rural youths felt they are deprived of necessary basic social amenities which are lacking in the rural areas. Development status in rural areas is still below average in Nigeria and youths' participation in rural development intervention is highly needed.

Rural areas have been noted to be the food basket of each state in the country which equally has impact on the economy. Hence, there is need to make an integrated and collaborative approach in developing the rural areas by harnessing the potentials of both the government and rural youths.

This study was conceived to assess rural youths' participation in rural development interventions in south western region of Nigeria. The study was designed to identify socio-economic characteristics of the respondents, identify programmes that have taken place in their communities. identify constraints to youths' participation and to determine factors that can affect youths' participation in the programmes.

METHODOLOGY

The South West lies between 3^0E and 6^0E of the longitude and also between 6^0N and 9^0N of the latitude. It transverses six of the thirty-six states making up the Federal Republic of Nigeria including Oyo, Osun, Ekiti, Ondo, Ogun, and Lagos States with estimated population of 50 million people. . The region hosts over eighty-five different ethnic groups speaking about two hundred and fifty dialects across about three hundred communities.

The target population of the study comprised youths within the age range of 18 to 30 years. A multi-stage random sampling procedure was used to select the respondents. Three out of six states within the south west region were randomly selected for the study. These states are: - Oyo, Ondo and Ogun States. Two Local Government Areas were selected from each state and a rural community from each Local Government Area while twenty people were randomly selected and a total of 120 respondents were interviewed. A structured interview schedule was used for collecting data for the study. Data were analyzed using frequency count, percentages, mean, median and standard deviation while inferential analysis was done using Chi-Square and correlation analysis.

Socio-economic characteristics

From Table 1, 78.5% of the respondents were aged between 21 and 30 years old while 21.5% were below 21 years of age. This is due to the fact the study focused on the youths in the study area. Most respondents (65.8%) were male and single 74.2%. while 41.7% and 54.2% belonged to Islamic and Christianity religions respectively. About 58.0% had secondary education while 28.3% had post secondary education. More than one third (38.3%) of the respondents were still in various post secondary institutions pursuing post secondary educational certificates. Also about one third (31.7%) had no definite income generating activities while 32.5% earned below N100, 000.00 annually and 55.8% belonged to one social organization or the other.

Table 1: Socio-economic characteristics of the respondents

Socioeconomic characteristics	Frequency	Percent
Age		
Below 21	22	21.5
Between 21 and 30	93	78.5
Sex	79	65.8
Male	41	34.2
Female		
Marital status	89	74.2
Single	31	25.8
Married		
Religion	50	41.7
Islam	65	54.2
Christianity	5	4.2
Traditional		
Educational status	7	5.8
No formal education	9	7.5
Primary education	70	58.3
Secondary education	34	28.3
Tertiary education		
Occupation	46	38.3
Students	21	17.5
Farming	6	5.0
Hunting	20	16.7
Trading	16	13.3
Civil service	11	9.2
Others		
Annual income	38	31.7
No definite source of Income	39	32.5
Below 100.000.00	33	27.7
Betw 100,000.00 and 300,000.00	6	5.0
Betw 301,000.00 and 500,000.00	4	3.3
Above 500,000.00		
Membership of social organization	53	44.2
No	67	55.8
Yes		

Source: Field survey, 2011

Participation in rural development interventions

Figure 1 below shows that 55.0% of the respondents had participated in rural development programmes involving crop production while 48.0% had participated in programmes involving livestock production. About 40.0% of the respondents indicated that they had participated in rural development programmes such as vigilante, campaign against HIV/AIDS and communal labour. Other programmes respondents participated were campaign for breast feeding (30.0%), adult literacy (35.0%), computer literacy (25.0%), construction of roads (27.0%) and construction of town halls (20.0%). This implies that if rural youths are motivated and encouraged they can be used for rural development programmes and their potentials can be channelled towards rural

development interventions since the old people have less energy for such programmes.

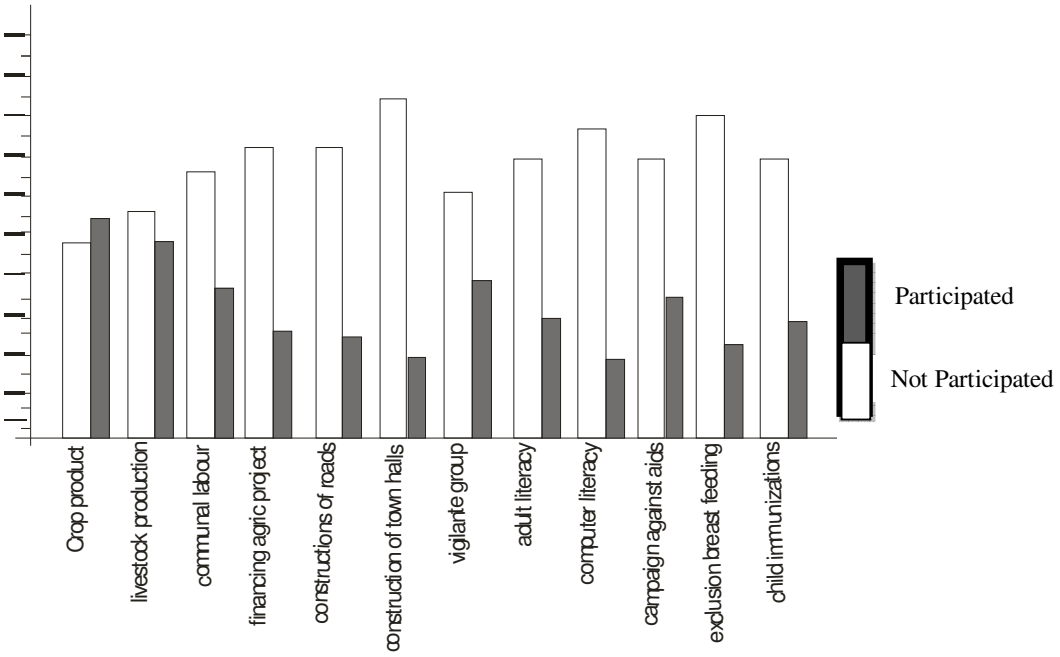

Fig 1: Participation of Rural Youths in Development Programmes

Constraints to youths' participation in rural development interventions

From Table 2 below, 42.5% of the respondents indicated that lack of financial support was the major constraint to rural development interventions. Other major constraints identified by respondents included poor education (30.8%) and lack of cooperation among the youths (15.8%). This finding implies that there should be financial support, motivation and adequate educational facilities for youths so that they can be effectively used for rural development programmes.

Table 2: Distribution of Constraints to Rural Youths Participation in Development Programmes

Constraints	Frequency	Percent
Financial problem	51	42.5
Lack of cooperation among youths	19	15.8
Poor education	37	30.8
Lack of encouragement from elders	2	1.7
Poor leadership skill among youths	2	1.7
Others	9	7.5

Source: Field survey, 2011

Relationship between socioeconomic characteristics and participation

The result of the inferential statistical analysis reveals that there were significant relationship between respondents' age (X^2 = 34.502), sex (X^2 = 21.981) as well as income r= 0.631) and participation in rural development programme. This implies that respondents' age, sex and how much they earn can influence their participation in rural development programmes. It can be further inferred that age of a youth will determine whether he or she will participate in rural development interventions. When an individual is growing old, he or she might be more occupied and this will hamper the participation of such individual in community development interventions. Also sex of individual will determine how far such individual can participate in rural development interventions. Culturally, females are to carry out household chores and other activities in the homes so they will

have less time for community development programmes. Money is needed for almost everything and so when an individual has more annual income he or she can easily participate in development programmes even when he or she does not have the time, money can be sent for such programmes.

Also positive and significant relationship exist between youths attitude and participation in rural development interventions ($r = 0.541$, $p = 0.004$). This implies that if the attitude of youths is improved it can lead to greater participation in rural development interventions.

CONCLUSION

It can be concluded that youths from south western region of Nigeria participate in rural development interventions such as agricultural development programmes, campaign against HIV/AIDs, and campaign for breast feeding, adult literacy, road and town hall constructions, vigilante programmes among others in their respective communities. Age, sex and annual income can influence youths' participation in rural development interventions.

Recommendation

It is recommended from the study that rural youths should be adequately empowered financially to be able to participate more in rural development interventions. The empowerment should come in form of provision of financial support, educational facilities and youths involvement at the decision making stage of community development interventions.

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Determinants of cocoa farmers' participation in farmer field school approach in Abia state, Nigeria

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Abstract: The study was conducted in Bende, Ikwuano and Umuahia North the three cocoa producing Local Government Areas of Abia State in 2011; in order to analyze determinants of cocoa farmers' participation in Farmer Field School Approach. Purposive and multistage random sampling technique was employed to select 120 cocoa farmers in Farmer Field Schools. A structured questionnaire was used to solicit information from the respondents and data obtained were analyzed with descriptive and inferential statistics using (tobit regression analysis). Results from the study showed that beneficiary Cocoa Farmers participated actively in the training technology components of the programme in areas of nursery and plantation establishment, agrochemical application, pruning techniques, fertilizer application, cocoa bean storage, processing and marketing. The tobit regression analysis estimates revealed that household size, education, farming experience, labour use and attendance to trainings were critical determinants to farmers participation in the programme. Deliberate policies on rural infrastructural provision, location of schools and establishment of rural education centres to complement efforts of Farmer Field School Approach were advocated for increased participation of farmers in the programme.

Keywords: Determinants, Participation, Cocoa Farmers, Field School, Approach

INTRODUCTION

Cocoa (*Theobroma cocoa*) belongs to the family *Steruliacacea* and genus *Theobroma.* Tree crop especially cocoa has the main stay of Nigerian economy before the advent of crude oil (Obatolu *et al*., 2000). The National planning commission (2006) observed that the Agricultural sector accounted for 42.1% of Gross domestic product (GDP) in Nigeria while the National Bureau of Statistics (2005) indicated that it employed about 70 % of the working population. Agriculture has remained the largest non – oil export earner, employer of labour, a key contributor to wealth creation and poverty alleviation in Nigeria. Nigeria as developing country had long ago commercialized her cocoa production and was rated the second highest producer of cocoa in world ranking until 1971, when its export declined to 21, 6000 and 15000 metric tonnes in 1986 thus, reducing the country's market share to about 6% and to the fifth largest world producer of cocoa with about 385,000 metric tonnes per annum, an increase of 215,000 metric tonnes from the year 2000 (Erelu, 2008). Nigeria produces about 250,000 metric tonnes of cocoa (Adesina, 2012). By these ratings Nigeria competed favourably with other front liners in cocoa industry like Ivory Coast, Indonesia and Ghana. Prior to the oil boom of the mid 70's cocoa was one of the highest foreign exchange earners in Nigeria and for a long time the crop has been generating substantial foreign earnings for the country (Onwumere and Alimba, 2010). The cocoa sector still offers a large sizable number of people employments both directly and indirectly (Oluwale, 2004). Cocoa serves as a source of foreign exchange and employment (Olayemi, 1973; Abang, 1984; Folayan *et al*., 2006). Cocoa is used for drinks such as chocolate, for candies, cosmetics, soap and pharmaceuticals. Cocoa and its processed product

like chocolate contain flavanol, which has a cardiovascular health benefit (Schroeter *et al*., 2006; Taubert *et al*., 2007). Similarly, Davison *et al*., (2010) reported that flavanol rich cocoa lowers human blood pressure. Cocoa is grown in fourteen states of Nigeria, which include Abia, Akwa Ibom, Cross River, Delta, Edo, Ekiti, Ogun, Ondo, Osun, Oyo, Kogi, Kwara, Adamawa, and Taraba states. One of the major ways that cocoa farmers receive information is through extension services. However, in most cocoa producing countries, cocoa extension services/agents are inadequate (David *et al*., 2006). Information is important in generating and disseminating agricultural technologies. Adequate information is an integral part of agricultural development. The quality of information required has the potentials of improving efficiency in all the spheres of agriculture, the associated issue of food security, the need to increase yield, the need to improve quality and the need to avoid costly mistakes (Ebewore and Emuh, 2013). The farmers need to participate in agricultural development programmes because, the beneficiaries, through involvement, develop greater responsiveness to new method of production, technologies and higher services offered. In the last twenty years, many efforts have been made in trying to change research and development in agriculture to better involve farmers, to the extent that it has been widely accepted (LEISA, 2006). According to Hellin *et al*., (2006), the most effective way for participatory research processes to benefit a greater proportion of farmers is by close coordination and collaboration with organizations that are better placed to link farmers and researches due to their relatively long-term contact with farmers. Akinbile *et al.,* (2008) in their study of Community Based Development Projects in Nigeria, identified age, education and frequent meetings as among the determinants of participation. In order to fill this technology dissemination gap, government through the National Cocoa Development Committee has adopted the Farmer Field School Approach as a vehicle for farm extension delivery. Farmer Field School Approach (FFSA) is a participatory training approach that can be considered both as an extension tool and a form of adult education. It focuses on building farmers capacity to make well-informed crop management decision through increased knowledge and understanding of the agro-ecosystem. Farmer Field School participants make regular field observations and use their findings, combined with their own knowledge and experience, to judge for themselves, what, if any, action needs to be taken (STCP, 2006; David *et al*., 2006).

In view of the stated facts this paper tends to analyze farmers' participation in cocoa production through Farmer Field School Approach in Abia State, specific objectives were to;

i. describe socio-economic characteristics of cocoa farmers in the study area;
ii. ascertain levels of cocoa farmers' participation in Farmer Field School technologies; and
iii. determine influence of socio-economic factors on the participation of cocoa farmers in the programme.

H_0: Socioeconomic variables such as age, household size, education, farm size, labour use, farming experience, farm income, chemical use and attendance to trainings do not influence cocoa farmers' participation in the programme.

METHODOLOGY

Study Area

This study was conducted in Abia State, Nigeria. Abia State lies between longitudes 7^{o} 23^{1} and 8^{o} 2^{1} East of the equator and latitudes 4^{o} 47^{1}

and 6^{o} 12^{1} North of the Greenwich Meridian. The State is located East of Imo State and shares common boundaries with Anambra, Enugu and Ebonyi States in the North West and North East respectively. On the East and South East, it is bounded by Cross River and Akwa Ibom States and by Rivers State on the South. Abia State is made up of 17 local government areas and most of the people especially, the rural dwellers engaged mainly in subsistence farming. They engage in arable crop production such as cassava, yam, rice, maize and sweet potatoes. Cocoa and oil palm were among the major cash crops grown.

The Local Government Areas namely; Bende, Umuahia North and Ikwuano were purposively chosen because they were the major cocoa producing areas in the state. Multistage random sampling technique was used in selecting participating and non participating cocoa farmers. First, two (2) Farmer Field Schools each were randomly selected out of the four (4) schools that make up the LGA's; **Bende- (**Okporoenyi and Isiala schools), **Ikwuano**- (Iberenta and Itunta schools) and **Umuahia North**- (Okweyi and Azueke schools). This gave a total of six (6) Farmer Field Schools. Finally, twenty (20) participating cocoa farmers were randomly selected from each of the selected schools to give a total of one hundred and twenty farmers (120).

Sample Size and Data Analysis

Objectives i, ii were analyzed with descriptive statistics such as frequency counts, percentages, mean scores and standard deviation, while objective iii was achieved with tobit regression analysis. The levels of participation of cocoa farmers in Farmer Field School in the study area was measured using an 8 – item statement rated on a 5 point likert type scale of Always (5), Often (4), Occasionally (3), Seldom (2), Never (1). A midpoint was obtained thus; 5+4+3+2+1 =15/5 =3.00. Based on the mid score decision rule, any mean score greater than or equal to 3.00 implied participation in technology and mean score less than 3.00 denotes non participation in technology by farmers.

Model specifications

In ascertaining the relative position of each technology component of Farmer Field School Approach, the total raw scores of the farmers and their participation using the 5 point Likert type scale is represented according to Fakoya and Daramola (2008) as:

Technologies = $5(N_1) + 4(N_2) + 3(N_3) + 2(N_4) + 1(N_5)$

The mean was calculated for each of the CBNRMP technology component.

$$\text{Mean} = \frac{5(N_1) + 4(N_2) + 3(N_3) + 2(N_4) + 1(N_5)}{5}$$

Where:

FFST Technologies = FFS Training Technology Raw scores.

N = number of participating farmers

S = sample size of participating farmers

M = mean of FFST technology component.

The 5 point Likert type scale is represented thus: Always (5) Often (4) Occasionally (3) Seldom (2) and Never (1)

Farmers with mean scores of 3.0 and above were regarded as had actively participated in the programme, while those with scores less than 3.0 did not participate actively.

The tobit regression analysis is expressed thus:

Since the level of participation of cocoa farmers, cannot be negative (the threshold is zero) the dependent variable can be written using an index function approach.

$Ii = B^{T}X + ei$..... (1)

$Yi = O$ if $Ii = T$..... (2)

$Yi = I$ if $I > T$..... (3)

Where,

Y represents a limited dependent variable, which simultaneously measures the decision to participate in the technologies and intensity of participation.

I^x is an underlying talent variable that indexes participation.

T is an observed threshold level

X is the vector of independent variables affecting participation.

βi is a vector of parameters to be estimated

ei = error term.

If the non variable T becomes a continuous function of the independent variables and O otherwise for t he generated case, the value of log likelihood function is given as, empirical model are presented below;

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9 + ei)$

Y = level of participation in technologies (measured by numbers of participation scores of the respondents)

X_1 = Farmers age (in years)

X_2 = Household Size (Number)

X_3 = Educational status (measured by the number of years a farmer spent in school)

X_4 = Farm Size (Hectares)

X_5 = Labour Use (Man days)

X_6 = Years of farming experience

X_7 = Farm income (the amount in Naira a farmer realized from his farm)

X_8 = Chemical Use (Litres)

X_9 = Attendance to Trainings (Number)

ei = Error term

RESULTS AND DISCUSSION

Socioeconomic characteristics of cocoa farmers' in the study area

Table 1 shows the socio economic characteristics of both farmer groups. The result shows that the mean ages of Farmer Field School Cocoa farmers were 49.50years with a standard deviation of 10.41. Also, the cocoa farmers had mean farming experience of 18.50 years with a standard deviation of 4.17. Farming experience had been shown to enhance the participation and adoption of improved farming techniques, thereby increasing output (Nwaobiala *et al*., 2009). The Table also reveals that the mean farm size of Farmer Field School Cocoa farmers was 4.5 hectares with a standard deviation of 0.97. This result conforms to the findings of (Onwumere and Alimba, 2010). The mean farm income of FFSC farmers was N1.556m with a standard deviation of 231.02.

Table 1: Mean and standard deviation of selected socioeconomic characteristics of farmer field school cocoa farmers in the study area

Variables	Mean	Standard Deviation
Age (years)	49.50	10.41
Farming Experience (years)	18.50	4.17
Farm Size (Hectares)	4.5	0.97
Annual Farm Income (N)	1.556 (M)	231.02

Source: *Field Survey Data, 2011*

Levels of farmers' participation in farmer field school approach

The result in Table 2 shows the levels of farmers' participation in the programme technologies in the study area. The Table indicates that a moderate proportion of cocoa farmers ascribed training in chemical application (fungicide, herbicide among others) (29.12%) with mean rating of 3.77 as technology they occasionally participated. Also, training in pruning techniques (34.83%) and fertilizer application (23.33%) with mean ratings of 3.75 and 3.60 respectively were technologies farmers were actively involved. Williams *et al*., (1998) affirmed that application of fertilizer and Diuron against black pod infestation has proved to be effective. Pruning of cocoa branches and fertilizer application are important techniques in cocoa production that enhances cocoa output (Obatunde *et al*., 2003).

Furthermore, the cocoa farmers participated in training on marketing (28.33%), plantation establishment (35.83%) and storage technologies (25.83%) with mean ratings of 3.58, 3.50 and 3.40 respectively. Finally, a moderate proportion of cocoa farmers 26.67 percent and 21.67 percent always participated in processing and nursery technologies with mean ratings of 3.0. This implies that the farmers were actively involved in the technology, since the mean is greater than 3.0. This result confirms that all the technologies disseminated by Farmer Field School facilitators were yield enhancing which increases cocoa production in the study area.

Table 2: Levels of Cocoa Farmers' Participation in Farmer Field School in Abia State, Nigeria

FS Training Technologies	Always	Often	Occasionally	Seldom	Never TFFS	Mean
Training in Nursery Establishment/Techniques	85 (17)	128 (26.67)	132 (36.67)	28 (11.67)	13 (10.83) 386	3.20
Training in Plantation Establishment	130 (21.67)	140 (35)	129 (35.83)	20 (8.33)	6 (5) 425	3.50
Training in Agro Chemical Application	165 (27.50)	164 (34.17)	105 (29.17)	16 (6.67)	3 (2.5) 453	3.77
Training in Pruning Techniques	165 (27.50)	172 (35.83)	90 (25)	20 (8.33)	4 (3.33) 451	3.75
Training in Fertilizer Application	180 (30)	112 (23.33)	99 (27.50)	32 (13.33)	7 (5.83) 430	3.60
Training in Cocoa Bean Storage	155 (25.83)	116 (24.17)	90 (25)	36 (15)	12 (10) 409	3.40
Training in Cocoa Bean Processing	160 (26.67)	92 (19.17)	66 (27.50)	50 (20.83)	18 (15) 386	3.20
Training in Cocoa Marketing	170 (28.33)	128 (26.67)	93 (25.83)	32 (13.33)	7 (5.83) 430	3.58

Source: Field Survey Data, 2011

Decision Rule 3.0 and above is Participation

Less than 3.0 is non Participation. Always 5, Often 4, Occasionally 3, Seldom 2, Never 1

Values in parentheses are percentages.

TFFS – Total Farmer Field School Scores

Determination of Factors Influencing Farmers' Participation in Farmer Field School Approach in Abia State, Nigeria

Data on Table 3 shows the tobit regression estimates of the determinants of farmers' participation in the programme technologies in Abia State, Nigeria. The Chi-square (χ^2) is highly significant at 1.00% level of probability, indicating goodness of fit of the regression line. The coefficient of household size (0.8026) was positively signed and highly significant at 1.00% level of probability. This implies that increase in household size will lead to a corresponding increase in participation and intensity of participation in Farmer Field School. Nwaru, (2004) reported that large house hold sizes are expected to enhance labour availability especially where the household members are of labour age especially in cocoa production that requires more labour. The coefficient of education (0.5761) was positive and significant at 5.00% level of probability. This implies that as education increases the probability of participating in the programme increases. This is in agreement with *a priori* expectation. Generally education is thought to create a favourable mental attitude for the acceptance of new practices especially of information intensive and management practices

(Caswell, 2001 and Onyenweaku, *et al*., 2010). The coefficient of labour (0.1897) was positively signed and highly significant at 10.00% level of probability. This implies that increase in labour will lead to increased participation in Farmer Field School. This is expected and in accordance with *a priori* expectation.

The coefficient for farming experience (0.3171) was positively signed and highly significant at 1.00% level of probability. This is in agreement with *a priori* expectation. The positive sign implies that as farming experience increases, the tendency for farmers' participation in the programme technologies increases. The positive effect of farming experience is thought to stem from accumulated knowledge obtained from years of observations and experimenting with various technologies (Bonabana-Wabbi and Taylor, 2008).

Attendance to trainings made positive effect (0.3308) on participation and is highly significant at 1.00% level of probability. This result is in consonance with the findings of Nwaobiala, (2010), where they found positive relationship between training and participation in Rural Extension project.

Therefore, the alternative hypothesis of factors influencing farmers' participation in the programme is hereby accepted.

Table 3: Tobit regression estimates of determinants of cocoa farmers' participation in farmer field school technologies in Abia state, Nigeria

Variables	Parameters	Coefficients	Standard Error	t-ratio
Age	X_1	0.1021	0.1279	0.84
Household Size	X_2	0.8026	0.2853	2.83***
Educational status	X_3	0.5761	0.2340	2.50**
Farm Size	X_4	3.8870	4.4647	2.81***
Labour Use	X_5	0.1807	0.1091	1.74*
Farming experience	X_6	0.3171	0.0643	4.93***
Farm income	X_7	0.0794	0.0651	1.22*
Chemical Use	X_8	-0.0002	-0.0003	-0.53
Attendance to Trainings	X_9	0.3308	0.5655	3.62**
Constant		45.8295	13.6799	3.36***
LR Chi2	X^2	55.68	0.0001	
Prod. Chi2				

Source: Field Survey Data, 2011.

*, ** and *** significant at 10.00%, 5.00% and 1.00% respectively

CONCLUSION AND RECOMMENDATIONS

The study has proved that Farmer Field School Approach has complementary role in extension delivery and technology dissemination in the State. The high level of participation had shown that the technologies transferred were beneficial to cocoa farmers. The study revealed that household size, education, farming experience, labour use and attendance to trainings were factors that influenced the farmers to participate in the programme.

The study therefore recommends that;

The programme should subsidize farm inputs such as fertilizer, improved cocoa seedlings and herbicides and ensure timely supply of these inputs taking cognizance of the fact that farming is time bound.

Since education had positive influence on cocoa farmers' participation, deliberate policy should be enacted to strengthen access to education to farmers. In order to achieve this, adult education centres should be located in the rural areas to complement Farmer Field School Approach stated objectives.

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Determinants of output of agricultural commodities in Nigeria

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Abstract: Agriculture has been the backbone of the economy in Nigeria providing employment and source of livelihood for the increasing population and accounting for over half of the GDP of the economy at independence in 1960. However, the role it plays in the regional and economic development of the country has diminished over the years due to the dominant role of the crude oil sector in the economy. With the increasing food demand in Nigeria, the country has available input, natural resources and potential for increasing the volume of crop production towards meeting the food and nutritional requirement of the rapidly increasing population and guarantee food security in the country. This study was undertaken to analyse the effects of different factors and policies determining the volume of agricultural crop production in Nigeria between 1970 and 2008.This study estimated the production function and regress output of agricultural commodities on the independent variables. The results show that price of agricultural commodities, agricultural land and value of agricultural loan are positive and significantly related to output of agricultural commodities. While the relationship between average total rainfall and output of agricultural commodities was counter-intuitive, that is, a negative, significant relationship exists between average total rainfall and output of agricultural commodities. The study, therefore, recommends that there should be unlimited access to markets and sourcing of production inputs.

Keywords: Average total rainfall, output, agricultural commodity

INTRODUCTION

Agriculture has been the mainstay of the economy in Nigeria and many of the African countries, providing employment and source of livelihood for their increasing population. The history of agriculture in Nigeria is intertwined with the political history of the country and can be assessed from the pre-colonial, colonial and post-colonial periods. The pre-colonial society in the country strived on agriculture as the main stay of the traditional economy and the period of the colonial administration brought a great impact on agricultural development with emphasis placed on research and extension services (Nwa, 2003). In the colonial era, agriculture was regarded as the backbone of the economy with most of the foreign exchanged earnings at the time derived from export of agricultural products. At independence in 1960, it accounted for over half of the GDP of the country's economy and was the main source of export earnings and public revenue before the emergence of the oil sector and exploration of crude oil began in the country. However, studies on the linkage between agricultural commodities and its determinants are scanty in Nigeria. This present study therefore bridges this gap by examining the factors that determines agricultural output in Nigeria.

With agriculture as an occupation accounting for more than 60 percent of the total labour force of Nigeria's working population providing both formal and informal employment in

which about 38 percent are females (Balogun, 2000); its role in the economic and regional development of the country is of significant importance. The total cultivable land in the country is estimated at 61 million hectares, which represent about 66 percent of the total area of the country (Aquasat, 2005), relating to adequate availability of land resources for agricultural production coupled with the availability of human labour resources.

However, the agricultural sector has suffered a relative decline in the preceding years after independence due to the dominance of oil sector in the economy and in the GDP aggregate share but the sector still accounts for about 33 percent of the GDP (Aigbokhan, 2001). While agriculture holds immense potential for enhancing and stabilizing the country's foreign exchange earnings and guaranteeing food security in the country, the past three decades have witnessed a steady decline in this role. Nigeria, which was once a large net agricultural produce exporter now imports food and attempts to revive the agricultural sector as a dominant sector, have been unsuccessful. With the increasing human population in the country and increase in demand for food, there are challenges for the development of the sector by boosting and increasing the volume of food production towards meeting the increase in food demand and guarantee food security in the country without reliance on external food imports. This can come through the development of the water and land resources which are major inputs in the agricultural production process and annexing the surplus and under-utilised human labour resources from the increasing population growth, available in the country. However, these steps must be taken without compromising the sustainability of the industry and environmental resources including water and land resources which are vital inputs in the production process.

In the economic and national development of Nigeria, agriculture is expected to provide adequate supply of food to the people, produce a high level of agricultural raw materials for the industries and also generate employment for the people and a high level of returns to the farmers. However, despite evidence of availability of natural resource inputs including land and water and ample supply of human labour force which are the principal agricultural inputs, different problems have been confronting the sector over the years and one of such is the inconsistent government policies which have been described as a fatal perturbation that had rocked the boat of food security in Nigeria (Okuneye, 2002). Other problems identified include the socio-economic characteristics of the farmers, poor infrastructural facilities, credit facility problem, agricultural inputs and land tenure problems, all of which interact in a synergy, resulting in low production, high prices of food items, inflation, underdevelopment and concomitant poverty.

The aim of the study is to examine the factors that determine the output of agricultural commodities in Nigeria and the connections that exist between agricultural output and the independent variables.

The challenges of ensuring food security in Nigeria and meeting the millennium development goals (MDGs) and reduction in the poverty level in the country is hinged on the revitalization of the agricultural sector in the country based on the role the sector is playing through provision of jobs for majority of the labour force. However, while the sector has been adjudged to be performing very low in the preceding times after independence, there has been different studies to identify the problems confronting the sector as well as the effect of different policies on the sector Balogun, 2000; Aigbokan, 2001 and Akande, 2006).

Agricultural practices themselves have often added to the water shortage problem in Africa more than anywhere else due to differences in property rights. More precisely, because farmers are often not owners of the land they work on, the preservation of natural resources is generally viewed as a secondary objective. In addition, pressures represented by increasing populations and changing technology add to the problem of land deterioration related to agricultural practices, see for example Drechsel *et al*(2001).Besides, problems associated with land use through, for example, deforestation, can translate into increased erosion. Another illustration of environment-damaging agricultural practices is the intense use of fertilizer in low-quality lands. As yields increase, so will water consumption, thus creating a vicious circle, see Gommes and Petrassi (1996).

Thus, it is expected of this study to contribute to an increased understanding of the development of agricultural commodities in relation to its determinants. It also adds to the existing literature on the increased knowledge of the potentials available for increased crop production and success in the agricultural sector in the country through their development.

This study therefore, focuses on the determinants of output of agricultural commodities in Nigeria. Quantitative techniques would be adopted, the study span through 1970 to 2008. The rest of the project is organized into four sections. The second section specifically reviews the relevant literature that is germane to the study. The methodology and data sources are devoted to section three. The interpretation of the empirical results will be the focus of section four. Section five articulates the summary, conclusion and policy implication of the study.

The literature is replete with varied categorization of agricultural productivity and factor inputs in terms of their definitions, measurement and linkages. Productivity measures the relationship between the quantity and quality of goods and services produced (agricultural output) and the quantity of resources needed to produce them (i.e. factor inputs such as labour, capital and technology). (Frisvold & Ingram, 1995; Okojie, 1995)

The relationship between the dependent variable (output of Agricultural commodities) and the independent variables (Price of Agricultural commodities, Average total Rainfall, Agricultural Land (cultivable) and Value of agricultural loan), is a one way relationship that was explained by the classical economists, that is, the classical growth theory, as reflected in aggregate production (mostly a variant of Cobb-Douglas function) derived essentially from the technical relations that make the level of output a function of production inputs (Shepherd, 1970). It is on this premise that classical model (Cobb-Douglas function) would be adopted as a framework in this study which will reflect better in the methodology.

Nigeria as a whole is well endowed with both natural and physical resources. The country is well drained with a reasonably close network of rivers and streams. Some of these rivers, particularly the smaller ones, are, however seasonal, especially in the northern parts of the country where the rainy season is only three or four months in duration. In addition, there are natural water bodies like lakes, ponds as well as lagoons, particularly in the coastal areas. Ayanwale *et al.*, (2006) examined that the problems of water resources management in Nigeria arise from inadequate planning and management of the water resources and poor distribution of water in time and space in relation to man's needs.

According to Balogun, (2000) high proportion of cash crop production takes place in

the tropical rain forest located mostly in the western region of the country where the soils are very rich in humus with a high percentage of soil fertility. Mitsch and Gosselink, (1993) also discovered that 3.5 percent of the cultivable landmass are wetlands and this plays a vital role (in their function) to the human society and the ecology of the watershed through atmospheric maintenance as wetlands stores carbons within their plants communities and soil instead of releasing it to the atmosphere as carbon dioxide and thus helping to moderate global climatic conditions.

Mugera and Ojede (2011) also tests for efficiency catch-up in the agricultural productivity of 33 African countries from 1966 to 2001. They used recent advances in data envelopment analysis (DEA) to generate standard and bootstrap bias corrected technical efficiency scores. In general, they found no evidence of efficiency catching-up. Their results indicated that technical inefficiencies do exist in African agriculture. The overall average efficiency score is 0.745 and 0.526 for the standard and bias corrected scores and the mean 95 percent confidence band ranges from 0.537 to 0.734.

DATA SOURCES AND THE MODEL

Data Sources

Data covering the Sample period (1970-2008) were culled from secondary sources, mostly time series and aggregated data. The central Bank of Nigeria (CBN) Annual statistical Bulletin, World Development Indicator (WDI) of the World Bank, Food and Agricultural Organisation Statistics (FAOSTAT) of the United Nations and Federal Office of Statistics (FOS) and Industry Survey for various years were also used.

The link between agricultural development and economic growth has a significant role to play in the transformation and structuring of the economy of Nigeria and other economies where the majority of the labour force is primarily dependent on agriculture.

The Model

The Model[1] in this study will follow the approach of production Analysis and estimate directly the production function of output of Agricultural commodities on the independent variables.

Output of Agricultural commodities is the dependent variable, while price of agricultural commodities, average total rainfall, agricultural land and value of agricultural loan are the independent variables. The independent variables will help in determining the output of agricultural commodities and its contribution to the Nigerian economy. The functional form of the model can then be written thus;

$$QAC = f(PAC, ATR, AGL, VAL) \quad (1)$$

In an econometric form;

$$QAC = \alpha_0 + \alpha_1 PAC + \alpha_2 ATR + \alpha_3 AGL + \alpha_4 VAL + \mu_t \quad (2)$$

QAC = Output of Agricultural commodities. ATR = Average total Rainfall

PAC = Price of Agricultural commodities. AGL = Agricultural Land (cultivable).

VAL = Value of agricultural loan μ_t = stochastic error term.

We will also extend the empirical work using the Cobb-Douglas production function as shown in equation (3);

$$QAC = \alpha_0 PAC^{\alpha_1} ATR^{\alpha_2} AGL^{\alpha_3} VAL^{\alpha_4} \mu_t \quad (3)$$

The equation is estimated by ordinary least square (OLS) technique by taking logarithm on both sides

[1]The aggregations of the variables used in this study are obtained from Food and Agricultural Organization Statistics (FAOSTAT) of the United Nations on line data base.

$\ln QAC = \alpha_0 + \alpha_1 \ln PAC + \alpha_2 \ln ATR + \alpha_3 \ln AGL + \alpha_4 \ln VAL + \mu_t$ (4)

Where QAC, PAC, ATR, AGL, VAL and μ_t are as define above. The advantage of Cobb-Douglas in functional form is that it is convenient to estimate, because it is linear in parameters.

All our agricultural data are taken from the FAO online database. For a measure of output of agricultural commodities and price of agricultural commodities we use the FAO net production index, where net production quantities of each commodity are weighted by the 1989-91 average international commodity prices and summed for each year, and the aggregate for a given year is divided by the average aggregate for the base period 1989-91.In order to proxy agricultural land input, in the production function, we use FAO's measure of agricultural area, which includes arable land and the area used for permanent crops and permanent pastures, while value of agricultural loan and average total rainfall are obtained from the same source.

These data have been used in previous studies of agricultural productivity in SSA countries (Alene 2010, Fulginiti *et al,* 2004).

RESULTS PRESENTATION

This section deals with the presentation, interpretation and analysis of the results. Econometric theory requires all variables to be stationary if regressions are to be realistic (non-spurious). Null Hypothesis of non stationary is consistently rejected for all variables across years when variables are expressed in first differences. We shall consider the results on *a priori* criterion before attempting other statistical test results like the test for stationary, co integration and ordinary least square regression (OLS).

With the existence of a unit root in the log spot rates series, we test for the presence of a single unit root using the method of Dickey and Fuller (1981). This test is important since, as rooted by Diebold and Nerlove (1986), the Dickey-Fuller tests are robust to most Batteries of econometrics tests.

A time series approach will also be adopted in order to avoid potentially spurious results emanating from the non-stationarity of the data series and to analyse the short-run dynamic structure of the relationships. Engle and Granger (1987) suggest a two-step approach. First, the existence of a co integrating relationship among the variables in the equations is determined by standard co-integration techniques. If the variables are co-integrated, stable long-run relationships can be estimated using standard ordinary least squares (OLS) techniques. All these tests and estimations were carried out and interpreted accordingly.

Unit Root Test Result

For a guide to an appropriate specification of the regression equation, the characteristic of the time series data used for estimation of the model were examined to avoid spurious regression. We begin by determining the underlying properties of the process that generate our time series variables, that is, whether the variables in our model were stationary or non stationary. Macroeconomic data often appear to possess stochastic trends that can be removed by differentiating the variables. We therefore employ the Augmented Dickey-fuller (ADF) to test the order of integration of the variables.

Table1: Unit Root Test: Augmented Dickey Fuller

Variables	T-Statistic	1% critical value	5% critical value	Order of integration
LnQAC	-5.621093	-3.6394	-2.9511	**I(1)**
LnPAC	-5.216496	-3.6394	-2.9511	**I(1)**
LnATR	-7.255541	-3.6394	-2.9511	**I(1)**
LnAGL	-3.471790	-3.6394	-2.9511	**I(1)**
LnVAL	**-4.546590**	**-3.6394**	**-2.9511**	**I(1)**

Source: Authors' computation using E-views 7.1

The result above in Table 1 shows that output of agricultural commodities, price of agricultural commodities, average total Rainfall, Agricultural land (cultivable) and Value of Agricultural loan are stationary at first difference, that is, the variables are integrated of order one(i.e. I(1) series). This is deducted from the fact that for the levels of variables; the absolute values of the Augmented Dickey- Fuller (ADF) are less than the critical values of the ADF at 5% level of significance.

Johansen's Co integration Test Results

The co integration analysis helps to test for the existence of long run relationship that exists between the dependent variable and its regressors. A vector of variables integrated of order one is co integrated if there exist linear combination of variables which are stationary. Following the approach of Johansen and Jusalius (1990) two likelihood ratio test statistics; the trace statistic and the maximal eigen value were utilized to determine the number of co integration vectors.

Table 2: Johansen Co integration Test Result

Trace Test K = 2					Maximum Eigen Value Test K = 2				
Ho	**H_A**	**Λ trace**	**Critical Values 5%**	**1%**	**Ho**	**H_A**	**λ max**	**Critical Values 5%**	**1%**
$r \leq 0$	$r > 0$	72.95	68.52	76.07	$r = 0$	$r = 1$	39.8486	39.37	45.10
$r \leq 1$	$r > 1$	40.85	47.21	54.46	$r = 1$	$r = 2$	31.1068	33.46	38.77
$r \leq 2$	$r > 2$	20.06	29.68	35.65	$r = 2$	$r = 3$	26.5597	27.07	32.24
$r \leq 3$	$r > 3$	5.48	15.41	20.04	$r = 3$	$r = 4$	23.5065	20.97	25.52
$r \leq 4$	$r > 4$	0.62	3.76	6.65	$r = 4$	$r = 5$	17.3213	14.07	18.63
$r \leq 5$	$r > 5$	0.59	3.58	5.79	$r = 5$	$r = 6$	4.3587	3.76	6.65

***Source**: Authors' computation using E-views 7.1*

***Notes**: r represent number of co-integrating equation and k represent the number of lags in the unrestricted co-integration test.*(^{xx}) denotes rejection of the hypothesis at the 5% (1%) level.*

From the results obtained in Table 2, using the Johansen procedure, the null hypothesis of zero co integrating vectors is rejected by both the trace and max-eigen value statistics. The trace statistic shows six co integrating equations at the 5% level and five co integrating equation at the 1% level. While the maximal eigen value test suggest one co integrating equations at the 5% level and indicates no co integration at the 1% level. Hence, it can be concluded that there is a unique co integrating relationship between the variables at 5% significance level, which suggests that there is a long run relationship between the examined variables.

Table 2 above reveals that the null hypothesis of no co integration relationship among variables were rejected, and this shows that there is a long run equilibrium relationship between output of agricultural commodities and its explanatory variables.

Table 3: Ordinary Least Square (OLS) Result

Variable	Coefficient	Standard Error	T-Statistic	Prob.
C	6.23589	1.96214	-3.178109	0.00033
PAL	0.53740	1.213445	8.683872	0.0000
ATR	-0.43943	13.27349	-2.519265	0.0171
AGL	0.953960	0.277703	3.435180	0.0017
VAL	0.004291	0.003793	1.131222	0.2666

Source: Authors' computation using E-views 7.1

$R^{2=0.834320}$ Adj. $R^{2=0.812942}$ F-Statistics = 39.02703

Prob. (F-Statistic) =0.00000

Durbin Watson=2.134101

Table 3 above shows that price of agricultural commodities; Agricultural land (cultivable) and value of agricultural loan are positively related to output of agricultural

commodities. However, a negative but significant relationship exists between average total rainfall and output of agricultural commodities

Our results indicates that 1% increase in price of agricultural commodities(PAC), Agricultural land (AGL) and value of agricultural loan(VAL) will result in 0.54%,0.95% and 0.004% increase in output of agricultural commodities (QAC) respectively while 1% increase in Average Total Rainfall (ATR) will result in a decline in output of agricultural commodities by 0.44%.The Adjusted R-Squared is 0.81, meaning that the explanatory variables explain 81% of the variation in output of Agricultural commodities (QAC). There is no serial autocorrelation given that the Durbin Watson Statistic is within the acceptable bound.

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS OF THE RESULTS

Our results show that Price of Agricultural Commodities (PAC) is positive and statistically significant related to Output of Agricultural Commodities (QAC). The implication of this is that, following the simple law of supply: the higher the price, the higher the quantity of the commodity supplied. Hence, price is one of the most important determinants of output, indicative that the price of agricultural commodities is a valid determinant of the quantity of agricultural produce in Nigeria.

The coefficient of Average Total Rainfall shows that it is negative,however, it is significant related to output of Agricultural commodities. The finding is counter-intuitive, that is, the more the amount of rainfall, the less the agricultural output in Nigeria. This may be as a result of the fact that asides rainfall, there are other artificial sources of water, like irrigation which boost agricultural production in Nigeria. Though our result shows that average total Rainfall is an important variable in determining the volume of agricultural output especially in the short term and medium term than in the long term. The implication of this is that Nigerian Government should embark on more technological method to conserve, preserve and manage the available water resources in order to increase the output of agricultural commodities. This result conforms to the empirical findings of Olagunju, 2007, who studied water resource development and its effect on agricultural production in Nigeria.

Furthermore, it is also observed that the agricultural land is positive and significantly related to output of Agricultural commodities. This implies that availability of land resources is one of the major factors determining the output of agricultural production in Nigeria. The result also indicates that cultivable land is required before any meaningful development can take place in the agricultural sector in Nigeria.

Value of Agricultural loan has a positive correlation with output of agricultural commodities and also significantly related to it. The coefficient of agricultural loan is very small (infinitesimal), the implication of this is that there is a shortage of loan (credit) available to Farmers to expand or improve agricultural activities in Nigeria. Therefore, for any significant contribution of agricultural loan to output of agricultural commodities and economic growth, there is need for conscious development in a new and innovative ways (Akande, 2006). Likewise, there is also need for the implementation of good macroeconomic policies that will increase the availability of credit to farmers in Nigeria.

In view of these, a number of recommendations are further made based on the findings from the study. These include the following: unlimited accessibility to markets; accessibility and sourcing of production inputs; reduction in imported items and encouragement of

local production; creation of opportunities for increased agricultural productivity; unlimited accessibility to credit facilities; accessibility to land resources and continuity in agricultural and economic policies.

From a policy perspective, there should be development and implementation of a new framework for agricultural techniques that optimize agricultural output through increased and improved agricultural land systems via irrigation.

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Economic analysis of oil palm and food crop enterprises in Edo and Delta states, Nigeria

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Abstract: Sustainable and stable mixed Oil palm food crop enterprise in Nigeria requires that farmers are guided by economic rationale for the choice of Oil palm food crop combination. The study determines the profitability of Oil palm Food crops combinations among small holder oil palm farms in Edo and Delta States Nigeria. Multi-stage sampling technique was employed for the study. Nine Local Government Areas (LGAs) with the highest concentration of oil palm farmers were selected. Five villages were selected from each LGA. Three farmers from each village were randomly selected, giving 60 farmers from Edo and 75 from Delta States as respondents. Data were collected on quantities and price of farm inputs and outputs. The seven crop combinations identified were Oil palm/plantain (OP), Oil palm/cocoyam (OC), Oil palm/cassava/maize (OCaM), Oilpalm/cassava/cocoyam (OCaC), Oilpalm/plantain/cocoyam (OPC), Oilpalm/maize/cocoyam (OMC) and oil palm/plantain/ cocoyam/maize (OPCM). Budgetary analysis and discounted cash flow technique were used in analyzing the data. The budgetary analysis shows that OC combination gave the highest return of N84,207:00/ha while OCaC combination recorded the largest negative return of N187,162:00/ha. The result of the profitability analysis shows that all the seven cropping systems considered are profitable. Sensitivity analysis indicate that the profitability of inter cropping of oil palm with plantain and oil palm with cocoyam are very stable. Mixed cropping of oil palm with maize and cocoyam, oil palm cassava and maize, oil palm plantain and cocoyam, oil palm plantain cocoyam and maize, oil palm cassava and yam are stable. Given the price, yield and other uncertainties in agriculture and specifically in the given situation, the probability of attaining the profits prescribed by the estimates are higher for the very stable cropping systems.

Keywords: Oil palm, food crops, Small holder farms, Profitability Analysis, budgetary analysis

INTRODUCTION

Intercropping of oil palm with food crops is the prevalent practice among the small- holder farmers. A wide variety of food crops are intercropped with the oil palm by this group of farmers. Productivity in a typical farmers field is however low due to inappropriate agronomic practices. Past efforts to develop appropriate technology to increase the productivity of the oil palm and food crops cropping systems showed that intercropping of the oil palm with various food crops had no adverse effects on the growth and development of the oil palms(Onwubuya, *et al.*,1989). More recent trials (Udosen *et al*., 2005) showed the benefit of appropriate cropping mixture and planting sequence on the productivity of the system under 4-year intensive intercropping. Typically, all these old trials were carried out under standard oil palm spacing of about 9mx 9m triangular, and this permit the growing of most food crops in the oil palm interrow for

only the first 3 to 4 years of oil palm planting after which the palm canopy closes. However for various reasons among which are population pressure on available land, labour utilization and some economic reasons, the farmers would usually like to intercrop their palms continuously throughout the life of the palm. Previous studies on the intercropping of oil palm spacing of 9mx9m triangular have shown that it is beneficial to plant food crops in the wide oil palm interlines during the first four years before the canopy closes so fertility of the soil should be enriched with inorganic fertilizers after several years of intercropping. The oil palm spacing of 9mx16m and 9mx20m have been recommended for continuous intercropping with food crops as fresh fruit bunch yields per hectare were better at these spacing (Ugbah *et al.,* 2009). However the economic implication of intercropping oil palm with various food crops under normal oil palm spacing of 9mx9m triangular as presently practiced by small holder oil palm farms have not been empirically determined. The relative profitability of the existing and potential intercropped and mixed cropping enterprises among the oil palm farming households are determined to estimate the most probable income and expenditure to be expected by these farmers.

METHODOLOGY

The study from which this paper was drawn was carried out in the lowland Rainforest and Mangrove Savanna Zones of Edo and Delta States, Nigeria respectively. The states are two of the 36 states in the country. A multistage sampling technique was used to get the required sample. The states currently have 18 local government and 25 local government areas and have been stratified into 3 zones by the Edo State Agricultural Development Project (Edo ADP) and into 3 zones by the Delta State Agricultural Development Project (DADP). Oil palm farmers in the nine local government areas form the sample frame for the study. The choices of these nine locations were based on the intensity of oil palm production in these areas.

The second stage of sampling involved the purposive selection of villages within these local government areas in which Edo ADP and Delta ADP had contact farmers participating in oil palm cultivation. The last stage was the random sampling of oil palm farmers that were interviewed.

A sample of 135 farmers was taken but only 130 farmers gave consistent responses which were used for the analysis.

Theoretical frame work

This paper relies on budgetary and discounted cash flow techniques.

Budgetary Analysis Concept

A scheme of action prepared in advance is a plan. Farm plan may represent any envisaged change in the organization and operation of the farm. The aim of the whole process is to achieve better allocation of resources or better combination of farm enterprises. However, the goal of planning might be merely to estimate the most probable income and expenditure to be expected from a given enterprise. One of the simplest ways in which farm plans may be documented is through budgeting, which is an attempt to estimate the future outcome of a plan in quantitative terms. Provided a budget is worked out on reasonable assumptions, it can be used to set up income and expenditure

targets against which actual performance can constantly be checked as the plan comes into operation, so that defects in management can be corrected before they have gone too far (this is known as budgetary) (Adesimi,1988). However, the discrepancies between the budget and the actual performance might be as a result of operational weaknesses.

There are some basic data needed in preparing a budget. They are termed input-output data. These input-output data are estimates of the physical quantities of each resource, seed, fertilizer, labour that will be needed, and of the quantities of output of each kind of product that may be expected to result from the use of these resources. There are two main sources of these input-output data in Nigeria.

(a) Data relating to past experience of the farm itself
(b) Average data computed by National or State Agricultural or Statistical Departments.

The evaluator must be very careful in the process of preparing the input/output data for a farm budget. Estimates of the variable inputs such as fertilizers, seeds, pesticides must be directly related to individual crop hectarage.

There are two types of budgeting analytical tools. These are:

(a) Partial budgeting: This is used when only a partial change in existing plan is being considered. So that if possible, most of the cost and receipt items on the farm will not change. It is considered as a rough form of marginal analysis (Bernard and Nix, 1973).
(b) Complete budgeting; this is appropriate when establishing a new farm.

Several criticisms of budgeting have been advanced, by (Bennard and Nix, 1973), and Adesimi (1988). Firstly, budgeting analysis does not give optimal or most profitable solutions, unlike the mathematical programming techniques. Secondly, economic principles such as the possibilities of diminishing marginal returns or increasing marginal costs, supplementary or complementary relationships between enterprises and resources and discontinuous or lumpy inputs should be considered in drawing up budgets. However, the techniques of budgeting do not seem to ensure that these factors are considered and, in practice, diminishing marginal returns are often ignored, constant average costs and returns are the generally used assumptions. Thirdly, there is also the problem of estimating future prices and yields of outputs of farm. Certainly, uncertainty such as fluctuations in prices and yields exist and even the most skilful and experienced adviser may find it difficult in such cases to forecast results exactly, especially in each individual years. However, the sensitivity analysis caters for the uncertainties in price and yields of output by providing new outcomes when inputs and prices are varied.

Discounted Cash Flow Analysis Concept

In the determination of the profitability of a project or an investment over a period of time, modern economic theory prescribes the use of discounted measures in preference to undiscounted measures. The rate of return on capital and payback period are conventional undiscounted measures of profitability which fail to take into account the earning life of the investment and the time value of money. The discounted measures of profitability, which are

the benefit/cost ratio (B/C), the internal rate of returns (IRR), and the net present value (NPV) measures, overcome the weaknesses of the conventional methods by taking into account the time value of money, the economic life of the investment, and the exact pattern of cash flows. They are used in comparing investment projects of different sizes and different economic lives through the use of present value indices.

The approach directs attention on cash rather than on "profit after depreciation and before tax" thereby excluding depreciation, interest payments and income taxes from operating costs. Depreciation is excluded because the capital investment schedule used in the approach already takes care of the replacement of all depreciable facilities. Interest payments are excluded because the opportunity cost of capital is involved in the discounting process, and income taxes are excluded because they are considered transfer payments and not costs.

In most projects, especially agricultural projects, the time path for committing resources and their yields are different because costs and benefits occur at different times, and the two flows must therefore by reduced to a common denominator to justify comparison. The discounting procedure is used in the process by applying the present value formula:

$$Pv = \frac{a_1}{(1+r)_1} + \frac{a_2}{(1+r)_2} + \frac{a_3}{(a+r)_3} + ... + \frac{a_n}{(1+r)_n} = \sum_{i=1}^{n} \frac{a_i}{(1+r)_i} \quad (1)$$

i=1

Where a_1 = either the annual net benefits, or annual costs,

or the annual benefits

r = the discount rate.

PV = present value of costs, or benefits or net benefits.

The following three situations define the three discounted methods.

1. When in the formula a_i refers to gross costs in one case and gross benefits in another so that the two present values are compared given a discount rate r, the benefit/cost ratio method is applicable.
2. If the a_i values are net benefits and the discount rate r is known, the NPV method is applicable.
3. Given the situation in (2) above but with r unknown so that the value of r is computed which equates the NPV to zero, that value of r is called the internal rate of return (IRR)

These three methods have their merits and demerits when used in the selection or ranking of projects. The net present value method referred to in this section as the discounted cash flow analysis is computationally the simplest. In the determination of profitability, an investment is profitable if its net present value is positive. For ranking profitable ventures of similar nature and life span, investments with higher net present values are relatively more profitable.

Analytical technique

Budgetary analysis of the crop enterprises

Budgetary method has in recent years been employed to decide on which alternative production method the farm operators should adopt. It has been employed to calculate the costs and returns from a year's historical farm operation data (Okoruwa, 1984). The budgetary analysis carried out in this study was used to highlight the likely returns expected from individual crop enterprises as well as the mixed enterprises. Observations

made during the exercise revealed that oil palm farms most of the time are intercropped with cassava, cocoyam and plantain. However, using the data collected, seven representative crop enterprises in the study area were identified.

The budgetary analytical method involves the identification of different farming operations. The cost implications of the various farming operations of a given enterprise as well as returns from farm produce of the same enterprise are also expected to be identified and documented. The principal farming operations considered in arriving at the costing of farming operations in the annual and perennial crops enterprise are under-brushing, liming out, opening of paths including blocking, cutting and removing of logs, felling using motor saw, beating down, cutting and making pegs, cutting of fire traces. Burning, pegging, re-alignment, preparation of wire collars, planting including holding and carrying seedlings from nursery to field; fixing of wire collars, sowing of cover crop seeds, fertilizer application in the year of planting including field maintenance. Others are harvesting, processing, pest and disease control operations. These operations constitute the variable and fixed costs of the individual crop enterprise or their mixture. The farm revenue is the total value of entire farm output or product of the farmer, factors like crop yield and prices were taken into consideration before arriving at farm revenue.

Profitability Analysis

Discounted cash flow Analysis Procedure

Use was made of estimates and data collected through interviews to develop and evaluate "ex ante" prototype multi-cropping systems which were then used to test the hypothesis that well planned intercropped enterprises are more profitable than the mixed cropped enterprises currently practiced by the farmers. This was done by comparing the relative profitability of three intercropped and four mixed cropped systems. To estimate the net present values, annual costs and returns from each of the crop enterprise were budgeted for over a twenty five year production period. The annual differences between gross returns and total costs resulted in annual net revenues for each of the twenty five years thus generating a twenty five years net cash flow. The net present value criterion was used as a test of the profitability of each enterprise (Gittinger, 1982)and for comparing the relative profitability of the seven enterprises involved.

RESULTS DISCUSSION

Results of Profitability Analysis

The objective of profitability analysis was to test the hypothesis that better planned intercropped enterprises are more profitable than the mixed crop enterprises currently practiced by the oil palm households. This hypothesis was tested by comparing the net present values estimated for the potential inter- and mixed cropped farm enterprises` practical values compared are presented in Table 1 which shows that all the cropping systems are profitable since all their net present values are positive for the discount rate used. The enterprises are ranked as in Table 2 in order of profitability which also corresponds to the order of their NPV magnitudes calculated at 18 percent discount rate.

According to the ranking, cropping systems 1 and 2 (CS_1 and $CS_{2)}$ which represent the intercropping of oil palm with plantain and of oil palm with cocoyam respectively and which also represent the improved, better

planned, prototype cropping systems, are shown to be more profitable than cropping systems 6 and 7 (CS_6 and $CS_{7)}$ which are currently practiced by the oil palm farmers.

This confirms the hypothesis being tested. In addition, the results shows that inter cropping of plantain proves to be the most profitable of all the seven cropping systems, the inter-cropping systems are more profitable than the mixed cropping systems. The results also tend to confirm the view that under the technology presently available to small farmers, inter-cropping is preferable to mixed cropping.

Sensitivity Analysis Results

A sensitivity analysis was deemed useful in determining the level of confidence or dependability that could be attached to the profitability results. The analysis was to test the stability of the profitability established for each of the seven cropping systems. The results are summarized in table 3 the results indicate that the pure cropping of plantain and the two inter-cropping systems ($CS_1$and CS_2) are very stable with respect to their profitabilities. Their profitability potentials are maintained even when (I) their total costs of production are doubled, (11) Their total revenues are reduced by one half owing either to a drop in the prices of the product or in the yields or in both prices and yields and (111) their total costs are increased by 50 percent simultaneously with a 50 percent drop in their total revenues. The mixed cropping of oil palm (CS_3, CS_4, CS_5, CS_6 and CS_7, are shown to have fairly stable profitability potentials. But, become unstable when their total costs are increased by 50 percent simultaneously with a 50 percent drop in total revenues. The seven cropping systems becomes unstable when total cost increase by 100 percent with a simultaneous drop in total revenue by 75 percent.

The Implication of Results

The results of the profitability analysis have shown that all the seven cropping systems considered are profitable. The objective was to ascertain the profitability of the mixed cropping systems currently practiced by the oil palm households and to compare their profitabilities with those inter-cropping systems considered suitable for the oil palm farmers. The results also indicate that under the available technology in the study area, properly maintained inter-cropping systems are more profitable than the mixed cropping systems.

The results of the sensitivity analysis indicated that; (1) the profitabilities of inter cropping of oil palm with plantain and oil palm with cocoyam are very stable, while (II) those of the mixed cropping of oil palm with maize and cocoyam, oil palm cassava and maize, oil palm plantain and cocoyam, oil palm plantain cocoyam and maize, oil palm cassava and yam are stable. This means that given the price, yield and other uncertainties in agriculture and specifically in the given situation, the probability of attaining the profits prescribed by the estimates of this study are higher for the very stable cropping systems.

The implications of those results are that the oil palm farmers' practice of inter-cropping system over mixed cropping also affects the size of the area cultivated by the oil palm farmers. The inability of the oil palm farmers to expand the area cultivated arises on account of (i) the difficulties encountered in clearing and preparing forested land for planting, (ii) inadequate supply of capital, and

(iii) the dependence of the oil palm farmers almost exclusively on their family labour. This state of affairs further justifies their practice of inter-cropping. Inter-cropping is not only more profitable but helps achieve the oil palm farmers` most essential objectives- food supply and cash for their subsistence needs. The fact that the oil palm farmer can achieve these basic objectives once he has successfully deforested and developed two to three hectares of land, leaves him with little incentive or motivation for expansion under those difficult conditions.

Summary of the Results of the Profitability Analysis

Cropping system	25 annual NR*	$\sum_{i=1}$	NPV at 18%
Cs1	5,990,040		830,459
Cs2	6,107,916		883,277
Cs3	4,332,064		729,427
Cs4	5,423,605		782,790
Cs5	5,199,278		715,754
Cs6	5,456,152		786,126
Cs7	5,101,538		660,895

Source: Field survey 2009 and secondary data from Nigerian Institute for oil palm Research (NIFOR)

*NR = Net Revenue

Cropping System Ranked in Order of Profitability

Cropping system	Rank	NPV at18%discount rate (N)
CS_2(Oilpalm intercropped with cocoyam)	1	883,277
CS_1 (Oilpalm intercropped with plantain)	2	830,459
CS_6 (Oilpalm mixed with maize and cocoyam)	3	786,126
CS_4 (Oilpalm mixed with cassava and cocoyam)	4	782,790
CS_3 (Oilpalm mixed with cassava and maize)	5	729,427
CS_5 (Oilpalm mixed with plantain and cocoyam	6	715,754
CS_7 (Oilpalm mixed with plantain cocoyam and maize	7	660,895

Source: Derived from Table 1

Summary of the sensitivity analysis of results effects on cropping systems (NPV is at 18% discount rate)

Variations	CS_1	CS_2	CS_3	CS_4	CS_5	CS_6	CS_7
No variation	830,459	883,277	729,427	782,790	715,754	786,126	660,895
100% increase in TC	421,451	530,596	255,729	320,276	188,531	363,873	39,703
50% decrease in TR	221,282	266,262	136,423	155,026	126,439	168,131	42,660
50% increase in TC and 50% decrease in TR	27,141	91,320	(111,890)	(43,176)	(169,781)	(59,669)	225,424)
100% increase in TC and 75% decrease in TR	(470,296)	(394,294)	(611,013)	(583,742)	(734,962	562,232)	(856,285)

Source: Derived from Table 1

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Economic Analysis of Staple Food Marketing in Benin Metropolis, Edo State, Nigeria

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Abstract: The study investigated the marketing of staple food in Benin Metropolis of Edo State, Nigeria with the objective of examining the economics of staple food marketing. Multi-stage sampling procedure was used to collect data from 90 respondents. The data were analyzed using descriptive statistics, budgetary analysis, and ordinary least square method. The result from the analysis shows 91.1% of the respondents were females and 74.4% had secondary education. Analysis showed that marketers made an average profit per bag of N308.96 (rice), N1,743.36 (beans) and N1,010.97 (garri) in Oba market and those in New Benin market made a profit of N302.35 (rice), N1,708.37 (Beans) and N861.17 (garri), while Ekiosa marketers made an average profit of N256.64(rice), N1,730.08(beans) and N961.75 (garri) respectively. Regression result shows that marketing cost ($p<0.01$) and quantity sold ($p<-0.01$) were the variables that determine the marketing margin. High interest rate (28.9%), insufficient capital (42.2%), price fluctuation (13.3%) where among the constraints faced by the marketers of staple foods in the study area.

Keywords: Marketing margin, profit, rice, beans, garri.

INTRODUCTION

Agriculture is a reliable and viable source of food and income for the ever increasing population and this sector has a greater role to play in a developing economy such as Nigeria. Nigeria is blessed with abundant natural resources with a substantial agricultural potential which makes it ranks first among the leading agricultural producers in the region and still it is the largest importer of staple foods in West Africa. Prior to the oil boom and accelerated rural-urban migration, agriculture was the major occupation of the rural sector (Olusegun 2008, Arene and Mkpado 2004). Despite the abundant of crude oil, the agricultural sector continues to play a prominent role in Nigeria's economic development. Agriculture accounts for about 36.5% of the country's gross domestic product and providing employment for 70% of the population. With a population of 150 million people, Nigeria is without contest the leading agricultural power and the largest market in West Africa. While the production of staple foods has greatly increased over the last twenty five years, yet production cannot cover the rising demand for staples. Nigeria is by far the largest agricultural producer of staple crops in West Africa and Production there is thought to have grown by 30% to 40% between 2000 and 2009. Production of staple food in West Africa rose from 59 million in 1980 to 160 million tonnes in 2000 to 212 million in 2006, (Soule *et a.,,* 2010). The marketing of agricultural products begins at the farm when farmer plans his production to meet specific demands and

market prospects, (Abbot and Makeham, 1992). Most of the products are basic foodstuffs whose price and distribution are considered strategic by government. According to Olayemi (1982) food marketing is very important but neglected aspect of agricultural development. He noted that more emphasis is usually placed by government on policies to increase food production with little or no consideration on how to distribute the food produced efficiently and in a manner that will enhance increased productivity. Agricultural marketing is the main driving force for economic development and has a guiding and stimulating impact on production and distribution of agricultural produce. The increasing proportion of the population living in urban centers and rising level of income require more organized channels for processing and distributing agricultural products. Marketing, according to Kohls and Uhi (1990), is concerned with all stages of operation, which aid movement of commodities from producers to consumers. The level of efficiency in the market is determined by assessing the marketing structure, conduct and performance amongst others, conditions. The main objective of the study is to examine the activities involved in staple foods marketing in Benin City. The specific objectives are to: identify the socio-economic characteristics of the marketers, estimate the cost and returns of the marketers in the study area, determine the factors affecting marketing margin and identify the problems faced by the marketers in the marketing of the product.

This study stands to benefit the stakeholders in the staple foods industry as it seeks to educate prospective investors in industry about the profitability or otherwise of the staple food commodity. The outcomes could also indicate ways by which some aspect of the market for staple foods can be improve upon thereby encouraging a wide and efficient market for the commodity.

METHODOLOGY

The study was conducted in Benin Metropolis of Edo State. The state has eighteen local government areas with a land mass of 17,802km^2 (6,873 sq miles) and a population of 3,497,502 and it lies roughly between longitude 06^0 04^1E and 06^0 43^1E and latitude 05^0 44^1N and 07^0 34^1N. The State has boundaries with Delta State on the South, Ondo State on the West, Kogi on the North and on the East by Anambra states (NPC, 2006). The State is delineated by Edo State Agricultural Development Programme into three agricultural zones namely, Edo South, Edo Central and Edo North (EADP, 2003).The study area centred on Benin City which is an urban center and also the heart of Edo State.

The data for this study were obtained mainly from primary sources with the aid of a well structured questionnaire administered to staple food marketers (rice, beans and garri) in the study area. The information collected bothered on their socio-economic characteristics, revenue data as well as challenges faced by the marketers in the study area. A multi-stage sampling technique was adopted for this study. Firstly, Benin City was purposively selected due to the limited time of the study and the amount of money available at my disposal. Secondly, three (3) markets were randomly selected namely Oba, New Benin and Ekiosa markets. The final stage was the random sampling of thirty (30) marketers each

from the three (3) markets totaling ninety (90) marketers on the whole.

The data generated from the study were analyzed using descriptive statistics, budgetary analysis as well as ordinary least square method. Gross margin can be stated as

GM = TR – TVC

Where GM =Gross Margin, TR = Total Revenue, TVC = Total Variable Cost.

The marketing margin formula as adopted by Adekanye, 1998 is stated as

MM = SP – PP, Where MM = Marketing Margin, SP = Selling Price, PP = Producer Price.

The net profit is represented as;

$\Pi = TR - TC$, (Anyanwu *et al.*, 2004).

Where Π = Net Profit, TR = Total Revenue, TC = Total Cost.

A straight line depreciation formula was used to determine the values of the fixed cost of items used in the marketing of staple food as follows:

$$\text{Dep. Cost} = \frac{\text{Total Cost}}{\text{Expected Life Span}}$$

Regression analysis:

The implicit form is stated as follows:

$Y = f(X_1, X_2, X_3, X_4, X_5, e)$

Where Y = Marketing margin

X_1 = Age in years

X_2 = Sex measured as dummy (male=1 and female=2)

X_3 = Marketing cost in naira

X_4 = Quantity sold per month in kilogram

X_5 = Marketing experience in years

e = error term

The three functional forms of model were tested and one that gave the best fit based on statistical and econometric considerations was chosen.

RESULTS AND DISCUSSION

Data in Table 1 present information on the socio-economic characteristics of the respondents. The result shows that 91.1% of the staple food marketers were females, while 8.9% were males, which indicated that more women were involved in staple food marketing which is in line with the report by ENADEP (2009) that women constitute overwhelming population of those who are involved in agricultural produce marketing as against men who focus more on artisan, subsistent farming and civil service occupations. Majority (81.1%) of the marketers were married while a large number (52.22%) of them were of 41 years and above. 74.4% of the marketers had secondary education. About 57.78% of the marketers had less than 10 years staple food marketing experience, while 73.3% of the marketers had a family size of equal to or less than 5 members.

Table 1: Socio-Economic Characteristics of Respondents.

Variable	Frequency	Percentage
Sex		
Male	8	8.9
Female	82	91.1
Total	90	100
Marital Status		
Single	3	3.3
Married	73	81.1
Divorced	1	1.1
Widow	13	14.4
Total	90	100
Age		
≤ 30	11	12.22
31 – 40	32	35.56
≥ 41	47	52.22
Total	90	100
Education		
Primary	19	21.1
Secondary	67	74.4
Post-secondary education	4	4.4
Total	90	100
Marketing experience		
≤ 10	52	57.78

≥ 11	38	42.22
Total	90	100
House-hold size		
≤ 5	66	73.3
≥ 6	24	26.7
Total	90	100

Source: Computed from field data, 2013

The estimated cost and returns to the staple food marketers in the study area is presented in Table 2. Results showed that the marketing margin for rice, beans and garri were N400, N2000 and N1250 in oba market, new Benin market and Ekiosa market respectively. From the analysis, gross margin for rice, beans and garri were N322.83, N1,785 and N1,028.33 for Oba market and N338.33, N1,815 and N906.67 for New Benin market while Ekiosa market has N295, N1,770 and N985 respectively. Analysis also showed that the marketers realized a net profit of N308.96 (rice), N1,743.36 (beans) and N1,010.97 (garri) in Oba market and those in New Benin market made a profit of N302.35 (rice), N1,708.37 (beans) and N861.17 (garri) while Ekiosa marketers made a profit of N256.64 (rice), N1,730.08 (beans) and N961.75 (Garri) respectively. The result implies that staple food marketers in Oba market made more profits than marketers in the other two markets. This may not be unconnected to the lower marketing cost incurred by marketers in Oba market when compared with the value of the marketing cost in the other two markets.

Table 2: Estimated Cost and Returns to the staple food marketers

	Oba market			**New Benin market**			**Ekiosa market**		
Items	**Rice (N)**	**Beans (N)**	**Garri (N)**	**Rice (N)**	**Beans (N)**	**Garri (N)**	**Rice (N)**	**Beans (N)**	**Garri (N)**
Variable cost (VC)									
Purchase cost	12,200	18,000	7,000	12,200	18,000	7,000	12,200	18,000	7,000
Transport cost	50	150	200	40	120	300	40	100	200
Packaging	27.17	65	21.67	21.67	65	43.33	65	130	65
TVC	**12,277.17**	**18,215**	**7,221.67**	**12,261.67**	**18,185**	**7,343.33**	**12,305**	**18,230**	**7,265**
Fixed cost									
Rent	8.10	24.31	5.83	20.00	58.67	21.5	21.03	22.59	11.72
Security	1.67	5	3.33	7.78	23.33	11.67	5	5	3.33
Sanitation	1.11	3.34	2.22	2.22	6.67	3.34	3.34	3.34	2.22
Depreciation on table	1.14	3.43	2.28	2.28	6.85	3.43	3.43	3.43	2.28
Depreciation on basin	1.85	5.56	3.70	3.70	11.11	5.56	5.56	5.56	3.70
TFC	**13.87**	**41.64**	**17.36**	**35.98**	**106.63**	**45.5**	**38.36**	**39.92**	**23.25**
TC	**12,291.04**	**18,256.64**	**7,239.03**	**12,297.65**	**18,291.63**	**7,388.83**	**12,343.36**	**18,269.92**	**7,288.25**
TR	12,600	20,000	8,250	12,600	20,000	8,250	12,600	20,000	8,250
Marking margin	400	2,000	1,250	400	2,000	1,250	400	2,000	1,250
GM(TR-TVC)	322.83	1,785	1,028.33	338.33	1,815	906.67	295	1,770	985
Profit (GM-TFC)	308.96	1,743.36	1,010.97	302.35	1,708.37	861.17	256.64	1,730.08	961.75

Source: Computed from field data, 2013

Data in Table 3 present the three functional forms of the regression result. The semi-log functional form was chosen as the lead equation based on the value of R^2 and the number and signs of significant variables. The value of R^2 was 68% meaning that the independent variable explained 68% of the variation in the marketing margin. Among the hypothesized variables only marketing cost and quantity sold were significant at 1% level. The coefficient of marketing cost was significant at 1% level with a positive sign which implies that as the cost of marketing activities increases, the marketing margin also increase. Therefore, the marketing cost directly affects the marketing margin of staple foods in Benin City. Contrarily, quantity sold per month was inversely proportional to the marketing margin. It was significant at 1% level which implies that as the quantity sold by the marketer's increases, marketing margin tends to diminish. This is expected because as the marketers handle larger unit at a time the average unit cost decreases which in turn lower the size of marketing margin.

Table 3: Determinants of marketing margin for staple foods in Benin City

Variable	Linear	Semi-log	Double
Constant	1382.491 (3.028)***	-1580.640 (-1.936)*	1.121 (2.820)***
Age	1.237 (0.179)	156.999 (0.334)	0.120 (0.524)
Sex	98.418 (0.517)	-65.145 (-0.135)	-0.244 (-1.040)
Marketing cost	0.043 (5.322)***	1573.672 (8.795)***	0.852 (9.773)***
Quantity sold per month	-15.215 (-8.180)***	-2169.900 (-13.228)***	-0.889 (-11.129)***
Marketing experience	0.589 (0.071)	17.882 (0.113)	-0.073 (-0.942)
R^2	0.45	0.68	0.62
Adjusted R^2	0.41	0.66	0.60
F ratio	13.584	35.366	27.108

Source: Computed from field data, 2013. ***Significant at 1% & * significant at 10%.

Table 4 shows the constraints encountered by staple food marketers. Multiple responses were given by the respondents. The result shows that 42.2% of the respondents had the problem of insufficient capital to run their business. This is supported by the findings of Kudi *et al*(2006) where he identified lack of finance as a major constraint in fish production in Kaduna State, Nigeria. The marketers also encountered the problems of high interest rate (28.9%), lack of collateral/guarantor (6.7%) and high cost of transportation (10%)The other constraints also reported were high cost of rent (10%), price fluctuation (13.3%) and high cost of marketing charges (7.8%).

Table 4: Major problems faced by staple foods marketers in Benin City

Variable	Multiple Response	
	Frequency	Percentage
High interest rate on loan	26	28.9
Insufficient capital	38	42.2
Lack of collateral/guarantor	6	6.7
High cost of transportation	9	10.0
High cost of rent	9	10.0
Price fluctuation	12	13.3
High cost of marketing charges	7	7.8

Source: Computed from field data, 2013

CONCLUSION

The marketing of staple foods were found to be profitable and the marketing cost and quantity handled impacted differently on the probability of marketing margin. This result has policy implications on the economics of marketing these products in the studied area.

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Economics of milled rice marketing in Gombe metropolis, Gombe state, Nigeria

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Abstract: Marketing involves all the legal, physical, and economic services which are necessary in moving products from producer to consumers. The more efficient the marketing functions are performed the better the marketing system for the farmers, marketing agents, and the society at large. Rice marketing ensures the flow of product from producers to consumers in the form, time and place of need.Therefore, this study examined economics of milled rice marketing in Gombe metropolis, Gombe State. Data were collected using structured questionnaires from ninety randomly selected rice marketers in Gombe metropolis. The data were analyzed using descriptive statistics, farm budget technique and regression analysis. The study revealed the total rice marketing cost incurred by rice marketers to be **N**6, 610,214.70. This gave an average of N73, 446.83 per marketer and **N**37.30 per Kilogram of rice. The Gross Income for rice marketers in Gombe metropolis was N15, 064,600.00. This value gave an average of N167, 384.44 per rice marketer or N85.00 per kilogram of rice. The study also revealed net income for all rice marketers to be N8, 454,385.30. This gave an average of **N**93, 937.61 per rice marketer or **N**47.70 per Kilogram of rice. The study further revealed a marketing margin, marketing efficiency and return per naira invested on rice marketing to be 39.30%, 150.16% and **N**0.56 respectively. The result of regression analysis shows that age, sex and cost of transportation are positive and significantly affect marketing margin of rice marketers in Gombe Metropolis. However, the main constraints to rice marketing in Gombe metropolis include inadequate electricity, capital, high transportation cost, instability of prices and low patronage among others. The study recommends provision of adequate electrical power supply in the State especially the State capital and also encouraging rice marketers in Gombe metropolis to form cooperative societies so as to have easy access to credit facilities especially from the formal sources.

Keywords: Rice Marketers, Milled Rice, Cost and Return, Marketing Margin, Efficiency, Profitability.

INTRODUCTION

Rice Oryza sativa (Asian rice) or Oryza glaberrima (African rice) is a staple cereal grain, which is widely consumed in most part of human population in the world, especially in Asia and the West Indies. It is the grain with the second-highest worldwide production, after maize (corn), according to Food and Agricultural Organization (FAO) (2006). The word "rice" derives its name from the Old French *ris*, which comes from Italian *riso*, in turn from the Latin *oriza*, which derives from the Greek ὄρυζα (*oruza*).

African rice has been cultivated for 3500 years. Between 1500 and 800 BC, *Oryza glaberrima* propagated from its original centre, the delta area of river Niger, and extended to Senegal. However, it never developed far from its original region. Its cultivation even declined in favour of the Asian species, which was introduced to East Africa early in the common era and spread westward (Maddox, 2006).

African rice helped Africa conquer its famine of 1203 (NRC, 1996).

Rice is the staple food of over half the world's population. It is the predominant dietary energy source for 17 countries in Asia and the Pacific, 9 countries in North and South America and 8 countries in Africa. Rice provides 20% of the world's dietary energy supply, while wheat supplies 19% and maize 5% (FAO, 2004). A detailed analysis of nutrient content of rice suggests that the nutrition value of rice varies based on a number of factors. It depends on the strain of rice, that is between white, brown, black, red and purple varieties of rice – each prevalent in different parts of the world. It also depends on nutrient quality of the soil rice is grown in, whether and how the rice is polished or processed, the manner it is enriched, and how it is prepared before consumption (Juliano, 1993).

The demand for rice in Nigeria has been soaring partly as a result of increasing population growth, increased income levels, rapid urbanization and associated changes in family/occupational structures. The average Nigerian now consumes 24.8kg of rice per year, representing 9% of the total calorie intake (FAO, 2005).

Marketing is the critical link between farmer production sector on one hand and non-farm sector, industry and urban economy. The role of marketing in developing any economy including agriculture cannot be over-emphasized. It involves all the legal, physical, and economic services which are necessary in moving products from producer to consumers (Olukosi, Isitor and Ode, 2005). The more efficient the marketing functions are performed the better the marketing system for both the farmers, food marketing firms, consumers and the society at large. Thus rice marketing ensures the flow of product from producers to consumers in the form, time and place of need. Buyers are in need of the products while the sellers in turn need to improve their socio-economic status through higher profits and enhanced income.

Despite the fact that, marketing provide the means of meeting these necessities (utilities) involved in the flow of goods and services; and therefore has an important multiplier effect in the development of any economy. It is beset with a lot of problems which includes unorganised and inefficient marketing system arising from seasonal variations, transportation, storage, processing, grading and communication (Anyaebugan *et.al.,* 2011). Therefore, this study is aimed at answering these questions:-

1. What are the cost and return to rice marketing in Gombe metropolis?
2. Is rice marketing profitable in the metropolis?
3. What are the problems facing the rice marketers?

Hence the objective of this study is to examine economics of milled rice marketing in Gombe Metropolis. Specifically the study will:-

1. determine the cost and return to rice marketing in Gombe metropolis,
2. determine the profitability of rice marketing in the metropolis,
3. determine the relationship between marketing margin and socio-economic variables in Gombe metropolis, and
4. identify the problems facing rice marketers in the metropolis.

METHODOLOGY

Study Area

Gombe is a metropolitan city having a Local Government Area in the North-eastern Nigeria. It is the capital city of Gombe State and has an estimated population of 261,536 (NPC, 2006). Gombe LGA occupies an area of 52km^2.and is located between latitude 9º 30´ and 12º 30´ North and longitude 8º 45´ and 11º 45´ East.

Gombe town shares common boundaries with Akko Local Government Area to the North, South and Southwest, Kwami Local Government Area to the West and Yamaltu/Deba to the East. The prominent ethnic groups in Gombe Town include Fulani, Hausa, Bolewa, Tera, Kanuri, Tangle, Tula, etc. Gombe is the commercial centre of the State.

Sample and Sampling Technique

Gombe metropolis was purposively selected for the study based on the intensity of rice processing and marketing in the area. The city of Gombe has a total of five markets: Gombe Main market, Kasuwan Mata, Pantami, Jekadafari and Bogo. Out of these three markets were purposively selected based on their sizes: Gombe Main, Pantami, and Kasuwan Mata. A total of ninety copies of well structured questionnaire were administered to randomly selected rice marketers in these markets.

Data Analysis

Descriptive statistics like percentage, mean, frequency distribution was used to analyse rice marketing in Gombe metropolis.

The Profitability Index (PI) which is the ratio of net income to gross income was used to determine the profitability of milled rice marketing in Gombe metropolis. It is mathematically given as:

$$PI = \frac{\text{Net Income}}{\text{Gross Income}} \times 100$$

Productivity ratios were use to determine gross ratio (ratio of total marketing cost to gross income) and operating ratio (ratio of total variable cost to gross income).

Marketing margin represent the difference in the price paid by the final consumer and that received by the producer at different stages of time, place and possession as the product move from its producer to its ultimate consumer (Arene, 1998 and Olukosi, *et al*2005). It is mathematically defined as:-

$$\text{Marketing Margin (MM)} = \frac{\text{Resell Price} - \text{Purchase Price}}{\text{Resell Price}} \times 100$$

Budgeting technique was used to analyse the cost and return to rice marketing in the study area.

Regression analysis was used to determine the relationship between marketing margin and variables included in the model.

Marketing Efficiency (ME):- This is used to measure the performance of rice marketing system as a whole. It describes how well the process of marketing is performed by rice marketers in Gombe Metropolis to maximize profit (Olukosi *et al*., 2005). The model is mathematically specified as:

$$\text{Marketing Efficiency (ME)} = \frac{\text{Value Added}}{\text{Processing and Marketing Cost}} \times 100$$

RESULTS AND DISCUSSION

Cost of marketing rice in Gombe Metropolis

Information on costs components of rice marketing in Gombe town is shown in Table 1. The table shows total rice marketing cost

incurred by all rice marketers to be **N**6, 610,214.70. This gave an average of N73, 446.83 per marketer and **N**37.30 per Kilogram of rice. The total cost is made up of variable and fixed costs. The study revealed that, among the variable costs, cost of paddy rice constituted 80.38% of the total cost of marketing. Transportation, Packaging, milling, loading, uploading and Miscellaneous expenses constituted 4.62%, 2.28%, 1.78%, 0.91%, 0.63% and 0.80% respectively. The total variable cost was N6, 041,925.0.

The fixed costs constituted 8.60% of the total cost of marketing rice in Gombe town. The low level of fixed cost is a reflection of low level of capital investment in rice marketing in Gombe town. The absence of "interest charges" from the list of fixed cost indicated that none of the rice marketers got loan from financial institutions in Gombe town. The total fixed and variable costs were N568, 289.70 and N6, 041,925.00 respectively.

Table 1: Gross income, components of fixed and variable costs among rice marketers in Gombe metropolis

Item	Value (N)	Percentage of total costs
Costs		
Variable cost		
Paddy rice	5,313,200	80.38
Loading	59, 973	0.91
Uploading	41, 635	0.63
Milling	117, 980	1.78
Transportation	305, 555	4.62
Packaging	150, 700	2.28
Miscellaneous (Feeding etc)	52, 880	0.80
Total variable cost	6,041,925	91.40
Fixed cost		
Tax	25, 340	0.38
Rent	535, 450	8.10
Depreciation on fixed assets like mud.	7, 499.70	0.11
Total Fixed Cost	568, 289.70	8.60
Total costs	6,610,214.70	100
Gross Income	15,064,600	
Gross Margin	9,022,675	
Net Income	8,454,385.30	
Quantity of Milled Rice (Kg)	177, 223.20	

Source: Field Survey, 2012.

Gross Income from rice marketing in Gombe Metropolis

The Gross Income for rice marketers in Gombe town was found to be N15, 064,600.00. The value was obtained by multiplying the physical quantity of milled rice by the unit (retail) price and summing together for all the respondents. This value gave an average of N167, 384.44 per rice marketer and/or N85.00 per kilogram of rice. The distribution of rice marketers according to their gross income is shown in Table 2. The table shows that 23.33% of rice marketers in Gombe metropolis had a gross income of less than N50, 000.0. The study also revealed that 16.67% each had a gross income of between N50, 000.0 to N100, 000.0 and N100, 001 to N150, 000.0. The study further revealed that 7.77% and 5.56% of rice marketers had gross income of between N200, 001.0 to N250, 000.0 and N250, 001.0 to N300, 000.0 respectively.

Table 2: Gross Income from Rice marketing in Gombe Metropolis

Gross Income (N)	Number of Respondents	Percentage (%)
< 50, 000.0	21	23.33
50, 001.0 – 100, 000.0	15	16.67
100, 001.0 – 150, 000.0	15	16.67
150, 001.0 – 200, 000.0	12	13.33
200, 001.0 – 250, 000.0	7	7.77
250, 001.0 – 300, 000.0	5	5.56
>300, 000.0	15	16.67
Total	90	100

Source: Field Survey, 2012.

Net Income from rice marketing in Gombe Metropolis

The net income was obtained by subtracting the total cost of rice marketing from the gross income. The net income for all rice marketers was **N**8, 454,385.30. This gave an average of **N**93, 937.61 per rice marketer or **N**47.70 per Kilogram of rice. The study also revealed a gross ratio (ratio of total marketing cost to gross income) of 0.439 and operating ratio (ratio of total variable cost to gross income) of 0.401. Since these ratios are less than one, it means that rice marketing is profitable in the study area. The distribution of rice marketers according to their net income is shown in Table 3. The Table shows that 13.33% had a net income of less than one naira (**N**1.00). This shows that they incurred a lost. The table also shows that 47.78%, 22.22%, and 6.66% each had a net incomes of between N1.00 and N100, 000.00, N 100, 001.00 and N 200, 000.00, N200, 001.00 and N300, 000.00 and N300, 001.00 and N400, 000.00 respectively. The table further revealed that 1.11% each had a net income of between **N**400, 001.00 to **N**500, 000.00, **N**500, 001 to **N**600, 000.00, **N**600, 001.0 and **N**700, 000.00 (Table 3).

Table 3: Net Income from Rice marketing in Gombe Town

Net Income (N)	Frequency	Percentage
< 1.00	12	13.3
1.00 – 100, 000.00	43	47.8
100, 001.00 – 200, 000.00	20	22.2
200, 001.00 – 300, 000.00	6	6.7
300, 001.00 – 400, 000.00	6	6.7
400, 001.00 – 500, 000.00	1	1.1
500, 001.00 – 600, 000.00	1	1.1
600.001.00 – 700, 000.00	1	1.1
Total	**90**	100

Source: Field Survey, 2012.

Profitability Index (PI), marketing efficiency and net income per kilogram of milled rice sold

Table 4 below shows the Profitability Index (PI), Marketing Efficiency (ME) and Net Income (NI) of milled rice sold in Gombe metropolis. The profitability index was found to be 56.12%. This shows that for every one naira (N1.00) invested on rice marketing in Gombe Metropolis, N0.56 is returned as profit. This shows that rice marketing is a profitable business in Gombe Metropolis. The result agrees with findings of Achike and Okoye (2004) which found that small-scale rice marketing is a profitable enterprise. Similarly, Marketing Efficiency (ME) was found to be 150.16%. This implies that market performance was good with respect to prices of milled rice in Gombe Metropolis. The result agrees with the findings of Bose *et al* (2012), which found a market performance of 130.46% for milled rice in Dass Local Government Area of Bauchi State. The distribution of rice marketers according net income per kilogram of milled rice sold is shown in Table 4. The result revealed that 14.44% of rice marketers in Gombe Metropolis had a net income per kilogram of less than N1.00. The result also revealed that 28.89%, 40.0% and 15.56% had a net income per kilogram of between N1.00 to N50.0, N50.1 to N100.0, and N101.1 to N150.0 respectively.

Table 4: Net Income per Kilogram of Milled Rice Sold

Net Income per Kilogram (N)	Number of respondents	Percentage
< 1.0	13	14.44
1.0 – 50.0	26	28.89
50.1 – 100.0	36	40.00
100.1 – 150.0	14	15.56
>150.0	1	1.11
Total	90	100

Source: Field Survey, 2012.

Marketing Margin

The marketing margin for milled rice marketers in Gombe Metropolis was found to be 39.30%. This shows that majority of rice marketers (66%) received a marketing margin range of 1.0% to 40.0% with a mean of 39.3% among the respondents. The distribution of rice marketers in Gombe Metropolis based on marketing margin is shown in Table 5. The table shows that 3.33% of rice marketers had a marketing margin of less than 1.00%. The table also shows that 18.89%, 24.44% and 5.56% had a marketing margin of 1.0% to 10.0%, 10.1% to 20.0% and 30.1% to 40.0%. The table further revealed that 30.0%, and 13.33% had a marketing margin of 60.1% to 70.0% and greater than 70.0% (Table 5).

Table 5: Distribution of Rice Marketers According to Marketing Margin

Marketing Margin (%)	Number of Respondents	Percentage (%)
< 1.00	3	3.33
1.00 – 10.0	17	18.89
10.1 – 20.0	22	24.44
20.1 – 30.0	3	3.33
30.1 – 40.0	5	5.56
40.1 – 50.0	-	-
50.1 – 60.0	1	1.11
60.1 – 70.0	27	30.0
>70.0	12	13.33
Total	90	99.99

Source: Field Survey, 2012

Production function estimates and analysis

Multiple regression analysis was used to measure the effect of Age (X_1), Marital Status (X_2), Sex (X_3), Level of Education (X_4), Source of Capital (X_5), Transport Cost (X_6), Selling Price (X_7), Purchase Price (X_8), Quantity of Milled Rice Sold (X_9) and Tax (X_{10}) on Marketing Margin (Y). The result of regression model was obtained for the Linear, Semi log and Cobb-Douglas functional forms. Table 6 shows the regression coefficients and t-ratios for the three functional forms. The coefficient for each variable shows the extent to which variation in that variable explains variation in the marketing margin (dependent variable). The choice of Cobb-Douglas form of the model was based on its conformation with *a priori* expectation in terms of signs and magnitude of the coefficients, the number of significant variables, coefficient of multiple determination (R-square value), and F ratio. The results revealed that variables like Age, Sex and Cost of Transportation are positive and significantly affect marketing margin of rice marketers in Gombe Metropolis ($P \leq 0.001$). Therefore, a 1.0% change in these variables will lead higher marketing margin for milled rice in Gombe Metropolis. However, the results also revealed that Level of Education, Source of Capital, Selling Price, Quantity of Milled Rice sold and Tax even though significant, negatively affect marketing margin of milled rice in Gombe Metropolis ($P \leq 0.05$). Thus, a 1.0% change in these variables will lead to lower marketing margin for milled rice in the study area. The result further

revealed R^2 (Adjusted) and F ratio to be 57.5% and 13.060 (Table 6). This means that 57.5% of variation in marketing margin of milled rice in Gombe Metropolis is explained by variables included in the model. The significant F-statistics of 13.06 implies that the joint effects of all the explanatory variables included in the model are significant.

Table 6: Estimated regression result for determinants of marketing margin for milled rice

Variable	Production Functions					
	Linear		Semi- log		Cobb-Douglas	
	Coefficients	t-ratio	Coefficients	t-ratio	Coefficients	t-ratio
Constant (a)		6.202ns		-1.045ns		2.449**
Age (X_1)	0.21	0.838**	0.132	2.062**	0.226	2.588***
Marital Status (X_2)	-0.062	-2.299ns	-0.140	-2.044ns	-0.088	-0.937ns
Sex (X_3)	0.095	3.842**	0.189	3.020**	0.015	0.187***
Level of Education (X_4)	-0.009	-0.435ns	-0.132	-2.445ns	-0.215	-2.608**
Source of Capital (X_5)	-0.004	-0.200ns	-0.057	-1.016ns	-0.091	-1.233**
Transport Cost (X_6)	0.029	0.954**	0.170	2.186**	0.468	4.852***
Selling Price (X_7)	0.403	17.203**	0.088	1.476ns	-0.099	-1.317**
Purchase Price (X_8)	-1.083	-44.086**	-0.852	-13.662**	-0.592	-6.815**
Quantity of Milled Rice Sold (X_9)	-0.022	-0.853ns	-0.130	-2.002ns	-0.204	-2.135**
Tax (X_{10})	-0.010	-0.355ns	-0.025	-0.344ns	-0.026	-0.242**
R^2	0.527		0.586		0.623	
Adjusted R^2	0.493		0.519		0.575	
F ratio	8.419		9.061		13.060***	
Durbin- Watson	1.151		1.799		1.883	

Source: Data Analysis
Where *** = Significant at 1%, ** = Significant at 5%. NS = Not Significant at either 1% or 5%.

The Problems faced by rice marketers in Gombe metropolis

Table 7 shows the problems faced by milled rice marketers in Gombe metropolis. The Table shows that inadequate electrical power supply and capital, instability in prices of paddy and milled rice, high cost of transportation (due to inadequate vehicles poor road networks especially in rural areas) ranked 1st, 2nd, 3rd and 4th were the major problems facing marketers of milled rice in Gombe metropolis. This result is in line with the findings of Biam and Koko (2007) who found that inadequate capital is one of major problems facing small-scale rice business in Benue state of Nigeria. Awoyinka, 2009 also found that inadequacy of transport facilities especially in rural areas leading to high transportation cost, inefficient and inadequate storage facilities, poor marketing of agricultural produce are some of the problems facing marketing of agricultural produce in Nigeria. Similarly, low demand or patronage from consumers, shortage of product especially paddy rice, low quality of paddy rice and so the milled rice, poor road networks in rural areas, problem of rainfall (which sometimes make it difficult for drying of paddy rice before milling as well as for transactions to take place due lack of shades especially in rural markets) and inadequate storage facilities were ranked 5th, 6th, 7th, 8th, 9th and 10th problems facing marketers of milled rice in Gombe metropolis.

Table 7: Distribution of respondents according to constraints of milled rice marketing

Problems	Frequency	Percent	Rank
Inadequate electricity	*43*	47.8	1st
Inadequate capital	41	41.11	2nd
Price fluctuations	30	33.33	3rd
High transportation cost	28	31.11	4th
Low patronage	24	26.70	5th
Shortage of paddy rice	21	23.00	6th
Low quality of paddy and milled rice	*17*	18.89	7th
Poor road network	*14*	15.56	8th
Rainfall	11	12.22	9th
Inadequate storage facilities	6	6.67	10th
Poor packaging (Bagging)	5	5.56	11th
Lack of workers	4	4.44	12th
Poor sunshine (During rainy season)	3	3.33	13th
Problem of communication (language barrier)	2	2.22	14th
Credit purchase	2	2.22	14th
Insecurity, illiteracy, low profit and high taxation	1	1.11	15th

Source: Field Survey, 2012.

CONCLUSION

From the findings of this study it could be concluded that milled rice marketing is a profitable enterprise in Gombe metropolis. This is because rice marketers realized a marketing margin, marketing efficiency and return per naira invested on rice marketing of 39.30%, 150.16% and **N**0.56 respectively. Empirical evidence from the study indicated that 57.5% of the variation in marketing margin for rice in Gombe metropolis was explained by explanatory variables included in the model with age, sex and cost of transportation significantly contributing positively. There is little or no investment in capital assets: milling, par-boiling, de-stoner, polishers and packaging machines. Rice marketing in Gombe metropolis is constrained by shortage of product during certain periods of the year, poor road networks, inadequate capital, electricity and price instability among others.

RECOMMENDATIONS

Based on the findings, the study recommends that rice marketers should be encouraged to invest on fixed assets especially milling machines with components for par-boiling, de-stoning, and polishing in order to add value to rice marketed and also improve the quality of locally milled rice in Gombe metropolis. Gombe State Government should improve on the quality of existing road networks in the state and also construct more so that rice marketers will have easy access to rice producers especially in rural areas at minimum cost. Rice marketers in Gombe metropolis should be encouraged to form cooperative associations. This will enable them have easy access to loans from formal financial institutions in Gombe state. Power Holding Company of Nigeria (PHCN) should improve supply of electricity to the State capital. Local Government Councils in Gombe State should construct shades for marketers so that their product will not be destroyed by rain, too much sunlight etc. Gombe State Government should provide rice farmers with improved varieties of rice that is of high yielding and quality.

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Effect of climate change on yam and cassava production in Oyo state, Nigeria: A co-integration model approach

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Abstract: This study examined the effect of climate change on yam and cassava production in Oyo state, Nigeria using the co-integration model approach. Secondary data were used for the study. Data on yam and cassava yield between 1990 and 2009 were obtained from the Oyo State Agricultural Development Programme (ADP) while data on climate variables (annual rainfall, annual relative humidity mean, annual sunshine hour mean, annual average temperature mean) between 1976 and 2010 were obtained from the Nigeria Institute of Meteorology, Oshodi. Trend, co-integration, and regression analytical tools were used to analyse data collected. The result showed that the time series data used for the study are stationary at the second difference and there is no co-integration between the data. It was also revealed that the mean annual temperature and mean annual sunshine hour have been increasing by an average of 0.012^{o}C ($p<0.01$) and 0.004 hours ($p<0.01$) per year respectively. This confirms the occurrence of global warming in the study area. The study revealed that sunshine hour significantly ($p<0.05$) affected yam yield. The study recommended among others that crop breeding researchers should work towards developing improved varieties of cassava and yam that can cope with future expected change in climate.

Keywords: Climate Change, Yam, Cassava, Production, Oyo State

INTRODUCTION

Climate change refers to the variation in the global or regional climates over time. It describes changes in the variability or average state of the atmosphere over time scales ranging from a decade to millions of years (Adejuwon, 2004). Climate change may result from factors such as changes in orbital elements (eccentricity, obliquity of the ecliptic, precession of equinoxes), natural internal processes of the climate system or anthropogenic forces (for example, increasing concentration of carbon dioxide and other green house gases). (Agbola *et al*2007). The variations in climate parameters affect different sectors of the economy such as agriculture, health, water resources, energy etc." (Ozor and Nnaji, 2011)

For Nigeria, agriculture is important. About 42 percent of the country's GDP comes from agriculture and related activities, and about 80% of the country's poor live in rural areas and work primarily in agriculture (NBS, 2006a). Nigeria's economy is therefore predominantly agrarian and the exploitation of natural resources remains the driving force for the country's economic development. Most of the crop production in Nigeria are low-technology based and are therefore heavily susceptible to environmental factors. (Nwajiuba *et al*., 2010)

Nigeria's agriculture therefore depends highly on climate, because temperature,

sunlight, water, relative humidity are the main drivers of crop growth and yield (Adejuwon, 2004). There is a growing consensus in the scientific literature that over the coming decades, higher temperatures and changing precipitation levels caused by climate change will be unfavourable for crop growth and yield in many regions and countries (Yesuf *et al.*, 2008). To what extent this will be the case in Nigeria particularly in the south west zone has not received much research interest.

The objectives of the study are to:

i. test climate time series data for stationarity and co integration.
ii. determine the effect of climate change on the yield of yam and cassava
iii. predict future values of climate variables, and
iv. examine the trend of climate elements (rainfall, temperature, relative humidity, and sunshine hour) over the years

METHODOLOGY

The study area is Oyo state, Nigeria. Secondary data were used in this Study. Data were collected from the Nigeria meteorological society (NIMET) and Oyo state Agricultural Development Programme. Selected journals were also consulted. Time series data on weather variables were collected over a period of 35 years (1976-2010). The time series data included the annual rainfall, annual temperature mean, annual relative humidity mean, and annual sunshine hour mean in Oyo state over the time period. Time series data on the annual yield of Yam and cassava in Oyo state over a period of 20 years (1990-2009) were also collected. The study was restricted to using a 20 year time series because data on annual yield before 1990 were unavailable. Yam and cassava were chosen because they are the major crops grown in the area.

Method of analysis includes co-integration analysis, regression analysis, trend analysis, and descriptive analysis. In this study, trend analysis was used to examine and establish the pattern for climate variables (Rainfall amount, Sunshine hour, Average temperature and Relative Humidity). Equations obtained from the trend analysis were also used to predict the future values of climate variables. Regression analysis was used to determine the effect of climate change on the yield of individual crops that is, how much of variation in yield is attributable to changes in climate variables.

The regression model in implicit form is

$Y=f(X_1, X_2, X_3, X_4, X_5, e)$

Y= Annual crop yield (for yam and cassava) (Kg/Ha)

X_1= Total annual rainfall/precipitation (mm)

X_2= Mean Annual temperature (^oC)

X_3= Mean Annual relative humidity (%)

X_4= Mean annual Sunshine hour (hours)

X_5= Time period

According to Nwajiuba *et al* (2010), the *a priori* expectation of the regression model is as follows:

X_1, precipitation is theorized to affect crop production positively. The basis for this theoretical expectation is justified with the fact that precipitation increase affects crop yield positively (IPCC, 2007a; IPCC, 2007b; Rosenzweig and Hillel, 1995) by readily dissolving the nutrients for easy soil absorption by plants.

X_2, temperature is hypothesized to be positively related to crop production. The basis for this is that temperature benefits crop production by enhancing photosynthesis

thereby increasing crop yield as it increases (Sombroek and Gommes, 1996; Rosenzweig and Hillel, 1995).

X_3, relative humidity should be positively related to crop production. The basis for this assumption is that crops trends absorb soil nutrients for optimum yield when there is sufficient humid air (Adejuwon, 2004).

X_4, sunshine hour should be positively related to crop production. The basis for this *a priori* expectation lies in the fact that tropical crops require higher photoperiods (day lengths) for their vegetative and reproductive growth and development (Adejuwon, 2004).

The co-integration analysis involve unit roots test performed on both level and first difference to determine whether the individual input series are stationary and exhibit similar statistical properties. It must be noted that regressing a non-stationary time series data over another non-stationary time series data gives a spurious or nonsense regression (Ayinde *et al.*, 2011). To correct for this, a unit root test is performed.

A time series data is stationary if the joint distribution of any set of *n* observations $X(t_1)$, $X(t_2)$, …$X(t_n)$ is the same as joint distribution of any set of $X(t_{1+k})$, $X(t_{2+k})$, …$X(t_{n+k})$ for all *n* and *k*.

$Yt = pY_{t-1} + U_t$, $1 \leq p$

$p \leq 1$ where U is the white noise error.

If Y_t is regressed on its lagged value of Y_{t-1} and the estimated p is statistically equal to 1 then Y_t is non-stationary that is, it exhibit unit root [I(1)]. On the other if the estimated value of *p* is not statistically equal to 1, the Y_t is stationary that is, has no Unit root [I(0)]. The null hypothesis of a unit root test is tested against a stationary alternative.

Augmented Dickey Fuller (ADF) Test was used to test for the stationarity of the data. The test consists of the following regression:

$\Delta Y_t = \beta_0 + \beta_0 + It + \cdots \delta Y_{t-1} \sigma \Sigma \Delta Y_t + \varepsilon$ Л□ *Y*□□= □*n*

The Augmented Dickey Fuller (ADF) Test was also used to test for the number of co-integration vectors in the model. Johansen technique was suggested by Maddala (2001) not only because it is vector auto-regressive based but because it performs better in multivariate model. However for this study, ADF was found to be best. If two time series variables, *pt* and *qt*, are both non-stationary in levels but stationary in first-differences, i.e., both are *I(1)*, then there could be a linear combination of *pt* and *qt*, which is stationary, i.e., the linear combination of the two variables is *I(0)*. The two time series variables that satisfy this requirement are deemed to be co-integrated. The existence of co-integration implies that the two co-integrated time series variables must be drifting together at roughly the same rate (i.e., they are linked in a common long-run equilibrium). A necessary condition for co-integration is that they are integrated of the same order. To check whether or not two or more variables are co-integrated, it is necessary to first verify the order of integration of each variable by performing unit root tests (Granger 1986; Engle and Granger 1987).

The co-integration model is given as:

$et = \Delta Yt1 = (Yt1 = (Yt1\, Yt2), \Delta Yt2 = (Yt2 - Yt3)$

RESULTS

Trend

The result of the trend analysis is presented in Table 1

Table 1: Descriptive and trend analysis of data on climate from 1976 - 2010

	Rainfall (mm)	Temperature (^{o}C)	Relative Humidity(%)	Sunshine hour (Hours)
Mean	1298.06	27.11	65.35	4.911
Standard deviation	238.05	0.379	7.402	0.304
Maximum value	1967.7	27.79	72.83	5.81
Minimum value	865.4	26.09	42.33	4.38
Trend coefficient	0.025	0.012^{xxx}	-0.037	0.004^{xxx}
Correlation coefficient	0.121	0.715^{xxx}	0.243	0.613^{xxx}

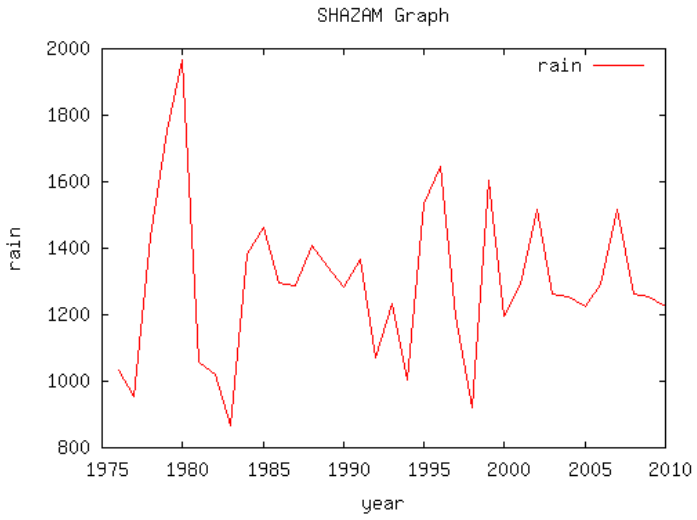
*** significant at 1%

Source: NIMET, Oshodi and Computer printout of SPSS result.

Trend of Rainfall

Statistical record of rainfall in Oyo state of Nigeria between 1976 and 2010 shows an increasing trend with the highest in 1996 and lowest in 1983. The value of the highest volume of rainfall which was recorded in 1980 was 1967.7mm while the lowest was recorded in 1983 with value of 865.4mm and the mean and standard deviation of the rainfall data in the zone from 1976-2010 are 1298.06mm and 238.05mm respectively. The standard deviation shows that there is a large variability in the amount of rainfall from year to year. The coefficient of correlation between rainfall and time has a value of 0.121 implying that there is a weak positive relationship between rainfall and time. This correlation is however not statistically significant.

The trend model is lnR = 7.085 + 0.025lnT and is not significant at 10% level of probability. (R stands for rainfall and T stands for time i.e. year)



Trend of Temperature

Data on temperature from 1976-2010 shows an increasing trend with the minimum temperature (26.09°C) recorded in 1976 and maximum temperature (27.79°C) recorded in 1998. The mean value of temperature and its standard deviation over the period are 27.11°C and 0.379°C implying that there is a slim variability in temperature values from year to year. The trend coefficient is 0.012 and is statistically significant at 1%. The coefficient of correlation of temperature and time is 0.715 and is statistically significant at 1% implying that temperature has significant positive relationship with time. Therefore, temperature changes with time significantly. The warming is real and significant.

The model for the trend is Ln C = 3.269 + 0.012LnT and is significant at 1%

(C stands for temperature and T stands for time i.e. year)

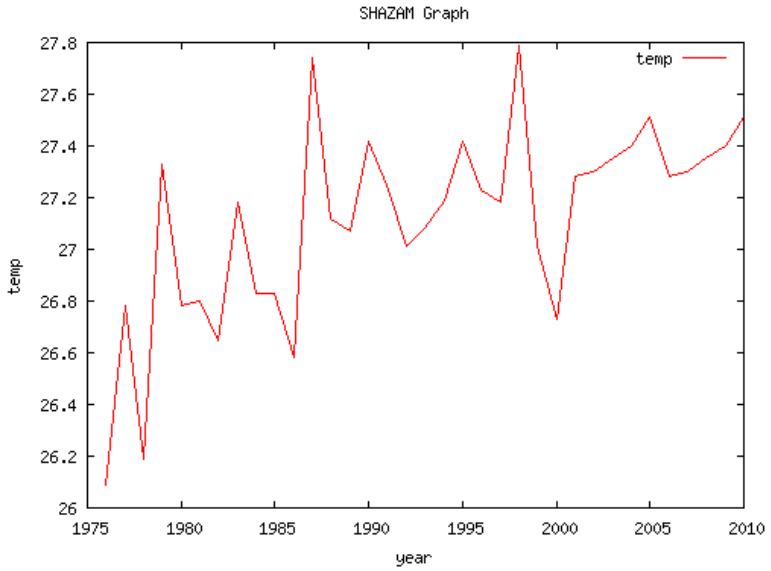


Figure 2: Trend of Temperature Data for Oyo state of Nigeria from 1976-2010

Trend of Relative Humidity

Relative humidity record from the Oyo state of Nigeria from 1976-2010 shows a decreasing trend with its highest value for the period (72.83%) recorded in 1979 and lowest value (42.33%) recorded in 2001. The mean and standard deviation values of the relative humidity over the period are 65.35% and 7.402% implying that relative humidity has a considerable variability from year to year. The trend coefficient is 0.037 and it is a decreasing trend. It is however also statistically insignificant. The coefficient of correlation has a value of 0.243 showing a weak negative relationship between relative humidity and time; also it is statistically insignificant.

The equation for the trend is LnH= 4.269 - 0.037LnT (Figure 3).

(H stands for Relative humidity and T stands for time i.e. year)

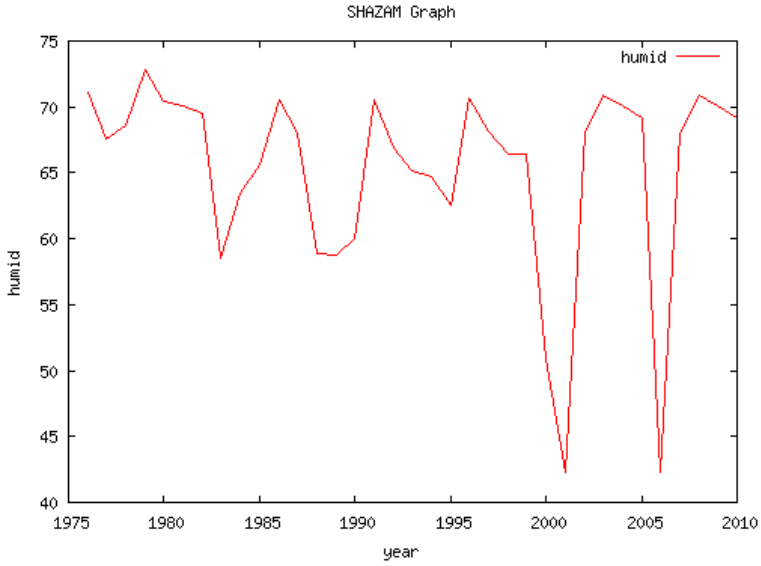


Figure 3: Trend of Relative Humidity Data for Oyo state of Nigeria from 1976-2010

Trend of Sunshine Hours

Sunshine duration data from Oyo state of Nigeria between 1976 and 2005 shows an increasing trend with a trend coefficient of 6.972 hours per year and is statistically significant at 1%. The maximum value of sunshine hours (5.81 hours) was recorded in 2001 while the minimum (4.38 hours) was recorded in 1983. The mean and standard deviation values over the period are 4.911 hours and 0.304 hour implying that there is a narrow variability in the value of sunshine hours from year to year. The trend coefficient is 0.004 and is statistically significant at 1%. The coefficient of correlation is 0.613 indicating that there is a strong relationship between time and sunshine hours; also it is statistically significant at 1%.

The equation for the trend is LnD= 1.525 + 0.004T (Figure 4).

(D stands for Sunshine hour and T stands for time i.e. year).

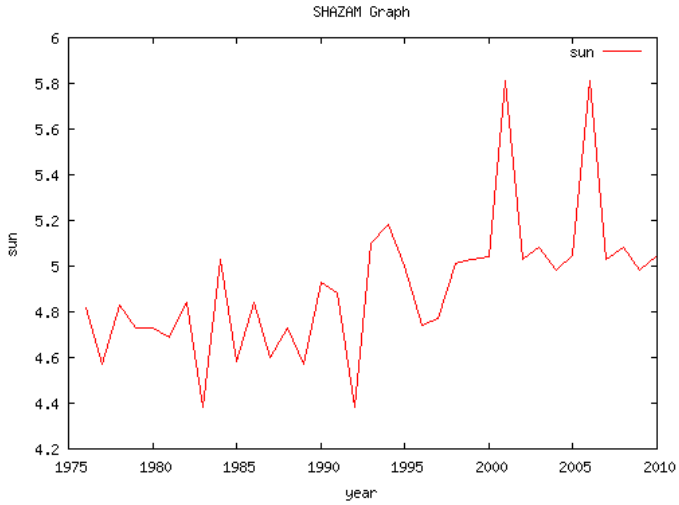


Figure 4: Trend of Sunshine Duration Data for Oyo state of Nigeria from 1976-2010

Co- integration

The results of the Augmented Dickey Fuller (ADF) unit root tests for the climate variables for each of the crops are summarized in Table 2.

According to these results when yam or cassava is used as regressand, the null hypothesis of a unit root cannot be rejected at conventional (10%, 5%, or 1%) significance levels for yam or cassava yield, sunshine hour and average humidity in level, but is rejected at the 1% significance level for all of the time series in second difference. These results imply that each series is non stationary in level but stationary in the second difference.

Accordingly, it can be concluded that yam yield and sunshine hour are *I(1)* series while cassava yield and average humidity are *I(2)* series.

For the tests, a constant term and time trend are included. Only the results of the unit root tests with both constant term and time trend variable included are reported in Table 2 to conserve space.

The critical values of the ADF t-statistic as reported by SHAZAM, the econometric software package used for performing the unit root tests, are –3.96, -3.41 and –3.13 at the 1%, 5% and 10% levels of significance, respectively.

Table 2. Result of stationary test from Augmented Dickey-Fuller Test

Variables	Level	1st difference	2nd difference	Order
Yam	-0.43515	-3.9829***	-5.0047***	*I(1)*
Cassava	-0.33311	-2.7007	-4.8893***	*I(2)*
Sunshine hour	-2.5238	-4.2775***	-6.0033***	*I(1)*
Rainfall amount	-4.8413***	-3.9652***	-6.1215***	*I(0)*
Average Humidity	-2.1742	-2.9354	-4.5444***	*I(2)*
Temperature	-4.4250***	-3.9445**	-5.2981***	*I(0)*

*** Significant at 1% level of significance

** Significant at 5% level of significance

Source: Derived by researchers

Having established that all the variables are *I(2)* (i.e. the necessary condition for co integration is satisfied), the results of the co-integration tests are reported in Table 3

Table 3. Results of the co-integration tests

Regressand	**Condition**	**ADF test**	**R^2**	**Durbin Watson**
Yam	Constant, no trend	-2.9320(0)	0.4250	1.001
	Constant, trend	-1.0535(0)	0.5652	0.5828
Cassava	Constant, no trend	-2.8547(0)	0.4098	0.9648
	Constant, trend	-1.0535(0)	0.5518	0.5454

Source: Computer printout of SHAZAM result

Critical values of ADF t-statistic for constant with no trend

1% level of significance = -4.96

5% level of significance = -4.42

10% level of significance = -4.13

Critical values of ADF t-statistic for constant with trend

1% level of significance = -5.25

5% level of significance = -4.72

10% level of significance = -4.43

The numbers in parentheses for the ADF test are the optimal lag lengths, which are determined using AIC. Since the results of the unit root tests on the OLS residuals of the co-integration regression does not reject the null hypothesis of a unit root in favor of the

stationary alternative even at the 10% significance level, we conclude that the series are not co-integrated. In other words, they are not linked in common long run equilibrium.

Effect of climate change on Cassava and Yam Production

Having established the fact that the variables are not co-integrated, the regression analysis was performed and a summary of the result is shown in table 4.

Table 4: Regression estimates of climatic elements and cassava and yam yield using the semi log functional form

Variables	Cassava		Yam	
	Coefficient	T ratio	Coefficient	T ratio
Constant	-159769.912	-1.139	141024.414	0.712
Rainfall (X_1)	4016.100	1.917*	2522.765	0.853
Temperature (X_2)	49074.724	1.099	-11434.344	-0.181
Humidity(X_3)	-2210.773	-0.640	-9940.463	-2.037*
Sunshine (X_4)	-6010.482	-0.619	-38020.236	-2.755**
Year (X_5)	-854.105	-0.588	-1641.322	-0.800
R^2	0.242		0.592	
Adjusted R^2	0.072		0.446	
F ratio	0.894		4.058**	

** Significant at 5% level

* Significant at 10% level

Source: Computer printout of SPSS result

Effect of Climate Change on Cassava Yield

In order to determine the effect of climate change on cassava yield, a model was subjected to regression analysis in four functional forms (linear, semi-log, exponential and double-log functional form). The semi-log function was chosen as the lead equation ($Y = -159769.912 + 4016\ln X_1 + 49074.724\ln X_2 - 2210.773\ln X_3 - 13974.645\ln X_4 - 854.105\ln X_5$) for further discussion because it has the highest adjusted R^2 value, and also has the highest F – ratio value (0.894). The result of the semi-log form shows that the coefficient of multiple determination (R^2) is 0.242 (24.2%) implying that the independent variables (X_1…. X_5) jointly explained 24.2% of variation in cassava yield. Consequently, the interpretation of the results of the regression indicates the following:

Rainfall (X_1) and Temperature (X_2) were positively related to cassava yield however they were not significant statistically. Relative humidity (X_3), Sunshine hour (X_4) and Time (years) (X_5) have a negative relationship with cassava yield but it is not statistically significant.

The F-ratio which determines the overall significance of the regression is not statistically significant at the 10% level as F-calculated value (0.894) is less than F-tabulated value. We therefore conclude that there is no significant relationship between climate change and cassava yield. Cassava is not affected by climate change as shown in the result. Cassava planting can therefore serve as

a viable alternative for farmers living in areas prone to climate change so that they can have something to fall back on in times when other crops fail. This is consistent with the findings of Jarvis, (2011) of the Colombia-based non-profit International Centre for Tropical Agriculture, who stated that cassava could be the answer to climate change adaptation in Africa, because cassava is "often the food crop that continues to provide food in periods of the year when other food sources are not available" and that cassava is ideally suited to withstand drought and climate change.

Effect of Climate Change on Yam Yield

The model was subjected to regression analysis with four functional forms (semi-log, double-log, exponential and linear functional forms). The semi-log form was chosen as the lead equation ($Y=141024.414+2522.765LnX_1-11434.344LnX_2-9940.463LnX_3-38020.236LnX_4+1641.322LnX_5$) because it has the highest adjusted R^2 value (0.446), and also has the highest F-calculated (4.058). The coefficient of multiple determination (R^2) has a value of 0.592 (59.2%) implying that the independent variables jointly accounted for 59.2% of the variation in yam yield.

Rainfall (X_1) is positively related with yam yield while Temperature (X_2) has a negative relationship with yam yield however both effects were not statistically significant at 1%, 5%, and 10% level of significance.

Relative Humidity (X_3) is negatively related to yam yield. This means that an hour increase in sunshine duration (sunshine hour), keeping all other variables constant will result to 9940.463 kg/ha decrease in Yam yield which will invariably reduce income of farmers. This effect is statistically significant at 10% level of probability as t-calculated value (2.037) is greater than t-tabulated value (1.677) at 10% level of probability.

Sunshine duration (X_4) has a negative relationship with yam yield. The result revealed that an hour increase in sunshine duration (sunshine hour), keeping all other variables constant will result to 38020.236 kg/ha decrease in Yam yield. This relationship is statistically significant at 5% level of probability as t-calculated value (2.775) is greater than t-tabulated value at 5% level of probability.

Time (years) (X_5) has a negative relationship with yam yield that is the yield reduces with time but it is statistically insignificant as the t-calculated value (0.800) is less than t-tabulated value (1.699) at 10% level of probability.

The F-ratio which determines the overall significance of a regression is statistically significant at 5% level of probability as F-calculated value (4.058) is greater than F-tabulated value. We therefore conclude that climate change significantly affected yam yield.

Predicted Future Values of Climatic Variables

The projections for values of climate variables derived from the trend models for rainfall, temperature, relative humidity, and sunshine respectively is presented in table 5.

Table 5: Predicted future values of climatic variables

	2020	2030	2040	2050
Temperature (^oC)	27.51	27.58	27.64	27.68
Rainfall (mm)	1313.13	1319.73	1325.25	1330.00
Humidity (%)	62.06	61.60	61.22	60.90
Sunshine (Hours)	5.50	5.73	6.00	6.20

Source: Derived by the Researchers

Table 5 reveals that by 2020 the average temperature of the state is projected to have a value of 27.51^{o}C and by 2030, 2040, 2050 temperature values are expected to be increasing from 27.58^{0}C to 27.64^{0}C and to 27.68^{0}C respectively. The table also reveals that rainfall in the zone is predicted to have the following values from 1313.13mm, 1319.73mm, 1325.25mm, and 1330.00mm in 2020, 2030, 2040, and 2050 respectively. This implies that values of rainfall are projected to be increasing signifying that floods could be experienced in the zone in the future if the trend continues. Relative humidity will have values decreasing from 62.06% in 2020, 61.60% in 2030, 61.22% in 2040, and 60.90% in 2050. For sunshine hours, the values are expected to be increasing from 5.50 hours in 2020, 5.73 hours in 2030, 6.00 hours in 2040, and 6.20 hours in 2050.

The optimal range of each of the climate variables for the growth of yam and cassava is presented in Table 6.

Table 6: Optimal Climatic conditions for the growth of yam and cassava

	Rainfall (mm)	Temperature (^{o}C)	Humidity (%)	Sunshine (Hrs)
Yam	1700 – 3000	25 – 30	75 – 80	4 – 5
Cassava	1700 – 2500	25 – 30	75 – 80	4 – 5

Source: Norman *et al*., 1984; Lumpkin and Plucknett, 1982; Rehm and Espig, 1991; Watson, 1983; Skinner, 1989; www.infonet-biovison.org/default/ct/146/crops

The table reveals that the optimal range of rainfall for the growth of yam and cassava are 1700 - 3000mm and 1700 - 2500mm respectively. The table also shows that the optimal range of temperature for the growth of the crops is 25 – 30^{o}C for yam and cassava. The optimal range of relative humidity for the growth of the crops is 75-80% for yam and cassava, while the optimal range of sunlight hours for the growth of both crops is 4-5 hours.

Comparing table 5 and table 6, it can be inferred that the projected values of the climatic variables in the future does not fall within the optimal conditions for the growth of cassava and yam except for the temperature. This implies that by 2050 the projected climatic conditions then will not be favourable for optimal growth of yam and cassava. This is consistent with the findings of Molua and Lambi (2007) in Cameroon, Deressa *et al*(2008a and 2008b) and Yesuf *et al*(2008) in Ethiopia, Adejuwon (2004) in Nigeria.

CONCLUSION

Statistical records of rainfall amount in Oyo state of Nigeria between 1976 and 2010 shows an increasing trend and also there is large variability in the amount of rainfall from year to year. Statistical record of average temperature in Oyo state of Nigeria between 1976 and 2010 shows an increasing trend however there is a slim variability in the value of average temperature from year to year. Average temperature also has a significant positive relationship with time which affirms that global warming is real and significant. Statistical records of relative humidity in Oyo state of Nigeria between 1976 and 2010 shows a decreasing trend and also there is average variability in the value from year to year. Statistical records of sunshine hour (duration)

in Oyo state of Nigeria between 1976 and 2010 shows an increasing trend and also there is narrow variability in the values from year to year. Sunshine hour also has a significant positive relationship with time corroborating the global warming phenomenon. It is also observed that the highest value of sunshine hour (5.81 hours) was recorded in 2001, and in that same year, the lowest value of relative humidity (42.33%) was recorded. This is logical as increased sunshine will definitely reduce the moisture content in the atmosphere.

Rainfall amount and Temperature are positively related with the yield of cassava while relative humidity and sunshine hour are negatively related with cassava yield. There is no significant relationship between climate change and cassava yield. Rainfall is positively related to yam yield while temperature, humidity and sunshine hour are not. Climate change significantly affects yam yield.

The projected values of climatic variables in the future do not fall within the optimal conditions for the growth of cassava and yam.

RECOMMENDATION

The government of Oyo state should enforce environmental laws that will forbid citizens from dumping refuse in drainages that is proper waste disposal management so as to forestall the incidence of flooding as the amount of rainfall is projected to rise in the future.

Farmers are to ensure that their farmlands are well drained to avert the disaster of water logging and flooding.

Researchers in the field of plant breeding should work towards developing varieties that would be able adapt or cope with the effects of the expected change in climate variables.

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Gross margin analysis of backyard farming in Osun state, Nigeria

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Abstract: Population continues to increase in the urban centers in Nigeria thereby deepening the crises of food insecurity and unemployment. There is the dearth of job opportunity especially among the youth and the need arises to look inward for job creation rather than seeking for one. A quick solution to the twin problems of food insecurity and unemployment may be attained by embracing backyard farming which may require little start-up capital. This study investigated the economic viability of backyard farming in Osun State. Primary data were collected from 120 respondents who engaged in backyard agriculture in Ife Central Local Government Area in the state. The data were analyzed using descriptive statistics, budgetary technique and some profitability ratios. Results revealed that the respondents were mostly men (65%), having their primary occupation in different activities (81%) and engage in farming within their buildings (86%). The prominent enterprises were fruits and vegetable production (43%), poultry keeping (19%) and fish farming (21%). A total cost of N16, 500.57 was incurred by the average backyard farmer. Fixed cost was low being only three percent of the total cost. This may not be unconnected with the fact that there is no need to further incur cost on land, building and machinery. It is evident that backyard farming requires a little start-up capital which could be an incentive to young entrepreneurs who usually find it difficult to attract initial investment fund. The average total revenue was N61, 113.35 with gross margin and net revenue of N47, 765.38 and N44, 612.78 respectively. The Benefit Cost Ratio, Expense Structure Ratio, Rate of Return and Gross Ratio were 3.7; 0.07; 2.7 and 0.27 respectively. Backyard farming is thus highly profitable as suggested by these indicators. It is a good point of entry into agribusiness for young entrepreneurs and holds good prospect for food security, alternative income generation and poverty alleviation in the urban areas.

Keywords: Gross margin, backyard farming, profitability

INTRODUCTION

Nigeria is the most populous country in Africa, with an estimated population of about 140 million (NBS, 2006) currently growing at an annual rate of about 2.8%. The predominant occupation in the country is agriculture with an estimated 65% of the population residing in the rural areas. National Bureau of Statistics (NBS, 1996) estimated that about 70% of the rural population is engaged in agriculture. Despite the proportion of the country's population engaging in agriculture, the country is still unable to provide adequate food for her teaming population. This may probably be due to one or all of the following factors; drudgery in farming operations, use of crude implements, land fragmentation, vagaries of weather, among others. Adeyemo and Kuhlmann (2009) opined that rate of urbanization in West Africa including Nigeria is expected to lead to increased demand for food and possible associated increases in urban unemployment and food insecurity. The challenge therefore is for researchers and policy makers to put in place policies and goals to make urban agriculture a legitimate

and viable economic activity capable of mitigating the problem of urban food insecurity. Thus, in a bid to bridge the food supply gap, the practice of peri-urban (PU) and urban agriculture (UA) is common in Nigeria. These refer to the practice of agriculture in urban settlements.

Urban agriculture is a term used to describe the production of agricultural products in the urban environment (Adeyemo and Kuhlmann, 2009). Three major types of urban agriculture have been identified as urban shifting cultivators, household gardeners and urban market producers, all which play distinct roles and contribute to urban market. In urban agriculture, much of the activities described are practiced in zones around large cities and urban towns. According to Oke *et al*(2011) PU and UA systems have been classified into home-based production systems, open space locations, vegetable markets or animal husbandry among many others. Mougeot (2006) found that 20% of the world's food is produced in urban and peri-urban areas and about 40% of the population in urban cities of Africa is involved in urban agriculture. Study (Garnett, 2011) has shown that fresh vegetables and poultry products are the major items of production in most urban areas, with little cereals, grain legumes, and root tubers. They are important for food security and significant contributors to income security and nutritive diets of many households. Backyard farming is a common feature of PU and UA as a result of limited availability of land in the domain of their practitioners.

According to Ojo (2009), backyard farming involves the production of vegetables, root/tuber crops, cereals, poultry and small ruminants using the small pieces of land in the residential areas, in such quantities that will ensure that the immediate needs of the household members are guaranteed. According to him, backyard farming: provides food items in fresh form; encourages landless people (tenants and poor people) to be involved in food crop production on small-scale basis; enables civil servants, clergymen, judges, political office holders who are interested in farming but are constrained because of the nature of their job or profession to use backyard farming to practice their love for farming.

Backyard farming performs two major functions that have great influence on the economy. These are food provision thereby ensuring food security and income generation which reduce poverty levels. These functions are germane to the achievement of the millennium development goals. For instance, chickens from backyard poultry enterprises account for 60-80% of national poultry production in Ghana (Aning, 2006; Asem-Bansah *et al*., 2012). The chicken from this category of enterprise contribute to household income, nutrition and food security and are used for various cultural and ceremonial rites such as payment of bride price for marriage (Abeo *et al*., 2006).

Food security is defined as the access by all people at all times to enough food, acquired by socially acceptable means, for an active and healthy lifestyle (Anderson, 1990). United States Agency for International Development (USAID, 2006) defined food security as access by all people to food in adequate quantity and quality consistent with decent existence at all times. At the 1996 World Food Summit in Rome, world leaders set a goal to reduce the number of hungry people by half by the year

2015 (FAO, 1996). Backyard farming is a form of microenterprise which can be a source of revenue for the unemployed, supplemental income for the low income earners and income booster for the high income earners. Roy and Wheeler (2006) suggests that low- and moderate-income individuals generally start microenterprises for the purpose of creating their own job or providing extra income for themselves and their families and they seldom engage in formal contractual agreements. Involvement in backyard farming would help improve income of average rural dweller in Nigeria. This paper therefore examines the socio-economic characteristics of the respondents and economic viability of backyard farming in the study area.

RESEARCH METHODOLOGY

The study was conducted in Ife Central Local Government Area (LGA) of Osun state. Osun state is located in the south-western part of Nigeria. It was created in 1991 and it covers an area of approximately 14, 875 square km with a population figure of 167254 (84653 male and 82601 female) (NBS, 2006). Osun state is mainly an agrarian community. The major crops grown are maize, yam, cassava, tomatoes, vegetables, cocoa, oil palm, timber etc. The state experiences two major seasons, the dry and rainy season with August break during the rainy season, the dry season is from late November to March. The mean annual temperature varies between 21.1^{o}C to 31.1^{o}C. Annual rainfall is within the range of 800mm in the derived savannah agro-ecology to 1500mm in the rain forest belt. Ile-Ife falls in rain forest zone of the state. The soil is made up of Itagumodi series, which are most friable red clays that may contain some iron detritus at depth. The locations in Ife central include Parakin-Obalufe, OAU Campus, Oluorogbo, Olonade, Eleyele, Igboya, Oranfe, Opa, Agric and Aba-Iya-Gani. These are urban settlements within the Local Government Area comprising of various categories of people like public and private employees, artisans, students and unemployed youths, young and old.

Data Source and Sampling Technique

The data used for the analysis were from individuals practicing backyard farming in the area. The data were collected using structured questionnaire. The information inquired bordered on the socio-economic characteristics of respondents such as sex, age, occupation, farm size, location of farm plot, enterprise type, and level of education, among others. Input-output data were also collected on labour use, running cost, and income generated. All input-output data were converted to naira value.

A two-stage sampling technique was used to collect information from the respondents. The first stage involves the purposive selection of Ife Central local government area of Osun State, an area with many people who are public and private workers who engage in backyard farming. The second stage involves the selection of 120 individuals having residences where backyard farming is practiced using the snowball method. The sampling was done in the 2009/2010 farming season.

Analytical Techniques

Data collected were analyzed using descriptive statistics and costs and returns technique. The descriptive statistics involves the use of mean, percentages, standard deviation, and the gross margin. Costs and returns technique was used to calculate gross

margin and other financial estimates. The gross margin analysis is given as:

- GM = TR – TVC …….. (1)
- NR = TR – TC ……..… (2)

Where

GM = Gross Margin (N)

NR = Net Revenue

TR = Total Revenue (N)

TVC = Total Variable Cost (N)

The performance and economic viability of the respondents were determined by the use of the following profitability ratios:

- Benefit Cost Ratio BCR = TR/TC … (3)
- Expense Structure Ratio ESR = TFC/TVC…….. (4)
- Rate of Return ROR = NR/TC….. (5)
- Gross ratio GR = TC/TR ……...(6)

TFC = Total Fixed Cost

RESULTS

Socio-economic characteristics

The result of the socio-economic characteristics of the respondents (Table 1) revealed that more males (65%) than females (35%) are into backyard farming in Ile-Ife. This is also the same as the proportion reported in a peri-urban agricultural study of the city by (Idowu and Kassali, 2011). More men engage in farming either as a hobby or main occupation irrespective of the geographical location (rural, per-urban or urban) in the area. Seventy two percent (72%) of the farmers are between the ages of 31 and 50 years. This is similar to the mean age of 45 years found among *Amaranth* farmer in the area by Akinola *et al* (2011). Such farmers are young adults who are physically active and able to contribute significantly to agricultural production. All the respondents have formal education. The table shows also that 83% of the respondents are educated beyond primary level. Such farmers are imbued with the ability to access and appreciate the use of improved technology and best practices in their enterprises.

Most respondents have their farming enterprise located within their compound (86%). They plant fruits and vegetables, maize, cassava, yam, and cocoyam; and raise poultry birds, rabbit, swine, snail and fish within the confine of their housing estate. The enterprises of the respondents in order of predominance are fruits and vegetable production (43%), aquaculture (21%), poultry (19%) and others (17%). More of the respondents are into vegetable production probably due to the low capital requirement and the high preference for its consumption when fresh. Vegetable is an essential part of everyday meal in the area as it constitutes the major source of protein among the poor. Most of the respondents (81%) have their primary occupation either as office workers (54%) or traders/artisans (27%). This supports the findings that backyard farming is vocational and a means of generating supplemental income for the household (USAID, 2006). More than two-third (69%) of the respondents employs family labour for their enterprise. Thus, backyard farming provides platform to train children and other members of the family in the art and science of farming. The proximity of the operation site affords family members to engage their leisure time doing one activity or the other on the farm.

Gross Margin Analysis

Table 2 shows the result of the gross margin analysis. The table shows that the average total revenue is N61,113,350. The

average total cost is N16,500.57 of which the total variable cost is N15,347.97 (97%) and the total fixed cost is N1,152.6 (3%). The highest component of the variable cost is the running cost. The fixed cost is ridiculously low because it excludes the cost of land, farm buildings and machinery. It represents depreciation on simple tools and implements such as hoe, cutlass, shovel, wheel barrow, baskets, cages and farm sheds employed in backyard agriculture. This cost structure reveals the ease of establishment of backyard farming especially for novel entrepreneur looking for a good starting point. It is a home grown business that can provide the needed experience for a larger business formation (Longenecker *et al*., 2008).

Adegeye and Dittoh (1982) asserted that Gross margin is a good measure of profitability. A business is profitable and viable if and only if revenue is greater than the total variable cost which makes positive the gross margin. The average gross margin of N47, 765.38 obtained is very high considering the amount of investment. Although smaller, it compares favourably with gross margins of N52, 333.10 and N59, 717.28 for users of organic manure and inorganic fertilizer respectively, who produce vegetables in the city (Akinola *et al*., 2011). The smaller gross margin is revealing the fact that backyard farmers are more land constrained than other urban farmers who have access to larger open space within the city. The positive gross margin value revealed that backyard farming is highly profitable in the study area. The net revenue of backyard farming in the study area is N44, 612.78. Both the gross margin and the net revenue of backyard farmers corroborate the findings of Adekunle (2001) who reported profitability of micro-enterprises based on five year data (2001 to 2005) in the area.

Profitability and financial efficiency estimates

The result of the profitability and the financial efficiency estimates are shown in Table 3. The table revealed that the:

- **Benefit cost ratio (BCR)** was 3.70. This implies that N1 invested yielded a benefit of N3.70. This ratio is one of the concepts of discount method of project evaluation. Project with benefit cost ratio greater than one, equal to one or less than one indicate profit, break-even or loss respectively (Olagunju *et al*., 2007). Since the ratio is greater than one, it shows profit and indicates that the enterprise is profitable.
- **Gross Ratio (GR):** The value 0.27 implies that every 27k spent would yield a benefit of N1.00. This implies that it is a viable enterprise.
- ***Rate of Return (ROR):*** The rate of returns to backyard farming in the study area is 2.7. This is return of 270% on every naira invested in backyard farming. This will be of interest to credit providers who may want to support backyard farmers. Even with the traditional money lenders who charge 100% interest on loans, a backyard farmer would conveniently repay the loan and still break even.
- **Expense Structure Ratio (ESR):** The value of the ratio is 0.07 which implies that about 7% of the total cost of production is made up of fixed cost component. It shows that backyard farming is an enterprise that will not tie

down the equity of the farmer in fixed asset. Such an enterprise is good for an entrepreneur with low capital base who is just entering the business world.

DISCUSSION

The proportion of male backyard farmers is higher than the female just like in any farming enterprise in the Southwestern part of Nigeria. Men are able to endure the drudgery in farming relative to women. The backyard farmers were found to be physically active and in their productive age. Their level of education allows for adoption of innovative ways of operating their farming enterprises. They plant crops and raise livestock within the confines of their estates. This makes it easy to use family labour and train young ones in the art and science of farming. Having primary occupation by most of the backyard farmers makes the enterprise vocational and a good source of secondary income to the practitioners.

The gross margin results that backyard farming is profitable in the area. The cost component is low and its structure is favourable to new entrants to this category of enterprise. Also, all the profitability ratios indicate that backyard farming is profitable.

SUMMARY AND CONCLUSION

The study analyzed the gross margin of backyard farming in Ile-Ife city. The respondents comprised of 120 farmers with agricultural production within or outside their residential buildings. More men (65%) were into the practice than women. The farmers are in their productive age (31 – 50 years) and have one form of formal education or the other. Result also show that a greater proportion of the respondents (86%) have production units located within the compound. The backyard farmers are majorly office workers (54%) or traders/artisans (27%) and they mostly engage their family labor (69%). Cost analysis revealed a very low fixed cost since that production is in-house with the family home. The gross margin analysis also shows that backyard farming is a profitable enterprise with gross margin of N 47,765.38 and net revenue of N44,612.78. The calculated profitability ratios, all attested to this fact. It is shown that backyard farming could easily payback loans even at high rates of interest. It is a microenterprise that could enjoy the financial intermediation of microfinance institutions in the area.

Backyard farming holds good prospect for provision of fresh food for city dweller thereby ensuring food security (Asem-Bansah *et al*., 2012). In addition, it is a good entry point to entrepreneurship by the unemployed youths given that it requires little capital for a start, it will alleviate poverty of practitioners and augment the income of people who do it on part-time basis.

Table 1: Socioeconomic characteristic of respondents

Variable	Percentages (%)
Sex	
Male	35
Female	65
Age	
≤30years	21
31-40years	28
41-50years	44
51-60years	6
>60years	1
Level of Education	
Primary	17
Secondary	45
Tertiary	38`
Household Size	
0-5	71
5-10	27
>10	2
Years of Experience	

1-5	63
6-10	28
Above 10	9
Location of plot	
Within compound	86
Outside compound	14
Type of enterprise	
Vegetable	43
Poultry	19
Fish farming	21
Others	17
Primary occupation	
Farming	19
Trading/artisan	27
Office work	54
Primary source of labour	
Family	69
Hire	31

Source: Data Analysis, 2011.

Table 2: Estimated costs and benefits of backyard farming

Cost items	Amount (N)*	Percentage (%)
Total Revenue	61,113.350	
Labour	3,925.400	27.8
Running costs	8,127.300	49.3
Miscellaneous	3,295.270	20.0
TVC	15, 347.97	97.1
TFC	1,152.6	2.9
TC (TVC+TFC)	16,500.57	
GM (TR-TVC)	47,765.38	
NR (GM-TFC)	44,612.78	

* N= Naira, Nigerian currency; N1=$0.0066, 100k = N

Source: Data analysis 2011

Table 3: Profitability and financial efficiency estimates

Profitability ratios	Estimates
Benefit cost ratio	3.7
Gross ratio	0.27
Rate of returns	2.7
Expense structure ratio	0.07

Source: Data analysis 2011

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Income sources, inequality and poverty among rural households in Ibadan, Oyo state, Nigeria

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Abstract: Some developing countries particularly in Southeast Asia have been able to catapult themselves into development using agriculture as a base. This has not been true of developing economies in sub-Saharan Africa which is evident in the widespread poverty and inequality. Thus, researchers have taken a paradigm shift by taking a holistic look at the rural economy vis-à-vis livelihood diversification. This paper is an effort in that direction. Primary data were collected from 120 households in rural parts of Ibadan using a multistage sampling procedure. Descriptive statistics was used to analyse the socio-economic variables while Gini source was used to decompose the income inequality in order to determine the contribution of each income source to overall income inequality. The results show that the share of agriculture in the total per capita household income (PCPHI) is 40.0% while non-farm self-employment (NFSE) and non-farm wage employment (NFWE) take 22.1% and 37.5% respectively. The results of source decomposition of the Gini coefficient reveal that agriculture contributes 41.6% to the overall income inequality; NFSE contributes 22.5% while NFWE contributes 36.4%. Agriculture and NFSE are also found to be inequality-increasing. There is therefore need to incorporate non-farm income sources into developmental efforts of the government by empowering the rural dwellers financially through their associations and ensuring equitable access to agricultural credit and other farm inputs.

Keywords: Gini coefficient, inequality, rural, sources of income

INTRODUCTION

Agriculture has always been considered as the mainstay of the rural economy in Nigeria. The subsistent farmers who toil hard on the fragile tropical soils are the backbone of this agriculture-based economy (IITA, 1993; Idachaba, 2000). However, a closer look at the situation reveals that rural dwellers, majority of who are farmers, derive livelihood from other income sources. Adams (2001) mentions that in the past, many researchers and policymakers have viewed the rural economy of developing countries as being synonymous with agriculture. According to this view, rural households receive most of their income from the production of food and export crops. In more recent years, this view has begun to change. There is now a growing recognition that rural households receive their income from a diverse portfolio of activities and that one of the most important of these activities is that connected with the rural non-farm sector. According to Awoyemi (2011), a key element in the history of the country's rural development efforts is that agriculture has been viewed as a basis for rural development, an approach which has neglected the contributions of other sectors in improving the quality of life of rural dwellers, and subsequently hindered the scope for a multisectoral and integrated approach to rural development programming.

The 2001 Human Development Report of the UNDP argues that global income inequality has risen based on the following logic: income inequality within countries has increased, income inequality across countries has increased and that global income inequalities have increased. According to the report, there is a growing

inequality and global gap between the rich and the poor. The richest 50 individuals in the world have a combined income greater than that of the poorest 416 million. The 2.8 billion people living on less than $2 a day, which represents almost half of the world population, receive only 5% of global income, while 54% of global income goes to the richest 10% of the world's population. A fifth (1.2 billion) lives on less than $1 a day (Todaro and Smith, 2003; Omonona, 2001). There is a revelation that destitution persists even though human conditions have improved more in the past century than in the rest of history. But the distribution of these global gains is extraordinarily unequal. The average income in the richest 20 countries is 37 times the average in the poorest 20 – a gap that has doubled in the past 40 years - and the experience in different parts of the world has been very diverse. In East Asia, the number of people living on less than $1 a day fell from around 420 million to around 280 million between 1987 and 1998. Yet in Latin America, South Asia and sub-Saharan Africa, the numbers of poor people have been rising and in the countries of Europe and Central Asia in transition to market economies, the number of people living on less that $1 a day rose more than twenty-fold (World Bank, 2001).

Nigeria, just like other parts of the sub-Saharan Africa, has not been left out of the crisis of poverty and inequality. This has been shown in several researches conducted on the subject matter. Canagarajah *et al*., (1997) reported an increase in the Gini coefficient from 38.1% in 1985 to 44.9% in 1992. Also, Aigbokhan (1997) reported a Gini coefficient of 0.510 for rural households in his 1991 household survey of Western Nigeria. Similarly, a deepening inequality from 0.394 to 0.520 was reported for urban households between 1983/84 and 1991 and a deepening rural inequality from 0.389 to 0.510 for the same period. The World Bank (1996) estimation showed similar case of deepening inequality, the Gini coefficient rose from 0.387 in 1985 to 0.499 in 1992. Oyekale *et al.* (2006) observed that income inequality worsened between 1998 and 2004 in most of the states in Nigeria and this increased poverty incidence and depth. Gini inequality index for the total income was 0.5802, which shows that income inequality was high in Nigeria with the Gini inequality index of total income being higher in rural areas (0.5808) than urban areas (0.5278).

The picture painted above is that of Nigerians wallowing in poverty with the bulk of the consequences borne by the rural dwellers. It is worthy of note however that the government has not folded its arm in the effort at making sure that Nigerians are able to afford basic necessities of life. Several programmes and projects had been set up or implemented by successive regimes in order to address the various manifestations of poverty. These include River Basin Development Authorities (RBDA), Agricultural Development Programmes (ADP), Agricultural Credit Guarantee Scheme (ACGS), Operation Feed the Nation (OFN), Green Revolution, Directorate for Food, Roads and Rural Infrastructure (DFRRI), National Directorate of Employment (NDE), Peoples Bank of Nigeria (PBN) and Family Economic Advancement Programme (FEAP). In recent times, just like in the past, much has been expended on poverty alleviation. According to Ogwumike (2002), in November 1999, the government declared that ₦470 billion budgets for year 2000 was "to relieve poverty". Also, before the National Assembly even passed the 2000 budget, the government got an approval to commit ₦10 billion to poverty alleviation programme. In the 2001 budget, the government increased the allocation to poverty alleviation programme by 150%. Omonona (2001) also pointed out that in the Poverty

Alleviation Programme (PAP) 2000 of the Federal Government, a total of 214,307 individuals, each paid a stipend of ₦3,500 monthly benefited all over the country. The adhoc nature of the PAP made the Federal government to introduce a new programme to replace it in January 2001.

However, in spite of these huge resources committed, one could see that the impact is so little that the masses are still not better off. The achievement has been in the area of growth with little or no achievement in the area of distribution. Akpobasah (2004) pointed out that income distribution in Nigeria is so highly skewed such that probably, less than 15% of the population actually benefit from the GDP (Gross Domestic Product) growth. Aigbokhan (2000) investigated the profile of poverty in Nigeria in the context of structural policy reforms introduced in 1986 and its reversal in 1994. He used National Consumer Survey data for 1985/86, 1992/93 and 1996/97 from the National Bureau of Statistics. As evident from his work, there was positive real growth throughout the study period but poverty, inequality and polarisation in distribution were evident. Experience in south Asia showed that growth alone is not sufficient to meet the needs of the poor. The region indicators are among the worst in the developing world, and in many parts of the region, the economic growth of the 1980s was not accompanied by concomitant improvements in living standards. Economic reforms had to be deliberately accompanied with the reallocation of public spending in favour of services that meet the needs of the poor. Growth alone does not guarantee reduction of poverty; it must be deliberately accompanied by equity (Okunmadewa, 1997). Structural inequalities, especially in income and input distributions are manifestations as well as strong causes of poverty. The higher the level of inequality, the less impact economic growth has in reducing poverty for any rate of economic growth (Awoyemi *et al*., 2004).

In line with this, this study intends to fulfil four objectives.

- identify the socio-economic characteristics of the respondents.
- measure the level of income inequality in the study area.
- decompose inequality by sources of income.
- determine the contribution of each income source to overall income inequality.

MATERIALS AND METHODS

Primary data was used in this study. The target population is rural households of Ibadan which consist of inhabitants of core-rural and peri-urban areas. The study area was grouped based on the population density and level of infrastructure. Multi-stage sampling procedure was employed in collecting data. One hundred and twenty (120) copies of questionnaire were administered in the study area using proportional random sampling. Descriptive statistics was used to analyse the socio-economic characteristics. The Gini coefficient was used as a measure of income inequality. Fambon *et al*.,(2002), citing Morrisson (1986), gave the general formula for calculating the Gini coefficient for a distribution of income among *n* individuals as follows,

$$G = \frac{1}{2n^2\mu}\sum_i\sum_j\left|Y_i - Y_j\right| \quad \ldots\ldots\ldots (1)$$

Where

Y = the average income (expenditure) of the whole population;

Y_iY_j= the income of individuals i and j.

Source decomposition of Gini

Adams (2001) employed source income Gini decomposition in his work on non-farm income, inequality and poverty in rural Egypt and Jordan. According to him, source decomposition of the

Gini coefficient can be developed following the notation of Stark *et al.,* (1986),

$$G = \sum_{k=1}^{K} R_k G_k S_k \quad \ldots (2)$$

Where:

S_k is the share of source k of income in total group income (i.e. $S_k = \mu_k / \mu$),

G_k is the Gini coefficient measuring the inequality in the distribution of income component k within the group, and

R_k is the Gini correlation of income from source k with total income, defined as:

$$R_k = \frac{\text{cov}[Y_k, F(Y)]}{\text{cov}[Y_k, F(Y_k)]} \quad \ldots. (3)$$

Equation (3) shows that the effect of source k income on overall income inequality can be broken down into three components:

1. the share of income component k in total income (captured by the term S_k);
2. the inequality within the sample of income from source k (as measured by G_k);
3. the correlation between source k income and total income (as measured by R_k).

Using this decomposition, it is possible to identify how much of overall income inequality is due to a particular income source. Assuming that additional increments of an income source are distributed in the same manner as the original units, it is also possible to use this decomposition to ask whether an income source is inequality-increasing or inequality-decreasing on the basis of whether or not an enlarged share of that income source leads to an increase or decrease in overall income inequality. On the basis of equation (3):

$$g_k = R_k \frac{G_k}{G} \quad \ldots(4)$$

Where g_k is the relative concentration coefficient of income source k in overall inequality.

From equation (4) it follows that income source k is inequality-increasing or inequality-decreasing according to whether g_k is greater than or less than unity.

RESULTS AND DISCUSSION

Socioeconomic characteristics of respondents

The descriptive statistics of the characteristics is presented in Table 1.The table shows that 90.8% of the respondents are males while the remaining are females. This shows that the male-headed households outnumber the female-headed households in the study area. Majority (88.3%) of the household heads are married while 7.5 % are single, 1.7% are divorced, 1.7% are widowed and 0.8% are separated. Age of an individual dictates his availability as a member of the workforce. It is also used in literatures as a proxy for experience. From the table, 52.5% of the respondents are between the ages of 41 and 60, 26.7% are in the age bracket 21-40 years while 20.8% are over 60 years of age. The average age is 49 years. This shows that majority of the household heads in the study area are within the working age (active age). Also, there is a substantial percentage to replace the ageing workforce.

The table also reveals that 56% of the households have between 5 and 10 members, 29.0% have less than 5 members while the remaining 15.0% households have above 10 members. The average household size is 6 persons. Household size is an important factor in resource allocation as it measures level of dependency. Households with large family sizes are usually associated with low per capita income especially in resource-constrained economies. In other words, large family size is associated with poverty. Twenty-nine (29) respondents representing 24.2% had non-formal education while the remaining (91) totalling 75.8% had formal education. Results also shows that 54.2% of the household heads are engaged in agriculture, 25% are engaged in non-

farm self-employment (trading – 14.2%, artisanship – 10.8%) and 20.8% are in the non-farm wage employment category (government – 13.3%, private – 7.5%).This indicates that agriculture represents the main income source in the rural economy.

Social organisations are rallying points for individuals. It serves as an avenue to reach out to the populace and to pool resources together for the benefit of members. As shown in the table, 73.3% of the respondents are members of social organisations (co-operative societies, occupational social groups and farmers' union) while 26.7% do not belong to any social organisation. From the table, 32.5% of the respondents have farmland of less than 0.05 hectares in size, 43.3% have land holding between 0.05 and 0.10 hectares while only 4.2% possess land above 0.10 hectares. Twenty percent (20%) of the household heads possess no land. The result shows that the farmers in the study area have small land holdings. Out of the one-hundred and twenty (120) respondents, forty-nine (49) farming households (which represents 40.8% of the respondents), do not secure agricultural credit. Furthermore, 2.5% received ₦5,000 or less, 11.7% received between ₦5,000 and ₦20,000 (the same percentage for between ₦50,000 and ₦100,000) while 14.1% secured between ₦20,000 and ₦50,000.

Table 1: Socioeconomic characteristics of household heads

Characteristic	Frequency	Percent (%)
Sex		
Male	109	90.8
Female	11	9.2
Marital Status		
Single	9	7.5
Married	106	88.3
Separated	1	0.8
Divorced	2	1.7
Widowed	2	1.7
Age		
21 – 40	32	26.7
41 – 60	63	52.5
> 60	25	20.8
Household size		
< 5	35	29.0
5 – 10	67	56.0
> 10	18	15.0
Education type		
Primary	13	10.8
Secondary	24	20.0
Modern school	7	5.8
Grade 2	5	4.2
Tertiary	42	35.0
Non-formal	29	24.2
Primary occupation		
Agriculture	64	53.3
Trading	17	14.2
Artisanship	13	10.8
Government	16	13.3
Private	9	7.5
Membership of social organisations		
Yes	88	73.3
No	32	26.7
Size of agric. land (ha) (Mean=0.06ha)		
< 0.05	39	32.5
0.05 – 0.10	52	43.3
> 0.10	5	4.2
None	24	20.0
Agric. credit (₦) (Mean= ₦22,119.79)		
None	49	40.8
Less than 5000	3	2.5
5,001 – 20,000	14	11.7
20,001 – 50,000	17	14.1
50,001 – 100,000	14	11.7
Not applicable[2]	23	19.2
	120	**100.0**

Size and source distributions of income

Table 2 presents summary of the size and source distributions of income. The distribution of income shows that the bottom 20% receives 2.8% while top 20% receives 58% of the total per capita income. A serious case of income inequality is glaring. This is also evident in the 0.5499 Gini coefficient value calculated with the original income data.

Based on source distribution of income, some deductions could also be made from the table. The nil value for agriculture at the lowest quintile indicates that none of the households in the study

[2] This refers to the non-farming households

area falls within the lowest category of the income distribution (i.e. based on quintile). This means that poverty is not very chronic in the study area. This might be as a result of some level of infrastructural development in the rural areas. For example, some parts of the rural areas have access to electricity which is a catapult of economic activity. The table also shows that other income sources apart from agriculture exist at the highest quintile. This means that high level of income is associated with other income sources apart from agriculture. It implies that households in the study area get more income from trading, artisanship, private, government and transfer (though a minute percentage get income from transfers).

Table 3 shows that non-farm wage employment is a very important income source in the rural areas of Ibadan with its 37.5% contribution to the total per capita household income. It follows closely behind farming as an income source. In the same vein, the non-farm sector (with the two components self-employment and wage employment taken together) contributes 59.6%. This shows that non-farm business is taking a leading role in the rural areas. This is in line with the submission made by Adams (2001) in a study carried out to examine the impact of different sources of income- including non-farm income- on poverty and inequality in rural Egypt and Jordan.

Table 2: Sources of rural income ranked by quintile on the basis of total per capita

Total per capita income Quintile	Average total per capita income	Percentage share in total income	Percent of total per capita income from Agric.	Trading	Artisanship	Private	Govt.	Transfer
Lowest	5,288.15	2.8	-	-	-	-	-	-
Second	12,416.53	6.5	13.38	-	-	-	-	-
Third	20,176.53	10.5	35.88	-	-	-	-	-
Fourth	42,746.14	22.2	40.15	-	-	-	-	-
Highest	111,900.91	58.0	45.53	22.49	15.61	44.4	20.17	0.74
Total	**38,505.65**	**100.0**	**40.0**	**13.0**	**9.1**	**25.8**	**11.7**	**0.4**

Source: Field Survey, 2007

Table 3: Summary of income data by income sources

Source of income		Mean annual per capita household income (PCPHI) (₦)		Percentage of total per capita household income from source	
Agriculture			15,402.38 (20,686.19)	40.0	40.0
Non-farm self employment	Trading	5,034.24 (15,306.54)	8,528.65 (27,237.63)	13.0	
	Artisanship	3,494.42 (23,304.02)		9.1	22.1
Non-farm wage employment	Private	9,938.47 (46,610.33)	14,451.57 (47,679.26)	25.8	
	Government	4,513.10 (13,830.29)		11.7	37.5
Transfer			165.13 (1,394.44)	0.4	0.4
Total		**38,505.65 (52,567.49)**	**38,505.65 (52,567.49)**	**100.0**	**100.0**

Source: Field Survey 2007

Results of Gini decomposition

An overview of the results shows that transfer (0.9870)is the most unequally distributed while agriculture (0.6419) is the least unequally distributed, in other words, it is the most equally distributed. This stems from the nature of the transfer income source which is mostly for the aged whose children reside in the city. Also, the rural dwellers are mostly farmers at the same subsistence level of production. The average value of land holding (0.06ha) attests to this fact. Non-farm self-employment (NFSE) and non-farm wage employment (NFWE) are also highly unequal having Gini values of 0.8869 and 0.8991 respectively.

Table 4: Decomposition of overall rural income inequality

Income source	Proportion of household receiving income source (P_k)	Share in total income (S_k)	Gini coefficient for income source (G_k)	Gini correlation with total income rankings (R_k)	Contribution of income source to overall income inequality ($S_kG_kR_k$)	Relative concentration coefficient of income source ($g_k = R_k \frac{G_k}{G}$)	Proportional (%) contribution to overall income inequality ($S_kG_kR_k/G$)	Source elasticity of total inequality (Relative marginal effect) ($S_kG_kR_k/G$) - S_k
Agriculture	0.7083	0.4000	0.6419	0.8912	0.2288	1.0401	0.4161	0.0161
Non-Farm Self Employment	0.2667	0.2215	0.8869	0.6290	0.1236	1.0143	0.2247	0.0032
Non-Farm Wage Employment	0.2917	0.3753	0.8991	0.5940	0.2004	0.9711	0.3644	- 0.0109
Transfer	0.0167	0.0040	0.9870	0.5096	0.0020	0.9145	0.0037	- 0.0003

Source: Author's calculation

Agriculture has the largest percentage (proportional) contribution to overall income inequality (41.6%) and is highly correlated with total income (0.89). It is important to note that agriculture has maximum contribution to total income (40.0%). Agriculture is followed by non-farm wage employment (NFWE) which has 36.4% contribution to overall income inequality and Gini correlation of 0.59. Transfer has the least contribution.

On whether the income source is inequality-increasing or inequality-decreasing, agriculture (1.0401) and NFSE (1.0143) are inequality-increasing, judging from the values of the relative concentration coefficient and relative marginal effect (g_k>1, RME= +ve). These income sources are associated with rich households. There is an unequal access to agricultural credit (40.9% are not able to secure it) and inputs like fertilizer since land is available to the farming households, though in small holdings. Non-farm wage employment (NFWE) and transfer will reduce inequalities because the relative marginal effects are found to be negative with the value of relative concentration coefficient being less than unity (g_k<1, RME= -ve). This means that the two income sources are in favour of low income group.

These results show that agriculture is the mainstay of the rural economy when each of the sources is considered singly (it contributes 40% to total income). However the non-farm income sources constitute a better alternative since it contributes a total of 59.6% to the total PCPHI. Though NFWE (which consists of government and private employments) is inequality decreasing, the obvious case of the high unemployment rate might

not make it practical to say that government should take in more people into paid employment. However, rural dwellers can be trained so that they become employable by the rural private sector. Also an option can be taken in NFSE by providing funds, which should be equitably distributed through their associations (73.3% belong to social organisations) so that people can stand on their own and be relieved of the capital intensiveness of their businesses. Similarly, specific technical assistance can be rendered especially in the artisanship sub-sector. Finally, government should also ensure equitable access to agricultural credit and other farm inputs because agriculture is still very relevant to the rural economy.

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Macroeconomic analysis of the determinants of private investment in Nigeria

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Abstract: This paper examines the behaviour of private investment and influencing factors in Nigeria. The result reveals that there is a linkage between private investment and economic growth vis-à-vis public investment; exchange rate; corruption perception index; inflation; savings rate; terms of trade; political instability; and credit to private sector. The parsimonious Error correction model (ECM) shows that all variables that are significant have a negative relationship with private investment except domestic credit to private sector. The R^2 of over-parameterized and parsimonious ECM are 98% and 96% respectively. The null hypothesis of no relationship between nominal private investment as a percentage of nominal GDP and other explanatory variables were rejected at 5%, because the F-statistic which test the significant of overall regression result stood at 15.8665 and 28.9937 for over-parameterized and parsimonious regression model respectively. Private investment in Nigeria is being affected negatively by mostly all the explanatory variables and serve as cogs to the wheel of progress in investment at large.

Keywords: Private Investment, Infrastructure, Corruption, Political Instability, Investment Climate

INTRODUCTION

Nigeria like most developing economies has adopted various forms of fiscal and monetary policy reforms since independence to make private sector the driver of economic growth and development through private sector investment. The adoption of Structural Adjustment Programme (SAP) marks a major policy shift to free market economy in 1986. However, the country's enthusiasm with this strategy progressively lost momentum, principally because it failed to deliver its most important promise of sustained economic growth and development. This resulted to an adverse economic performance (Ndebbio and Ekpo, 1991).

Before the 1986 reform, Nigerian economy was more of a public sector economy, where the government controlled the market system through various intervention strategies and massive expansion of the public sector through the establishment of a large number of state enterprises. SAP and NEEDS (National Economic Empowerment and Development Strategy) in the new millennium introduced the move to a new paradigm in which the government only plays essential roles and assign greater role to the private sector. In 2009, vision 20:2020 came on board, an ambition by the government to be among the top 20 economies in the world by year 2020, when we were in number 44, and by 2011, we were in number 36. Although a promising progress but a lot of investment was expected to go into power sector among other sectors of the economy. Government expenditure as a ratio of GDP declined from an average of 18.53 per cent in the decades of the 1990s to an average of 13.43 per cent from 2000 to 2008. But private investment show enormous volatility during the period; it declined from 12.3% of GDP in 1991 to 8.3% of GDP in 1992. This may partly be due to decreased

public investment, which declined over the same period. Private investment then increased to 12.5% in 1993 and to 16.0 % in 1994. It however declined continuously to 8.9% in 1996. The ratio increased again to 13.0% in 1999 before plummeting to its lowest level of 10.7% in 2000. Since 2001, there has been a substantial recovery. Between 2001 and 2005, the ratio average 13.0%; it peaked at 16.2% in 2002 but declined again to 12.0% in 2005 before it further decline to 6.3% in 2008.

Investment plays a crucial role in models of economic growth. It is an essential component of aggregate demand, and fluctuations in investment have considerable effect on economic activity and long-term economic growth. The view that capital formation is the key to growth, called "capital fundamentalism" by Yotopoulos and Nugent (1976), was reflected in the development strategies and plans in many countries. While capital accumulation is no longer viewed as a panacea for poor countries, it is nevertheless clear that even mildly robust growth rates can be sustained over long periods only when countries are able to maintain investment at a sizeable proportion of GDP. This has necessitated some reforms in Nigeria to move toward a more market friendly economy to attract more private investment. The Nigerian economy which was characterized by excessive government control of production, financial intermediation processes and foreign trade variables via the administrative determination of interest rates, prices and exchange rates received a new turn at the adoption of SAP in 1986, and later NEEDS in the 2000s.

The concern of researchers and policy makers is that despite the reform; Nigeria is kept in economic maladies, a few among which are low level of savings and investment, high rate of inflation, high level of unemployment and poverty. Bakare(2011)surmised that the expected role of private sector as an engine of investment and growth never materialized. For instance, the calculated withdrawal of the public sector from the investment scene leaving the stage to private sector to play its role has not been auguring well for the country. The major expansion in private investment needed to sustain economic growth is yet to be achieved.

Macroeconomic indicators highlight these poor performances of private investment in Nigeria between 1986 and 2008. For example, private investment declined from 12.3% of GDP in 1991 to 8.3% of GDP in 1992 and 6.3% in 2008. However, there has been a gradual increase in the ratio.Despite the improvement in economic performance, Nigeria continues to be confronted with a number of constraints. Among the constraints are levels of savings and investment that are too low to allow self-sustained growth. This has caused a lot of concern in government and academic circles about the sustainability of the achievements so far. The level of domestic savings and investment is inadequate to fuel the growth needed to raise standard of living and generate sufficient productive employment.

To bridge the gap between the desired level of private investment needed for sustainable growth and the present, an explicit understanding of the behaviour, attribute and contributing factors to private investment in Nigeria must be understood beyond the present state of ambiguity. This study therefore attempted to answer questions such as: what is the behaviour of private

investment in Nigeria? What are the factors that determine private investment in Nigeria?

Studies have been carried out to examine the determinants of private investment behaviour in Nigeria but the results have been controversial and hence inconclusive (Akpokodje, 1998;Iyoha, 1998;Bamidele and Englana, 1998).Attention has been focused on the traditional determinants of private investment such as output, relative prices, and credit/liquidity and so on. It is interesting to note that domestic credit to the private sector has continued to expand and relative prices tend to favour investment in such sectors as agriculture and manufacturing. However, the expected investment associated with such favourable environment has not been attained. It seems that some other factors are driving the response of the private sector to investment spending beyond relative prices and current profitability (Edoumiekumo, 2012).This study therefore attempted to examine the factors responsible for private investment in Nigeria.

Whereas there is a consensus in the literature on the factors discussed so far, findings of various empirical studies are not, however, consistent on the relationship between interest rates and investment. While certain studies Green and Villanueva (1991), Serven and Solimano (1992) have confirmed the negative relationship between interest rates and investment, study by others Serven and Solimano (1993) has shown that in repressed financial markets, credit policy affects investment in a distorted manner, this study has shown the relationship between private investment, interest rate and growth.

The need for an improved economic growth and sustained development that can productively employ the increasing skilled and unskilled manpower is a major concern of the policy makers at all levels of government in Nigeria. This requires a definite understanding of the investment behaviour especially in the private sector and its response to the counter-part public investment. This study therefore in addition to showing the determinants of private investment in Nigeria, has also shown the effect of public investment on private investment and consequently, growth.

Keynes (1936) called attention to the existence of an independent investment function in the economy. The central feature of the Keynesian analysis is the observation that although savings and investment must be identical ex-post, savings and investment decisions are, in general, taken by different decision makers and there is no reason why ex-ante savings should equal ex-ante investment. The next phase in the evolution of investment theory gave rise to the accelerator theory, which makes investment a linear proportion of changes in output. In the accelerator model, expectations, profitability and capital costs play no role. Keynes argued that investment depends to a large extent on the prospective marginal efficiency of capital, relative to interest rate which is the opportunity cost of capital. He stresses the volatility of private investment given that investors cannot predict for certainty the returns on investment. It follows that investors instinct would be main driving force in investment decision. This corroborates the views of both Keynesian and neoclassical models of investment. Both models argued that income and interest rate are important determinants of investment (Obaseki and Onwioduokit, 1998).

Jorgenson (1967 and 1971) and Hall (1977) reviewed the restrictive assumptions of the accelerator theory and formulated the neoclassical approach. In this approach, optimal capital stock is a function of the level of output and user cost of capital. Lags in decision making and delivery create a gap between current and desired capital stocks, giving rise to an investment equation relating to change in the capital stock. The major drawbacks of this approach are the assumptions of perfect competition and the exogenously given output which are inconsistent. In addition, the assumption of static future prices, output and interest rates is unrealistic given that investment is a futuristic process and the lags in delivery cannot be introduced in an orderly fashion as predicted by the model. The neoclassical model has its major appeal in that it addresses the primary motive for investment- that is profit maximization. This suggests that cost-benefit analysis calculations are at the heart of investors.

On the other hand, Tobin (1969) argued that main focus should be the link between the increase in the value of the firm as a result of installation of an additional unit of capital and its replacement cost. When the increase in the market value of the extra unit exceeds the replacement cost, firms will want to increase their existing capital or vice versa. This ratio identified in the literature as marginal Q, may differ from the other one because of delivery lags and adjustment or installation costs.

Precious (1985) and Hayashi (1982), identified major defects of the average Q, that if firms enjoy economies of scale or cannot sell all their products, marginal or average Q will differ. They argued further that the assumption of increasing installation cost is suspect. This is because the cost of acquiring additional capital stock by the firm is likely to be either proportional to the investment volume, due to the lumpy nature of most investment projects. Furthermore, since capital goods are firm specific with a low second hand value, disinvestment is more costly than investment.

Greene and Villanueva (1991), Balassa (1988), Servenm and Solimano(1992), Serven and Solimano (1993), Skully (1997), Pollard and Qalo (1994), Serven (1997), Jayaraman (1996) Duncan *et al*(1999) and Weder (1998) have carried out empirical and stochastic investigations on the determinants of private investment. Most of them discovered that private investment behaviour is primarily influenced by the profit motive plus other factors such as wage rate, real exchange rate policies, and raw material costs, rate of inflation and appropriate pricing of capital, labour and land. Furthermore, private investment would flourish in a supportive environment of cost reductions in power, transport and communications, which are often provided through public investment. Macroeconomic uncertainty plays a key role in determining investment behaviour in developing countries. Uncertainties arise from high and unstable inflation rate, unstable fiscal deficits, overvaluation or depreciation and exchange rate misalignment. Macroeconomic uncertainty or instability could also arise from political instability or poor macroeconomic management. When the future is highly uncertain, investors defer their investment decisions until ‘the air is clear’. At the microeconomic level firms may decide to limit their capacity in the face of uncertainty in demand conditions, which leads to reduced investment capacity (Udah, 2010).

Another element of uncertainty was introduced by Rodrik (1991) who argued that investors' perception of new policy influences private investment. When a policy reform is introduced, it is very unlikely that the private sector will see it as one hundred percent sustainable. A number of reasons may be adduced, among them the expectation that the political-economic configuration that supported the earlier policies may resurface. There is also the fear that unexpected consequences may lead to a reversal. Investors must respond to the signals generated by the reform for it to be successful. However, rational behaviour calls for withholding investment until much of the uncertainty regarding the eventual success of the reform is eliminated.

Udah (2010) used the co-integration and error correction frameworks of analysis to investigate the extent to which government size and other factors have been successful in improving the conditions needed to stimulate private investment in Nigeria. The study laid emphasis on the implications of policy reforms initiated since the early 1980s. The results showed that government size did not complement private investment initiative, because of inefficiency in government expenditure and poor service delivery. It was found that the reform efforts in the banking system yielded positive results, because credit to the private sector was a significant factor in stimulating private investment in Nigeria. In addition, interest rate, political stability and external debt were significant factors. The paper recommended the need to urgently strengthen the budget preparation and execution process in Nigeria. This, in the opinion of the author, would substantially improve service delivery and efficiency of government expenditure.

Iyoha (1998) investigated the macroeconomic issues important to stimulating investment behaviour in Nigeria. In particular, he estimated equations for both aggregate and private investment. His findings showed that interest rate, marginal product of capital, foreign exchange rate premium, external debt to income ratio and inflation were the key determinants of investment behaviour. His findings also revealed that the major determinants of private investment were public investment, return on investment, foreign exchange premium and a debt overhang variable.

Akpokodje (1998) examined the association between private investment and macroeconomic policies. His paper identified fiscal policy, exchange rate policy and monetary policy as macroeconomic policies. His findings confirmed previous studies submission of a negative impact of real exchange rate and high inflation on private investment in Nigeria. The paper also emphasized the adverse effect of large budget deficits on private capital formation.

Bamidele and Englana (1998) investigated the relationship between macroeconomic environment and private investment behaviour. They found that Nigeria's macroeconomic environment occasioned by policy reversals, political instability and poor infrastructural facilities is responsible for the high cost of doing business in Nigeria. The paper concluded by arguing that macroeconomic stability, reliable and efficient infrastructure, diversified export base, political stability and transparency are factors required to lubricate the engine of economic growth and development in Nigeria.

Bogunjoko (1998) examined private and public investment nexus, and growth and policy reforms in Nigeria. He used VAR framework to simulate and project, inter temporally, private investment response to its principal shocks, namely, public investment, domestic credit and output shocks. The results of the VAR show that government policies that produce sustainable output growth, steady public investment and encouraged the availability of domestic credit to the private sector will promote investment in the long and short term.

Busari and Olaniyan (1998) investigated public investment and policy uncertainty in Nigeria from 1970 to 1994. The paper argued that in a bivariate framework, inflation uncertainty and fiscal deficit uncertainty impacts negatively and significantly on private investment decision. Their findings revealed a weak negative relationship between exchange rate uncertainty and private investment decision. A multivariate extension of the model confirms the bivariate analysis. The paper concluded that the relevant authorities should strive to reduce macroeconomic uncertainty if efforts aimed at improving private investment are to yield any positive and fruitful dividend.

Umoh (1998) investigated the relationship between rural financial markets, investment and rural development. His findings showed high potentials of the daily savings enterprises in financial intermediation process. The paper argued that to rekindled interest in rural savings and given the obvious failure of government initiatives in savings mobilization at the rural level, the daily savings enterprises becomes an important alternatives.

Thomas, (1997) in his study of 86 developing countries examined data on terms of trade, real exchange rates, property rights and civil liberties and concluded that while factors including credit, availability and the quality of physical and human infrastructure are important influences, uncertainty in the investment environment was negatively related to private investment in sub-Saharan countries. Employing the variability in real exchange rates as an explanatory variable in regression analysis, Jayaraman (1996) in his cross-country study on the macroeconomic environment and private investment in six Pacific Island countries observed a statistically significant negative relationship between the variability in the real exchange rate and private investment.

Chete and Akpokodje (1997) study show that private investment in Nigeria is influenced by public investment and other factors including inflation, real exchange rate, change in domestic credit to the private sector and net foreign private capital inflow. Their paper concluded with the argument that public investment crowds in private investment in Nigeria.

Ekpo (1995) investigated the relationship between public investment and private investment. The study attempted to determine the influence of different categories of public expenditure on private investment. The study isolated infrastructure expenditure (which is social services expenditure that does not compete with private investment) from real sector expenditure like manufacturing and construction which compete with private investment. Social services crowd in private investment while expenditure in real activities like manufacturing and construction crowd out private investment. The study opined

that the result strongly suggested that the private sector is better placed to invest in construction and manufacturing. The empirical findings further revealed that capital expenditure on agriculture positively influence investment, while capital expenditure on education and health exerts positive impact on private investment.

The focus of Blejer and Khan's (1994) study was on the role of government policy in stimulating investment. They derived an explicit functional relationship between the principle policy instruments and private capital formation. Using the model they investigated the extent of the crowding out phenomenon. Their study made a distinction between government investment that is related to the development of infrastructure and government investment of other kind. Ariyo and Raheem (1991) attempted an inquiry into the determinants of investment in Nigeria. The determinants of investment highlighted in their study include public investment, rate of growth of GDP, domestic credit to the private sector and interest rate. Their findings showed a strong evidence of the 'crowding out' among the variables estimated. Outside Nigeria, Martin and Wasom (1992) modeled private investment in Kenya with the real exchange rate, foreign exchange reserves, credit, public investment and incomes as argument. Their results indicate the significance of all variables except interest rate and income.

Shonekan (1997) highlighted the usefulness of public sector expenditure to the development of Nigeria's private sector enterprises. He argued that public spending squeeze tends to produce recession of some sort in private sector operation. This underscores the annual ritual of private enterprises, who, usually wait for the direction of government policies and programmes through budget statements before making any new commitment. Obadan (1997) had argued that the success of most private firms in most cases is not based on any managerial expertise; rather it comes from government continued patronage. Ajakaiye (1997) summarizes this position by saying that a large part of what the public perceived as private sector profits are essentially transfers, through various tricks, from public sector organization. Atoyebi *et al.*, 2012, using a time series data for Nigeria over the period 1970-2008 concluded that if the sector lack adequate credit then there will be a reduction in the level of private investment with adverse effect on the long term productive capacity of the private sector

METHODOLOGY

This methodology draws on Bakare, 2011. From the literature and particularly the accelerator model, we can derive an investment model that will permit us to study the determinants of investment for Nigeria. In the accelerator model, expectations, profitability and capital costs play no role. Keynesians have traditionally favoured the accelerator theory of investment while disregarding the role of factor costs. A more general form of the accelerator model is the flexible accelerator model. The basic notion behind this model is that the larger the gap between the existing capital stock and the desired capital stock, the greater a firm's rate of investment. The hypothesis is that firms plan to close a fraction of the gap between the desired capital stock, K*, and the actual capital stock, K, in each period. This gives rise to a net investment equation of the form of:

$I = \delta (K^* - K_t)$ …….. (1)

Where I = net investment, K* = desired capital stock, K_t = last period's capital stock, and δ = partial adjustment coefficient. Within the framework of the flexible accelerator model, output, internal funds, cost of external financing and other variables may be included as determinants of K*. In the flexible accelerator model, K* is proportional to output, but in alternative models, K* depends on capacity utilization, internal funds, the cost of external finance and other variables. The other variables to be included might be selective of the socio-political and economic environment otherwise called the investment climate of a nation.

Many researchers encounter problems with the presence of unit roots when they estimate econometric models from time series. Consequently, some of them then use data that are differenced at least once to test the soundness of various theories. Nevertheless, using these differenced data means that sometimes essential long-run relationships between variables are ignored (Engel & Granger, 1987). Therefore, the Engel-Granger approach to long-run estimation is used to test whether the gross domestic product portrays any long-run relationship with the regressors or not.

This approach follows a three-step procedure. The first step is to test the existence of unit root for each series in the model; and second step is to specify the long-run relationship. If the variables are found to be co-integrated, one then moves on to the third step, namely to apply the unit root test to the residual. This tests whether there is a co-integration relationship amongst the variables. If this residual is stationary, then the next step is to include the error correction variable in the equation and this will be the appropriate model, than a model in pure first difference. Hence this model will not only give the long-run relationship but also give the short run relationship as well.

In this paper, the Augmented Dickey-Fuller (ADF) test will be employed to test for stationarity as this regression consist of 42 observations.

$$\Delta Y_t = \beta_1 + \beta_2 + \delta Y_{(t-1)} + \sum_{i=2}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \qquad (2)$$

Where, t= the time trend, m= the number of lags, ε_t is the stochastic white noise error term.

The null hypothesis of ADF is that the variables are non stationary and alternative hypothesis is that variables are stationary. The t-statistics of this regression is checked for the acceptance and rejection of hypothesis. If t-statistics of ADF test is greater than critical values then accept the alternative hypothesis and series are stationary. If series are not stationary at level then it is tested at first difference to make them stationary.

Model Specification

The model adapted from Bakare (2011) is stated as -

$$\mathbf{PRGDP} = \alpha_1 + \alpha_2 \mathbf{PUBINV}_t + \alpha_3 \mathbf{NEXR}_t + \alpha_4 \mathbf{CPI} + \alpha_5 \mathbf{INTR}_t + \alpha_6 \mathbf{SAVR} + \alpha_7 \mathbf{TOT} + \alpha_8 \mathbf{FDI} + \alpha_9 \mathbf{PRIVCRED} + \alpha_{10} \mathbf{D} + \mu_t \quad \text{---------- (3)}$$

PRGDP = Nominal private investment as a percentage of nominal GDP

PUBINV = Nominal public investment as a percentage of nominal GDP

NEXR = Nominal exchange rate = nominal exchange rate as the ratio of Nigeria currency in term of US dollar (NEXR is defined in such way that an increase implies depreciation)

CPI = Corruption Perception index.

MINS = Macroeconomic instability (proxied by the inflation rate)

INFRAST = Infrastructure (proxied by power supply)

INTR = Interest Rate

SAVR = Savings Rate.

TOT = Terms of Trade

PRIVCRED = Domestic Credit to Private sector (% of GDP)

FDI = Foreign Direct Investment

D = Dummy for political instability (proxy for investment climate), D = 1 for positive political years, and 0 otherwise

μ_t = Error Term.

With regard to *a priori* expectations, first, the recent favourable interest rate policy in Nigeria is expected to induce the private investor, especially the new investor, to invest more since this may be an indication of a good investment climate. Therefore, INTR is expected to have a positive impact on private investment. Theoretically, the effect of public investment on private investment is ambiguous. The explanation is that, while government investment in infrastructure is expected to be complementary to private investment, government investment in non-infrastructure may compete with private investment especially if the government competes with the private sector for funds or in the product market. Blejer and Khan (1984) show by decomposing public investment into infrastructural and non-infrastructural investment that government investment in infrastructure is complementary to private investment whereas other types of government investment are not.

CPI is expected to have a negative sign, theoretically, one would expect corruption to hamper private investment through at least three channels. First, corruption requires an external transfer that, under conditions of limited external financing, leads to reduced investible resources. Second, the anticipated tax associated with future corruption reduces the anticipated return on investment. All the two components of corruption are expected to have negative influences on investment. The measure of political instability is expected to influence investment negatively.

INFRAST is expected to impact negatively on private investment. As earlier stated there is poor and inadequate power supply in Nigeria which is expected to hamper investment. SAVR is expected to impact positively on private investment. Savings and investment are complimentary. The higher the savings, the higher will be the investment. Economic theory suggested that whatever is saved is assumed to have been invested. MINS which captures the macroeconomic instability is expected to affect private investment negatively particularly if the inflation is hyperinflation type.

Sources of Data

The study focused on the determinants of private domestic investment in Nigerian economy from 1970 – 2011. Time series secondary data were used for the analysis (1970 – 2011, 42 Observations). The secondary data were obtained from such publications as World Bank Digest of Statistics, Central Bank of Nigeria statistical bulletin and World Development Indicators (WDI).

Data Analysis and Interpretation of Results

This section provides in detail the analysis of data used in the study and interpretation of the empirical results. The unit root test was performed to confirm the stationarity of data; the co-

integration test was used to establish the existence of a long-run equilibrium relationship among the variables while the error correction mechanism shows the speed of adjustment of the dependent variable to changes in the independent variables.

Unit Root Test

Non-stationary data produces spurious regression and also reduce the precision of the regression model; hence the result may be misleading. Therefore, it is important to establish the stationarity of data. This is carried out using the Augmented Dickey-Fuller (ADF) unit root test. The decision rule is that the ADF test statistic value must be greater than the Mackinnon critical value at any of the conventional level of significance (1%, 5%, and 10%) and at absolute value. However, 5% was chosen as the level of significance for this study. The table below shows the summary of unit root test conducted on the parameter at level.

Table 4.1: Unit root test at first difference

Variables	ADF Test Statistic Value	Mackinnon critical Value at 5%	Remark	Order
PRGDP	-7.446581	-2.936942	Stationary	I(1)
PUBINV	--3.410585	-2.963972	Stationary	I(2)
NEXR	-5.225944	-2.936942	Stationary	I(1)
MINS	-6.481091	-2.938987	Stationary	I(1)
INFRAST	-7.937645	-2.936942	Stationary	I(1)
CPI	-5.355174	-2.936942	Stationary	I(1)
SAVR	-7.545212	-2.936942	Stationary	I(1)
FDI	-4.713362	-2.936942	Stationary	I(1)
PRIVCRED	-5.623285	-2.941145	Stationary	I(1)
TOT	-5.946262	-2.963972	Stationary	I(1)
INTR	-7.092776	-3.605593	Stationary	I(1)

Source: Authors Computation

From Table 4.1, it can be deduced that all the variables are non-stationary at level, but stationary at first difference, except PUBINV (i.e. integrated of order 2) because they have their Augmented Dickey Fuller (ADF) statistics greater than Mackinnon critical value at 5%. However, since nearly all the variables are I(1), it gives an indication that the variables are co-integrated in the same order.

Co-Integration: The essence of co-integration test is to ascertain if a long-run equilibrium relationship exist among variables of the model. Decision rule requires that the traced statistics and Maximum-Eigen statistic (likelihood ratio) must be greater than 5% critical ratio at None Hypothesized. However, both of them should establish the number of co-integration that exists among variables. The table below shows the summary of result from analysis conducted on the specified model. The result of Trace statistic and Maximum-Eigen statistic indicate fully confirmed that five variables (PRGDP, PUBINV, MINS, CPI, SAVR, and FDI) co-integrate and thus have long-run equilibrium relationship.

Table 4.2: Johansen co-integration result

Series: PRGDP PUBINV MINS CPI SAVR FDI PRIVCRED TOT INTR

Lags interval (in first differences): 1 to 1

Unrestricted Co-integration Rank Test (Trace)

Hypothesised No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.982257	419.2771	215.1232	0.0000
At most 1 *	0.963281	298.3249	175.1715	0.0000
At most 2 *	0.906906	199.1912	139.2753	0.0000
At most 3 *	0.781876	127.9669	107.3466	0.0011
At most 4 *	0.616948	82.28614	79.34145	0.0295
At most 5	0.578862	53.49861	55.24578	0.0707
At most 6	0.446968	27.55477	35.01090	0.2499
At most 7	0.265686	9.784607	18.39771	0.5014
At most 8	0.017185	0.520045	3.841466	0.4708

Trace test indicates 5 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Co-integration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.982257	120.9521	61.80550	0.0000
At most 1 *	0.963281	99.13378	55.72819	0.0000
At most 2 *	0.906906	71.22430	49.58633	0.0001
At most 3 *	0.781876	45.68072	43.41977	0.0279
At most 4	0.616948	28.78753	37.16359	0.3304
At most 5	0.578862	25.94384	30.81507	0.1756
At most 6	0.446968	17.77017	24.25202	0.2843
At most 7	0.265686	9.264562	17.14769	0.4685
At most 8	0.017185	0.520045	3.841466	0.4708

Max-eigen value test indicates 4 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Authors Computation

Having established the extent and form of co-integrating relationships between the variables of the model, an ECM can then be estimated. First, an over-parameterized ECM was estimated and this specification established lag lengths on all variables. This was specified in order not to lose information of the variables by lagging all the variables once. At this stage, the over-parameterized model was found to be difficult to interpret in any meaningful way but could still be explained to some extent based on the probability values. This then led to the simplification of the model into a more interpretable characterization of the data. That is, a parsimonious ECM was estimated.

Parsimony helped to ensure data admissibility and proper clarification on whether the model was consistent with theory, and with the estimation, non-significant variables were dropped from the model. The overall validity of the reduction sequence sought to minimize the goodness of fit of the model with minimum number of variables. The decision rule for choosing which of the two models had the best fit (i.e. whether over-parameterized or parsimonious model) is indicated in the Schwarz criterion. Thus, a fall in *Schwarz criterion* is an indication of model parsimony; that is, the model is significant with theory.

Results of Stationarity Tests: The analysis begins with a consideration of the time series characteristics of the data employed. This was achieved by considering the order of integration of each series using the Dickey-Fuller (DF) and the Augmented Dickey Fuller (ADF) classes of unit root tests. The results are displayed in Table 4.1 and the ADF tests strongly support the hypothesis that almost all the explanatory variables are I(1) or non-stationary at levels. This suggests the need to difference the variables twice to obtain stationary or 1(0) series. Cases of a higher order integration I(2) also exist for the variable representing the value of public investment (PUBINV). By implication, the variables should be differenced twice in order to attain stationary in the series.

Results of the Co-integration Analysis: The tests try to establish whether there was long run relationship between the dependent and independent variables. Table 4.2 shows the result of the co-integration tests conducted. However, it is obvious that the absolute value of the DF test statistic was greater than its corresponding critical value, so co-integration was not rejected based on the DF test while the absolute value of the ADF test statistic was less than its critical value, so co-integration was rejected by the ADF test, thus signifying no co-integration. In fact, the Trace and Maximum-Eigen value confirms that five and four variables are co-integrated respectively.

Error Correction Model: The existence of co-integration among the dependent variables and their determinants necessitated the specification of ECM for gross domestic product. An over-parameterized model was thus specified in order not to lose information on the variables. In this regard, all the variables were lagged once. The ECM produced the expected negative sign and the estimate was statistically significant (Table 4.4). Thus, it reinforced the finding of the DF test that there is a long-run structural relationship between PRGD Pandits regressors. The coefficient in particular showed that the speed of adjustment of PRGDP to disequilibria from the long-term values of the explanatory variables was 0.5309 percent.

The result over-parameterized Error Correction Model in Table 4.3 indicates that the value of Nominal exchange rate (NEXR)has a negative and significant relationship with PRGDP, therefore an increase in NEXR by $1 holding the influence of other regressors constant will reduce PRGDP on average by about 3%. Similarly, there is negative and significant relationship between RGDP and CPI ; but sweeping out the influence of other explanatory variables on PRGDP, will make private investment to fall on average by about 2% if CPI get worse. However, a negative and significant relationship exists between PRGDP and Foreign Direct Investment (FDI), while a positive and significant relationship emerges between PRGDP and Private Credit (PRIVCRED).

The terms of trade (TOT) has a negative and significant relationship with PRGDP, thus an improvement in TOT will reduce private investment by about 1% because improvement reduces the unit price of domestic goods that can be exchanged for foreign goods. Hence, allowing for the influence of other regressors on PRGDP, will reduce private investment on average by less than 1%, if FDI increases by $1 million but will increase private investment on average by about 8%, if credit to private sector increases by $1 million. Meanwhile, the dummy variable has the expected sign, but it is insignificant.

The parsimonious ECM shows that all the variables have either positive or negative significant relationship with PRGDP except public investment and dummy variable. However, the R^2 of over-parameterized and parsimonious ECM are 0.9812 and 0.9621 respectively. This implies that about 98.1% and 96.2% variation in GDP is jointly explained by the explanatory variables in over-parameterized and parsimonious ECM respectively. The ECM variable in over-parameterized model has an expected negative sign but it was statistically insignificant; while the variable was negative and significant under parsimonious ECM. There is no evidence of autocorrelation in parsimonious ECM (DW=2.1415), but exist in over-parameterized ECM (DW=2.3892).

Moreover, evidence contained in Tables 4.3 and 4.4 indicated that the Schwarz criterion reduced from 1.3157 in the over-parameterized model to 1.0194 in the parsimonious model, thus implying that the parsimonious model carried more information. In other words, the restricted model performed better than the full model because the lower the Schwarz criterion the better or preferred the model while comparing. The overall regression result is significant; since the F-statistic is statistically significant in both models and thus rejects the null hypothesis of no relationship between PRGDP and other explanatory variables.

Table 4.3: Result of over-paramatized ECM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.533121	0.823524	3.075952	0.0179
PUBINV	1.26E-06	9.56E-07	1.314515	0.2301
PUBINV (-1)	8.70E-07	1.59E-06	0.547979	0.6007
PUBINV (-2)	-7.63E-08	1.43E-06	-0.053556	0.9588
NEXR	-0.039737	0.013301	-2.987537	0.0203**
NEXR (-1)	0.040407	0.015108	2.674625	0.0318**
MINS	0.002718	0.005156	0.527151	0.6144
MINS (-1)	0.004113	0.005300	0.776083	0.4631
INFRAST	3.45E-11	4.97E-11	0.694103	0.5100
INFRAST (-1)	6.10E-11	5.10E-11	1.196218	0.2706
CPI	-1.199847	0.490936	-2.444001	0.0445**
CPI (-1)	-0.621989	0.562618	-1.105526	0.3055
SAVR	0.005826	0.015841	0.367784	0.7239
SAVR (-1)	-0.003393	0.012222	-0.277641	0.7893
TOT	-0.007405	0.004482	-1.652076	0.1425

TOT(-1)	-0.011271	0.005126	-2.198876	0.0638**
FDI	-1.99E-10	9.29E-11	-2.141611	0.0695**
FDI(-1)	1.19E-10	7.70E-11	1.541868	0.1670
INTR	-0.000206	0.021087	-0.009781	0.9925
INTR(-1)	0.000521	0.026615	0.019591	0.9849
PRIVCRED	0.079230	0.030741	2.577365	0.0366**
PRIVCRED(-1)	0.029496	0.039647	0.743966	0.4811
DUM	-0.020118	0.164627	-0.122206	0.9062
ECM(-1)	0.530926	0.444097	1.195518	0.2708

R-squared	0.981179	Mean dependent var	1.648971
Adjusted R-squared	0.919340	S.D. dependent var	0.916165
S.E. of regression	0.260197	Akaike information criterion	0.205558
Sum squared resid	0.473919	Schwarz criterion	1.315742
Log likelihood	20.81385	Hannan-Quinn criter.	0.567451
F-statistic	15.86656	Durbin-Watson stat	2.389288
Prob(F-statistic)	0.000494		

Source: Authors Computation

Table 4.4: Result of parsimonous ECM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.263036	0.392950	8.303936	0.0000
PUBINV	1.06E-06	7.58E-07	1.393469	0.1825
NEXR	-0.032863	0.009978	-3.293672	0.0046
NEXR (-1)	0.036300	0.011308	3.210222	0.0055
CPI	-0.941717	0.327376	-2.876566	0.0110
CPI (-1)	-0.528088	0.250422	-2.108788	0.0511
TOT	-0.008219	0.002984	-2.753880	0.0141
TOT (-1)	-0.011302	0.003051	-3.704388	0.0019
FDI	-1.11E-10	4.83E-11	-2.297075	0.0354
FDI (-1)	8.99E-11	4.23E-11	2.125377	0.0495
INTR (-1)	-0.030297	0.015301	1.980077	0.0652
PRIVCRED	0.080105	0.021671	3.696323	0.0020
PRIVCRED (-1)	0.022638	0.017785	1.272864	0.2213
DUM	-0.146375	0.110281	-1.327291	0.2030
ECM (-1)	-0.460182	-0.269747	-1.705976	0.0073

R-squared	0.962077	Mean dependent var	1.648971
Adjusted R-squared	0.928895	S.D. dependent var	0.916165
S.E. of regression	0.244300	Akaike info criterion	0.325503
Sum squared resid	0.954919	Schwarz criterion	1.019367
Log likelihood	9.954709	Hannan-Quinn criter.	0.551685
F-statistic	28.99373	Durbin-Watson stat	2.141544
Prob(F-statistic)	0.000000		

Source: Authors Computation

SUMMARY AND CONCLUSION

The major objective of the study is to examine the behaviour of private investment in Nigeria and investigate the factors responsible for them. This study reveals that there is a linkage between private investment and economic growth vis-à-vis public investment; exchange rate; corruption perception index; inflation; saving rate; terms of trade; political instability; and credit to private sector. The parsimonious ECM shows that all variables that are significant have a negative relationship with private investment except domestic credit to private sector that has positive relationship. However R^2 of over-parameterized and parsimonious ECM are 98% and 96% respectively. The null hypothesis of no relationship between nominal private investment as a percentage of nominal GDP and other explanatory variables were rejected at 5% level of significance, because the F-statistic which test the significant of overall regression result stood at 15.8665 and 28.9937 for

over-parameterized and parsimonious regression model respectively.

It can however be concluded that private investment in Nigeria is being affected negatively by mostly all the explanatory variables and thus serve as cogs to the wheel of progress in investment at large. The study shows that private investment and public investment are not complementary; rather, public investment crowded out private domestic investment in Nigeria. The macroeconomic instability and political instability were found to be among significant factors that militate against private investment in Nigeria. However, the overall measures were identified as a major hindrance to private investment. This reveals a poor investment climate and its detrimental effect on private investment. Thus, the investment climate constitutes a bad indicator for current investment decisions.

RECOMMENDATIONS

In order for private sector to be a pivotal force in Nigeria economic growth and development, the following suggestions are recommended. The publicity about various incentives given to private sector should increase and areas of investment for potential investors should also be specified. There is need to also sensitize Nigerians about the advantages of investing in our economy, rather than saving or investing their money abroad. Similarly, domestic consumers also need sensitization towards their perception about made in Nigeria product or else, our large population will only be a variable of economic growth to other countries at the expense of domestic economy. Policies that address only some components of macroeconomic and political instability may not be enough to improve private investment. For policies to improve private sector response, all components that is, capital expenditure on infrastructure, the exchange rate, the inflation rate, the lending rate, must be addressed simultaneously.

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Marketing of perishable agricultural products in Benin City: A case study of tomatoes, bananas and pineapples

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Abstract: Fruits and vegetable production forms a substantial percentage of the major food crops cultivated in the tropics. The quantity of the products available to the consumers rather than the level of production is more important. This study is aimed at providing information on the marketing of perishable agricultural products in major markets in Benin City. Primary data were collected using a well- structured questionnaire administered to ninety respondents from the three major markets in the study area. Descriptive statistics and gross margin analysis were employed on data. The Likert scale was used to examine the marketing constraints in the study area. Result of the study showed that majority (92.22%) of the respondents were female, 40.00% had no formal education and 44.44% of them were in their economic active age. A mean net profit of ₦1278.71, ₦1473.27 and ₦1564.27 were recorded on the tomato, banana and pineapple respectively indicating that the enterprise is profitable. Poor transportation, poor packaging, rough handling and high temperature were the major constraints to tomato, banana and pineapple marketing in the study area.

Keywords: Perishable Crops, Gross Margin, Markets.

INTRODUCTION

The importance of perishable agricultural products such as fruits and vegetables cannot be over emphasized, since they are of great nutritional value, important source of vitamins and minerals and an essential component of human diet. Consequentially, there had been increased trade / commerce activities surrounding these commodities (Egharevba, 1995). Vegetable production forms certain percentage (25%) of the major food crops cultivated in the tropics and so it is the source of livelihood for a considerable section of the population (Kara and Bani, 1988)

In spite of their importance in the diet, per capita consumption of vegetables and fruits in the developing world is only 100g compared with 220g in the more advanced countries (Messiean, 1992). In Nigeria, enormous quantities of fruits and vegetables are produced and staggering figures are sometimes given as estimated annual production. For example, figures like 3.8 million tones of onions, 6 million tones of Tomatoes, 15 millions tones of Plantain and 35 million tones of citrus have been quoted as annual production levels for some fruits and vegetables, which are real large quantities of food crops (Oyeniran, 1988; Erinle, 1988). However, it is the amount of the products available to the consumer rather than the level of production that is more important.

During the past thirty years, less than 5% of the funding provided for fruits and vegetables has been invested towards post-harvest areas of concern, while more than 95% has gone towards trying to increase production (Kader and Rolle, 2004). This shows that research attention over time have been given to production technology of fresh products, while more work needs to be done on their marketing and the constraints that enhances or induces their perishability leading to losses in terms of spoilage and wastage.

Marketing of perishable crops is quite complex and risky due to the perishable nature of the products, seasonal production and bulkiness. Moreover, the marketing arrangements at different stages also play an important role in price levels at various stages namely from farm gate to the ultimate user. These features make the marketing system of fruits and vegetables to differ from other agricultural commodities, particularly improvising time, form and space utilities. While the market infrastructure is better developed for food grains, fruits and vegetables markets are not that well developed and markets are congested and unhygienic (Sharan, 1998). In Nigeria, losses as high as 50% are common in fruits and vegetables between rural production and town consumption (Oyenira, 1988). These losses, as it is noted occurred during transportation, storage and marketing (Idah, Ajisegiri and Yisa, 2007; Okhuoya, 1995)

The markets for most agricultural products are interrelated, some more closely than others. Nigeria constitutes a tremendous market for perishable agricultural products. Prices of these products and consumption pattern have changed in recent years. The problems of food insecurity and hunger have continued to attract the attention of experts and government worldwide (Babatunde, Omotesho and Sholaton, 2007).

In Nigeria as at 2000, the total population estimate stood at 123,337,800 million people, this number increased to 170,123,700 in the year 2012, which shows a growth rate of 3.8% between 2000 to 2012 (Mondi index, 2012). This indicates that Nigerian population is among the fast growing population in the world. On the other hand, food production increases marginally at a rate lower than population growth rate. This is an issue to worry about as population growth rate exceeds that of food output. Increased production without corresponding increase in marketing may amount to wastages of resources (Adetunji and Adesiyan, 2008). Food self-sufficiency could be attained if the rate of perishability of agricultural products and problems associated with its marketing and distribution such as spoilage and wastage are minimized.

Perishability by definition is to lose natural qualities or decay. This implies that they are the kind of foods that go bad rapidly if a preservation technique is not employed. They include fruits, vegetables and flowers. They require timely harvesting, efficient transportation and advanced storage and processing. The perishables lack the hard texture of cereal or grain legumes and thus are very susceptible to spoilage. Examples of perishable agricultural products include fruits and vegetables such as: onions, tomato, plantain, banana, pineapple, apple, etc.

"Marketing" can be defined as the performance of all business activities involved in the flow of goods and services from the point of initial agricultural production until they are in the

hands of the ultimate consumers" (Panda, 2011). In subsistence economy agricultural marketing may be of little significance since farmers only produce food for their household to eat leaving very little or nothing to sell, but as agriculture is becoming commercialized, agricultural marketing becomes very important (Adegeye and Dittoh, 1985). Agricultural marketing comprises all operations involved in the movement of farm products from the producer to the ultimate consumers.

In Nigeria, most of the fruits are grown in the southern area; a large majority of the vegetables are grown in the northern part of the country. (Oyeniran, 1988; Erinle, 1988). Therefore, there is a well-established North – South trade route in this produce. The major types of fruits and vegetables being transported over long distances and marketed include oranges, pineapples, mangos, bananas and pawpaw and others include tomato, pepper, onion and okra.

The marketing of perishable agricultural products warrant special attention for several reasons. First, the marketer's aim is to be able to bring his product directly or indirectly from the production centre into the hands of the final consumer at an affordable price and a reasonable level of profit. It suffices to say here that the marketers find it difficult to fully actualize this purpose because they are constrained by the nature of these products and other marketing constraints in carrying out their marketing function

The objective of the study is to carry out an economic analysis of marketing of tomato, banana and pineapple in major markets in Benin City.

The specific objectives are to:

- identify the socio economic characteristics of tomato, banana and pineapple marketers in the study area;
- determine the cost and returns to tomato, banana and pineapple marketing in the study area and
- identify the constraints in the marketing of these perishables in the area.

The study will generate information on how to help marketers and sensitize potential investors in marketing perishables. Also it will contribute to improvement in policy formulation and implementation as regards food self-sufficiency. Since marketing is performed in a dynamic environment, the marketing of perishable agricultural products should be continuous.

METHODOLOGY

The Research was conducted in Oredo Local government area in Benin City the capital of Edo State in Southern Nigeria.

Edo State is bounded in the North and East by Kogi State, in the South by Delta State and in the West by Ondo State. It lies within the geographical coordinates of longitude $06^{o}04^{o}$E and $06^{o}43^{o}$ E and latitude $05^{o}44^{o}$ N of the Greenwich. It occupies a total land area of 17,802km.The total population of the area is 3,233,366 (wikipedia 2013).

The State is divided into three agricultural zones, based on Edo State Agricultural Development Project delineation, comprising Edo South, Edo Central and Edo North. Edo South is made up of seven LGAs, Edo Central has five LGAs, and Edo North has six LGAs making a total of 18 LGAs. Oredo local government area is one of the LGAs in Edo Central. Agriculture is the

predominant occupation of the people in Edo State. The major cash crops produced are rubber, cocoa and palm produce. In addition, the State produces such crops as yams, cassava, rice, plantains, guinea-corn, and assorted types of fruits and vegetables such as mango, banana, pineapple, orange (Edo State Government, 2007).

A purposive sampling method was used to collect data from the three studied markets because there was influx of tomato, banana and pineapple marketers in these markets.

A sample size of 30 respondents and the 3 perishable commodities was taken from the 3 studied markets making a total of 90 respondents that were used for the analysis.

Sample selection was done in three urban markets in Oredo local government area in Benin City, which is New Benin, Oliha and Oba market. This is because Benin is crowded with fruit and vegetable marketers. A well-structured questionnaire was administered to a total numbers of 90 respondents, 30 from each 3 perishables and each studied markets. The questions were designed to elicit information on: Socio economic characteristics of the marketers, this include age, sex, marital status, household size and marketing experience; the cost and return analysis of tomato, banana and pineapple marketers and the constraints faced by the marketers in the study area.

Data obtained on the socio economic characteristics were analyzed using descriptive statistics such as frequency counts, percentages and mean scores. Gross margin was used to determine the cost and return analysis of the enterprise. Likert Scale as adopted from Osuala, (1993), was used to determine the marketing constraints based on questions and responses from the marketers in the study area. The responses were grouped into five points comprising of 5 = Very serious, 4 = Serious, 3 = Moderately serious, 2 = Least serious, 1 = Not serious.

Model specification

Gross margin (GM) technique

GM = TR-TVC……. (1)

Profit $(\bar{\Lambda}) = TR - TC$

$TR = P_iQ_i$

Where:

TR = Total Revenue,

P = Price unit of tomato basket or bunch of banana or pineapple in ₦/kg/day

Q = Quantity of a unit tomato or bunch of banana or pineapple in ₦/kg/day

Likert Scale Formula

$$\bar{X} - \frac{\Sigma X_i}{N}$$

Where n = 1, 2, 3, 4 ….n

N = the number of occurrence

X = the assigned value of constraint

Σ = summation sign

Where:

x1 = Transportation,

x2 = Poor Packaging,

x3 = Rough Handling,

x4 = High Temperature,

x5 = Method of Storage,

x6 = Selling at reduced Price

RESULTS AND DISCUSSION

The socio economic characteristics of the respondents which include sex, age, education, household size and marketing experience are presented in Table 1.

The result of the study showed that most of the respondents were females (92.22%). This

indicates that women are more involved in the marketing of tomato, banana and pineapple in the study area than males who are more active in the production of these crops. These findings are in agreement with the works of Izekor and Abiola (2011); Kalu and Rachael (2006). Majority of the marketers showed that 44.44% were between the ages of 41-50 years followed by those between 31-40years with a value of 33.33%.This indicates that respondents are in their economic active years. The result indicated that 40.00% of the respondents had no formal education, 17.78% had primary and 35.56% had secondary education while only 6.66% had tertiary education . The result also revealed that majority were married (65.56%) while others were either single (12.22%), divorced (14.44%) or widowed (7.78%).This indicates that the marketing of perishables is a good source of generating income for supporting families in the study area. It was observed that majority (51.11%) of the respondents had household size of 6 – 10, indicative of high dependency rate. It was observed that only 11.11% of the respondents had marketing experience of less than five years, others had experience of between 6-10years (23.33%) with majority of the respondents (51.11%) having more than ten years of marketing experience. This indicates that a large number of the perishable marketers in the study area have been in business for a long time and would have some business techniques and the needed experience.

Table 1: Socio-Economic Characteristics of Respondent

Personal Characteristics/Variable	Frequency	Percent
Sex		
Male	7	7.78
Female	83	92.22
Age		
10-20	3	3.33
21-30	10	11.11
31-40	30	33.33
41-50	40	44.44
Above 50	7	7.77
Educational level		
No Formal Education	36	40.00
Primary	16	17.78
Secondary	32	35.56
Tertiary	6	6.66
Marital status		
Single	11	12.22
Married	59	65.56
Divorced	13	14.44
Widowed	7	7.78
Household Size (HH)		
1-5	32	35.56
6-10	46	51.11
Above 10	12	13.33
Marketing Experience		
0-5	10	11.11
6-10	21	23.33
11-15	46	51.11
Above 15	13	14.44

Source: Field Survey, 2013

The result of the cost and return analysis of the three perishable crops is presented in Table 2, the mean total variable cost in the marketing of the three perishable crops: tomato, banana and pineapple were ₦9595, ₦6200 and ₦4101.67 respectively. The difference in the variable cost of the 3 perishable products was as a result of the difference in the various cost involved in marketing, for example more cost are incurred in tomato marketing than the other enterprises. The total fixed cost for the 3 products were ₦459.62, ₦126.73 and ₦100.73 respectively.

The mean total sales for the three crops were ₦11333.33, ₦7800 and ₦5766.67 respectively. This implies that these marketers operated at different levels of markets and different factors which tend to affect their cost levels.

The results also showed that mean gross margin (GM) in each of the enterprise combination of the perishable crops were ₦1738.33, N1600, ₦1665 respectively. The study further showed a mean net profit for tomato, banana and pineapple were ₦1278.71, ₦1473.27 and ₦1564.27 respectively. This reveals that the marketing of these perishable crops is a profitable venture since their gross margin was greater than zero and in the short run should be encouraged in the study area. Also the mean profit was highest in pineapple product, it could be deduced that it was due to its low perishability.

Table 2: Cost and Returns Analysis of the Perishable Crops

Cost Items	**Products**		
Variable cost	**Tomato (₦/kg/day)**	**Banana (₦/kg/day)**	**Pineapple (₦/kg/day)**
Purchase cost	9233.33	5766.67	3766.67
Transportation cost	200	250	215
Loading and off loading	96.67	183.33	120
Packaging	45	NA	NA
Ticket	20	NA	NA
Total Variable Cost (TVC)	9595	6200	4101.67
Fixed cost			
Rent/daily	95.56	62.67	36.67
Shed/ground cost	350	50	50
Security	6.67	6.67	6.67
Sanitation	6.67	6.67	6.67
Mean Depreciation	0.72	0.72	0.72
Total Fixed Cost (TFC)	459.62	126.73	100.73
Total Cost and Return Analysis			
Total Cost (TC)	10054.62	6326.73	4202.40
Total Revenue (TR)	11333.33	7800	5766.67
Marketing Margin (MM)	2100	2033.33	2000
Gross Margin=TR – TVC	1738.33	1600	1665
Profit=TR – TC	1278.71	1473.27	1564.27

Source: Field Survey Data, 2013

The various constraints limiting the marketing of the 3 perishable products were identified by the respondents. These constraints were ranked on a Likert type scale and presented in table 3. It shows four major constraints as ranked by the respondents in order of hierarchy which include transportation (4.22), poor packaging (4.16), rough handling (4.14), and high temperature (3.64). This supports the work of Izekor and Abiola (2011) which shows that poor transportation and road network are major constraints to post-harvest losses in green vegetable marketing. Also, the work of Oyeniran, (1988),Idah, Ajisegiri and Yisa,(2007) asserted that as high as 50% losses are common in fruits and vegetables which occurred during transportation, storage and marketing.

Table 3: Marketing constraints of the perishable products

Constraints	**Mean**	**S.D**
Transportation	4.22**	1.86
Packaging	4.16**	1.85
Rough Handling	4.14**	1.69
High Temperature/Heat	3.64**	1.81
Method of Storage	2.95*	1.66
Selling at reduce Price	2.72*	1.53

** *Serious constraint (Mean >3.0)*

Source: Field Survey Data, 2013

CONCLUSION

It has been established in the study that marketers of tomato, banana and pineapple recorded a mean net profit of ₦1278.71, ₦1473.27

and ₦1564.27 respectively in the study area. The positive difference between total revenue and total cost indicates that the marketing of these perishable products is a profitable enterprise. According to the respondents, transportation, poor packaging, rough handling and high temperature were the major constraints to tomato, banana and pineapple marketers in the study area. Based on the findings, it is advised that government should rehabilitate the bad roads and create good road networks to solve the transportation problems of marketers. There should also be an integrated scheme to reducing perishability of products by initiating packing houses at production and market centres to maintain quality along delivery channels. Marketers should be educated on proper packaging, effective transportation, storage and handling techniques.

APPENDIX A

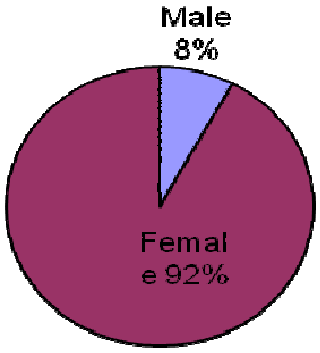

Figure 1a : Sex ratio of respondents

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