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Explaining the ‘hungry farmer paradox’: Through dynamics of Nutritional Scarcity and Its Determinants among Farming Households in Southwestern, Nigeria.

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Abstract

Nutritional depravation (both in quality and quantity) is high amongst the rural inhabitants of Nigeria. The study was carried out to examine the dynamics of nutritional depravation and its determinants among farming households in Southwest, Nigeria. The results indicated that 39.96% households in the region were able to meet the basic nutritional demands the year round, while 64.58% of the male-headed households are nutritionally well off and are able to meet their food requirements. Estimated minimum amount required to meet the basic nutritional requirements of a person (on a weekly basis) was N 451.48 (1 United States dollar = N165), whereas the amount actually spent was N 412.95, indicating a gap between the demand and supply of food items and expected to affect the overall health of the individual in some way or another. The results from the transitory matrix indicated that 44.2% households were nutritionally well off.

Keywords: Food insecurity, inadequacy, Tobit regression model, Southwest Nigeria

1. Introduction

Literature have delineated the concept of Food security as “when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (USAID, 2011, Awokuse, 2011, CPRC, 2005, Ribar and Hamrick, 2003). The concept of food security by literature emphasizes availability and accessibility of basic food needs. Nutrition security however added utilization of food; therefore, the inclusion of utilization underlines the important of “Nutrition Security” (USAID, 2011, FAO, 2011). The work of Senefeld and Polsky (2005) Bickel *et al*, (2000) and Carlson *et al* (1999) revealed that nutritional adequacy amongst the population is said to exist when “all people at all times in that household have access to safe nutritious food to maintain a healthy and active life”. Hence, food/nutrition inadequacy can thus be defined in terms of the



inability of households to have access to safe nutritious/ nutrition and it relates to both the current and future needs of food items to fulfil the same. Nutritional insecurity or inadequacy can therefore be conceptualized as when there is a shortfall of availability of nourishment that is adequate for safe food utilization. Data from Food and Organization (FAO), 2011 exposed that more than 800 million people throughout the world do not have enough food to meet basic nutritional needs out of which 98 percent of the world's undernourished people lives in developing countries and have a prevalence rate of 16 percent. According to FAO (2011), the number of undernourished persons in Nigeria is put at 9.4 million, while the prevalence of rate is put as 6% annually. Past studies have identified that even though food supplies have increased substantially in Nigeria, there are constraints on access to food such as poor household incomes to purchase requisite household's food needs (Apata *et al*, 2011, Charles *et al*, 2010, Sanusi, 2010). The report further indicated that this problem is likely to persist and even increase dramatically unless urgent, determined and concerted actions are taken. Therefore nutritional adequacy becomes an important factor in any consideration of sustaining the wealth of the nations.

Policymakers and social scientists are eagerly interested in understanding the causative reasons leading to economic hardship such as nutrition inadequacy in consumption amongst the residents in developing world including Nigeria (Krishna, 2012, Makombe *et al*, 2011, Aramolaran, 2009; Amaza *et al*, 2008; Apata, 2006; Goni, 2005; Okuneye, 2002; Yusuf and Falusi, 2000; Olayemi, 1998). Central Bank of Nigeria (CBN), 2010, ANAP (2006) and Akinyosoye (2006) indicated that although Nigeria is endowed with abundant natural resources, the country is classified as the 13th poorest nation. The reports also add that the country is dependent on external aid to meet the nutritional demands of the residents. Although earlier studies carried out by Aramolaran, (2009); ANAP, (2006); Okunmadewa, (2003); Omonona, (2001) examined the incidences, correlates and determinants of food insecurity in the country. These studies only examined food or nutrition insecurity parameters using a snapshot data, the dynamics of the parameters were however not studied which can provide sufficient information for policy direction. This opinion was attested by many researchers that the dynamic properties of nutritional

imbalance and its determinants for developing countries are yet to be properly addressed (Copper and Coe, 2011, Agatha *et al*, 2009, Jacobs, 2009, Temple and Steyn, 2009, Delaney and McCarthy, 2009, Kristjanson *et al*, 2004, Rose *et al*, 2003, Hoddinoff, 2003 and Gundersen and Gruber, 2001).

It has been observed that nutritional imbalance amongst the study population in Nigeria can be attributed to myriads of problems such as imbalance in the amount and quality of protein, calorie obtained by the members of the rural households, seasonality in production among others. As reported by NBS, (2011), Adejobi, (2004); Okuneye, (2002); Huddleston *et al*, (1984), that high poverty levels are mainly associated with hunger and malnutrition. Over the years, there have been an ever increasing gap between demand and supply of food in Nigeria; this has led to recurrent import of food stuff from other nations (CBN, 2009). Results from earlier studies by CBN (2008); HDP, (2008); Akinyosoye, (2006); ANAP, (2006); and Olayemi, (1998), revealed that the period 1990-2005 showed 41 percent of the population suffer from food inadequacy and nutritional imbalance with 16 percent of them being under nourished. These findings also highlighted serious shortage of food products within the country

Results obtained by Gunderson, and Oliveira (2001) in the study conducted in Mali indicated that food inadequacy/insecurity decreased during the period of crop harvesting and increased during the off harvest seasons. Similar observations were recorded by Jacobs (2009) from Vihiga district of Kenya, and Labadarios *et al*, (2009) who observed similar results. In addition, the results from Ethiopia reported by Devereux (2000) indicated that food insecurity-inadequacy is dependent on un-diversified livelihoods, based primarily on low-input and low-output rain fed agriculture. Ethiopian farmers do not produce enough food even in good rainfall years to meet consumption requirements (Masfield 2000). In rural Tanzania, and other parts of Eastern Africa, the occurrence of food/nutrition deficit inadequacy was as a result of seasonality of agricultural harvest (Shiferaw *et al*, 2011, Hardley *et al* 2007, Daponte, *et al* 2002, Gunderson and Gruber 2001, Bauman 2000, Cohen *et al*, 1999). According to Hardley *et al*, (2007) seasonal food deficit inadequacy appears to have lasting effects on the well-being of residents and often leads to enhancement of poverty in the region. The reviewing of literature on the determinants of

food/nutritional insecurity by Jacobs (2009), SDIFN (2009), Sewen (2007), Clampet-Lundquist *et al*, (2004), Ribar and Hamrick (2003), Chaudhuri *et al*, 2001, Frongillo, 1999 and Hamilton *et al*, (1997) have helped to searchlight on food/nutrition deficit inadequacy theoretically which thus shaped the conceptual framework for this study.

Therefore, the purpose of this study was to unveil the causal factors that contribute to nutritional inadequacy among farming households in Nigeria using data generated from Southwest, Nigeria. The study went further to used panel data to examine the dynamics of nutritional inadequacy of the affected farming households. This is to provide sufficient information for policy direction. Hence the objectives of the paper are to determine average per capita expenditure of farming households in the study area, the number of food/nutritional inadequate households in the study area and the transitional index. In addition, the study examines the factors influencing this transition and the determinants of food/nutrition inadequacy in Nigeria.

2 Methodology

The study was carried out using the Markov Chain Model as adopted by Baulch *et al* (1998) and Nord *et al* (1999). Markov Chain Model was modified to examine the dynamics of food inadequacy transitory in the prospective of Nigeria. The model explore the dynamics of food inadequacy and transitory factors affecting food inadequacy. In order to determine the factors affecting nutritional balance (adequacy vis a vis inadequacy) the threshold parameters were determined as a cut off line of food inadequacy. The cut of line was constructed to delineate food adequacy and inadequacy status of the households taking a cue from Greer and Thorbecke (1986). The food inadequacy line, Z, (which is the estimated cost of acquiring the calorie recommended daily allowance (RDA) was estimated as:

$$Z = e^{(a + bR)} \quad (1)$$

Where Z = Food inadequacy threshold (line)

R = Recommended daily allowance of 2350 calories per adult
(Scubert, 1994)

e = exponential log function

b = value/parameter to be estimated

(g) The classifications of various measures of households suffering from Food inadequacy ($P\alpha$) were computed using the methodology as suggested by Foster et al (1984).

2.1. Area of Study and Sampling Procedure

South-western part of Nigeria is one of the six major political zones. The federal government in 1998 divided the country (Nigeria) into six political zones namely: North West, North east, North central, South west, South east and South south. Southwest zone has six states. These are Lagos, Oyo, Ogun, Ondo, Osun and Ekiti states. Two states namely Ondo and Ekiti ($45^{\circ} 1'$ to $50^{\circ} 45'$ East longitude and $70^{\circ} 15'$ and $80^{\circ} 5'$ North latitude) were randomly selected out of the six states. Four rural-semi-urban local government areas (LGA) were selected randomly from each state. A cluster combination and systematic random sampling techniques were used to select 40 households out of the selected 12 rural-semi-urban communities. Thus, a total of 160 households per state were selected and 320 households in all were selected. At the end of data cleaning and processing, 300 samples were useful for analysis because the unconsidered 20 samples consist of incomplete data and hence were discarded. A questionnaire was developed which was pretested and amended for use in data collection. Food price data were obtained through community market surveys.

The market surveys were carried out on a weekly basis for a period of 36 weeks. The study incorporated both primary and secondary sources of data. In order to capture the seasonality of agricultural products and food availability as identified by past studies data were collected during season of agricultural harvest (dry season) and off-season (or wet) of agricultural harvest. Therefore to capture the specific transition on the nature of data requirement for this study, panel data were adopted and collected during the dry and wet seasons. Primary data was collected with a questionnaire, distributed to farming households in the study area, while the secondary data were obtained from the Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS).

Information on food consumption pattern was collected from individuals. Information related to the amount of total daily food intake was collected for each member of the household, using a 48-hour recall method. Each household was visited at least once in two weeks. Data were collected respectively during the late and early rain over a period of nine months (July 2012 to March, 2013). Thus, daily food intake quantities for each individual in the household were collected twice a month for a total of twelve times in a period of nine months. The investigated data concerns the per capita daily food consumption averaged over the nine months period. This was carried out to reduce errors associated with measurement in food consumption and to smoothen day-to-day food intake fluctuations. The obtained quantities were then converted into kilogram units. Income and expenditure information were obtained on a fortnight basis for the nine months period.

2.2 Empirical Model

Preference structural model adopted as framework for this study is the Tobit regression model as suggested by Mcdonald and Moffit, (1980) and Tobin (1958). The model took into account both the food inadequacy status of the households and the food inadequacy-gap (percentage inadequacy gap) of the household in a single model. The Food inadequacy-gap (percentage inadequacy gap) was considered as one of the dependent variables has a censored distribution as:

$$\text{The Food adequacy inadequacy-gap (Gi)} = \left[\frac{Z - Y_i}{Z} \right] \quad (2)$$

Where Gi (Food inadequacy -gap) = Latent economic quantity of interest.

1. If $Z > Y_i$, Gi is positive. This means that the household records a food expenditure level that is less to the threshold food sufficiency (line) and is regarded as food inadequate family.
2. If $Z < Y_i$, Gi is negative. It has more than the threshold food expenditure level and is regarded as a family with food adequacy.

The implication is that for households with food inadequacy, the G_i 's are positive while for household with food adequacy they are negative. This situation calls for censoring in the variable; hence the censored regression model (commonly referred to as the Tobit model) was used. In the specification of the model, the percentage food inadequacy -gap X 100 is used as the dependent variable. A similar specification was used by Nassimbeni (2001).

The model is expressed as

$$D_{ij} = D1^* = X_i\beta + U_i; \quad X_i\beta + U_i > D_0 \quad (3)$$

$$D_{ij} = 0 \quad X_i\beta + U_i; \quad X_i\beta + U_i < D_0 \quad (4)$$

The estimating equation is

$$D_{ij} = a_0 + a_1X_1 + a_2X_2 + \dots + a_{19}X_{19} \quad (5)$$

Where $D_i = 1$, if $D_i > D_0$

$D_i = 0$, if $D_i < D_0$

$i=1 \dots 300, \quad j=1 \dots 4$ categories of food inadequacy transitions

$$D_{ij} = f(x_1, x_2, \dots, x_{19})$$

The four categories of food inadequacy transitions are as stated below:

$D_{11}=1$ if never food inadequacy, 0 if otherwise

$D_{12}=1$ if becoming food inadequacy, 0 if otherwise

$D_{13}=1$ if exiting food inadequacy 0 if otherwise

$D_{14}=1$ if always food inadequacy, 0 if otherwise

Note: Food is also conceptualized to mean nutrition in this study

a = coefficients; β = vector of respective parameters; $X_1 - X_{19}$ = independent distributed error term, the independent variables which are socio – economic and demographic variables are captured as:

X_1 = Household size (number), X_2 = Level of education (years), X_3 = Age (years)

X_4 = Marital Status of household head, X_5 = Gender of Household head, X_6 = Farming/fishing experience (Naira), X_7 = Hired labor (Naira), X_8 = Dependency ratio (No.), X_9 = Expenses on food (Naira), X_{10} = Farming/fishing income (Naira), X_{11} = Farm size (Ha), X_{12} = Expenses on non-food items (Naira), X_{13} = Expenses on inputs (Naira), X_{14} = Non-farm Rural Activities Income

(Naira), X_{15} = Income Consumed Outputs (Naira), X_{16} = Access to extension facilities (Dummy), if access = 1, otherwise = 0, X_{17} = Access to credit facilities (Dummy), if access = 1, otherwise = 0, X_{18} = Market facilities (Dummy), if access = 1, otherwise = 0, X_{19} = Asset status

2.3 *Econometrics estimation issues*

Even though the structural equation presented in equation 5 is theoretically valid, estimating the model by a single equation (ordinary least square (OLS) regression procedure) would likely result in biased estimates of elasticity coefficients for food inadequacy status of farm-household and income used to access food needs. Theoretically, both inadequacy status of farm-household and income share are considered endogenous to the accessibility to food needs for two reasons. Firstly, the income variable used in this model is basically the income coming from labour; its value was largely an outcome of labour supply choices. Secondly, reverse causality is a potential source of bias in the OLS estimate of the coefficients of inadequacy status of farm-household and income share. Furthermore, the difficulty in obtaining accurate information on income of individuals and household in developing countries leads to error associated with classical measurement (or dwindling bias) and it may also be a very important source of bias in this study. Therefore, a number of steps were taken to address the potential biases of the OLS estimates of inadequacy status of farm-household and income share elasticity as discussed earlier. In order to reduce classical measurement error bias, averages of food intake and income data through multiple visits over the period of data collection was used. The instrumental variable of two stage least square (2SLS) estimation procedure was used to address the problems of bias due to measurement error, omitted variable and reverse causality which was likely to occur if the OLS procedure is used to estimate the income share and inadequacy status of farm-household and per capita income elasticity.

3.0. Results and Discussions

The results from Table 1 indicate that the average age of the respondents in Ondo State was estimated to be between 43-55, and 46-47 for the respondents of Ekiti State. The average monthly income of the respondents in Ondo State is higher (by ₦9996.03) when compared to their counterpart from Ekiti State. Similarly, the results indicate that the maintenance allowance in Ondo State is ₦ 16073.94. It therefore transpires that respondents in Ondo State used a major part of their income as maintenance allowances. The results revealed farming community in the Ekiti State spent 9.11% more on food when compared to the respondents in Ondo State. The farm outputs (that are supposed to provide income when sold in the market) were consumed by the respondents from Ekiti state. The implication of this finding is that farming households in Ondo State (as observed during data collection) has extra disposable income accrued from engagement in non-farm activities to meet other needs.

Further analysis revealed that respondents from Ondo state diversified more to non-farming activities and the percentage of this income is higher by 27.7% as a result of more of economic activities. Similarly, farm income increases by 5% during the second data collection in Ekiti State, while a decrease of about 3.2% was observed in Ondo State.

3.1 Households' Food Inadequacy Status and Food Expenditures

The results from Table 2 show the results on food expenditures, minimum food spending needs and food inadequacy status for all the respondents considered in the study. The data for the analysis were grouped together. The average per capita expenditure (on a weekly basis for food items) was N390.06 in Ondo State. On the other hand, residents from Ekiti State, spend N435.83. Moreover, households which have adequate food, usually have higher expenditure on food and related items per capita basis when compared to groups who suffer from seasonal or chronic inadequacy (CPRC, 2005). The findings may be attributed to extra income from various activities which are diverted to the procurement of food materials (Table 2). The ratio of minimum food expenditure vis-à-vis actual food expenditure was estimated to be around one for the families who are sufficient in food; however the values are higher for families who are experiencing food

inadequacies. This evidence indicates households that experienced food inadequacy could not matched their needs with available resources. It was observed that the numbers of family members per household under this category are large hence the per capita availability was less than those with smaller family size. However, households' ability (due to their level of education and low-scale of farm operations) to manage resources may contribute to differences between food inadequacy levels between them. The analysis revealed that there is no much difference between food expenditures, minimum food spending needs and food inadequacy status of the two States under examination.

3.2 Food Inadequacy Threshold Indicators

The results for the food inadequacy threshold indicators as presented in Table 3 show that the average monthly values for Ondo and Ekiti States were N 3782.57 and N 3913.45 for the first round of data while, the results were N3913.45 and N 3612.18 for the second round of data collection for the two states respectively. The results of the threshold indicates (for the first round of data collection) that, 58 percent of the respondents in Ondo State were categorized as receiving adequate nutrition ,while the corresponding value for the respondents in the Ekiti State was estimated as 52 percent. However, the results for the second round of data (if considered alone) indicates that the food adequacy estimates for Ondo state and Ekiti state was 46 and 42 percent respectively. The values are lower than the average values obtained earlier and the same may be attributed to food inadequacy due to seasonal effects as the period coincided with off-harvesting season. This finding is similar with the work of Jacobs (2009) and Labadarios et al, (2009), who also observed that food inadequacy levels were enhanced when the agricultural output was low.

The results for the food inadequacy transition matrix revealed that there was a shift of 4.25% (between the households) from the food adequacy status to that of food inadequacy status between the two States studied. The inadequacy matrix for the Ondo state exhibited 6.15 percent of the households transitioned from food adequacy to food inadequacy during the two periods,

while the values for Ekiti state during the same period were estimated to be 2.35 percent. The low percentage recorded for Ondo State farming households was due to the fact that farming households in Ondo State had the opportunity to engage in non-farm activities to generate additional income as a result of more of economic activities that are in place in the State. The results obtained indicate that food inadequacy transition exists in the two periods; the results are in consonance with the observations in the subsequent Tables i.e. 4 and 5 respectively as confirmed by studies of CPRC (2005), and Kristjanson *et al*, (2004). The estimates indicate that the results of the transition matrix varied by 11.12% during the two periods further supporting the earlier observations of food inadequacy and agriculture harvest.

The results from the food sufficiency threshold index presented in Table 5 indicate that the respondents from Ekiti State had more food inadequacy when compared to their counterparts in the Ondo state (Table 4). The implication of this finding is that majority of farming households in Ekiti derived income mainly from farming activities. The results from Table 7 indicate that in 2013 the probability estimates report an increase in respondents who are under the food inadequacy category, while 1.2 percent of the respondents actually moved into the food adequate category. The earlier methodological discussion showed the relationship between entry and exit probabilities and the steady-state food inadequate headcount using Markov model (with the ratio of entry to exit probabilities being equal to the ratio of the proportion of food inadequate to food sufficient). The dynamics nature of food inadequacies within the panel emphasizes the importance of understanding the determinants influencing entries into and exits from food inadequacy.

3.3. Determinants of Food Inadequacy

There are several factors identified as variables which may influence the transition between the food/nutrition adequacy and inadequacy category. The results indicate that the transition of the food inadequacy status is significantly ($P < 0.01$) influenced by household size (numbers of family members) and marital status of the respondents. The other significant factors ($P < 0.05$) observed are low education status, age of the respondents, gender, numbers of dependents (relatives, friends



other than immediate family members), expenses on procurement of food items, income from agrarian activities (farming/fishing), farm size and access to credit facilities. .

The results indicate that the marginal effects of variables that measure well-being (food spending needs) differ among households. This is used in predicting the food security risk, and is larger for the most moderately and core food inadequate households. Although the effects of the significant variables have similar effects but the effects are significant, when predicting food inadequacy as observed in Table 9. The results from Table 9 indicate that an additional increase in Household size by 10% will lead to a decrease in food inadequacy by 0.8%, in families with adequate food availability. On the other hand, the values change to 13% in families with moderate food inadequacy (those who shift from food adequate to inadequate situation depends solely on agricultural harvest). Values for families who are permanently under food deprivation category shifted to 28%. Also, the effect of education indicated that a 10% increase in educational status leads to 15.8% decrease in food inadequacy status among respondents. Corresponding figures for the moderate and highly food inadequate group was assessed as 14% and 20% respectively. It may be because the awareness due to education can help the respondents to input significant decisions pertaining to the family planning decisions as indicated. The results indicate that by increasing 10% in the spending on food items did not make any significant increase in the overall food adequacy status of the respondents who had larger family size and this might be attributed to very little changes in per capita availability status. However, when similar increase in spending was made in the families who were adequate in food resources the results were quite different. The results obtained in the present findings are in consonance with those obtained by Jensen, 2002, London and Scott, 2005 and Hamelin *et al.* 1999. These studies concluded that marginal prosperity is correlated with consumption of surplus items (which otherwise could be sold) to earn cash to procure other non-food items. It has been observed that farmers sell items of livestock origin (which fetch higher prices) to procure cereals and other agricultural items (which are relatively



cheaper than the former). This system helps in coping with food inadequacy when agriculture items are dearer to procure.

The results also show that families who have alternate sources of income (other than farming) have a better resilience ($P < 0.01$) to cope with food inadequacy. This may be attributed to additional cash income which may be used later for purchasing food items. This result is similar to studies of Serem (2007), Senefeld & Polsky (2005) and Baulch & McCulloch (1998) that farming households who have other sources of income apart from farming have a better resistance to cope with food inadequacy than farming households who did not have other sources of income apart from farming.

4 Policy implications and recommendations

The results of the present study show that the food inadequacy situation among the farming households in the Southwest Nigeria is very high. The factors influencing the same include; family size (which is quite large), single earning member and high numbers of dependents, and procurement of non-agricultural products for daily needs.

The ratio of minimum food expenditure vis-à-vis actual food expenditure was estimated to be around one for the families who are sufficient in food; however the values are higher for families who are experiencing food inadequacies. This evidence indicates that experiencing greater food inadequacy also expected their needs to be significantly higher than available resources. It was observed that the numbers of family members per household under this category are large hence the per capita availability was less than those with smaller family size. Thus, there is need for education on family planning so that budget available might be enough to meet nutritional status of the household.

Finding from this study also indicated that farming community in the Ekiti State spent 9.11% more on food when compared to the respondents in Ondo State that is most farm outputs supposed used for exchange of income were consumed by the respondents from Ekiti state. The

implication of this finding is that farming households in Ondo State (as observed during data collection) have extra disposable income accrued from engagement in non-farm activities to meet other needs. Policy implication of this finding is that one of the ways out of nutritional adequacy is for government to create and boost non-farm activities for farmers for income increase and not to depend solely on farm income as attested by CPRC, 2005.

Finding from the study revealed family's facing food inadequacy status is those who are poorly informed and motivated about government policies and practicing traditional agriculture with primitive tools. Hence for long term sustenance of the society and to come out of the whirlpool of poverty there is a serious need of improvement of rural infrastructure. Regular trainings should be organized in modern agronomic practices, besides improvement of marketing infrastructure and intelligence so that distress selling can be avoided. The initiation of adequate and timely credit facilities should also be looked into so that the poverty stricken families do not fall into the crunches of the money lenders. To improve the credit facilities it is important to promote microcredit institutions and self-help groups. On the other hand promotion of traditional handicrafts and cottage industries can assist in reducing the dependency on agriculture and also promote additional non-farm income thereby playing a primordial role in poverty reduction besides promoting rural artisans.

4.1 Conclusion

The results from the study indicate that the food/nutrition inadequacy situation was most critical in households who solely depended on agriculture. The individuals who were better educated and had smaller family size were less likely to suffer from critical food inadequacy. Similarly, families with alternative sources of income were able to cope better as income from non-agrarian sources are likely to augment, especially during crop failures. Long- term rural planning for employment generation schemes should be formulated, and the handicraft sector developed. The most critical period of intervention is the off-season agricultural activities when the food scarcity is at maximum.



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List of Tables

Table 1: Basic Statistics of Variables that influences Food Transitions Matrix

Selected Variables	Ondo State	Ekiti State
	Mean± SD	Mean ± SD
Household Information		
1. Age	43.55± 18.25	46.97± 18.19
2. Marital Status	1.77 ±1.440	2.07± 1.62
3.Educational level	2.81±0.930	3.04± 0.96
4.Religion	1.43± 0.699	1.43± 0.81
5.Household Size	9.65± 6.480	7.83± 6.38
Income Generation (Monthly) ₦		
1.Income (Monthly) ₦	40668.71± 5000.04	30672.68± 18500.2
2.Upkeep allowances ₦	37347.57± 8652.19	21273.63± 11771.05
3.Income to upkeep %	81.45± 43.17	85.55± 39.14
4.Expenses on Asset ₦	8224.35± 5604.29	6586.85± 1117.10
5.Expenses on Non-food ₦	9018.48± 2452.65	7201.77± 2727.15
6.Expenses on food items ₦	11213.43± 8113.52	8639.43± 2675.15
7. Exp. on asset in total % (1 st)	39.51± 21.94	33.28± 11.25
2 nd Data	10.15± 12.23	18.17± 10.81
8.Exp.on non-food in total % (1 st)	12.14± 8.75	8.83± 3.41
2 nd Data	38.77± 12.18	24.76± 11.27
9.Exp. on food in total % (1 st)	48.35± 25.18	57.79± 17.51
2 nd Data	61.23± 18.15	75.24± 21.38
10.Farm income in total % (1 st)	54.42± 21.51	56.48± 17.82
2 nd Data	43.15± 28.06	57.62± 34.18
11.Non-farm income in total(1 st)	37.69± 11.38	29.94± 15.43
2 nd Data	56.25± 25.17	42.38± 18.19
12. Gifts from friends & Relations % (1 st)	7.89± 3.46	13.58± 6.58
2 nd Data	10.23± 4.58	11.13± 8.24
13.Farm produce consumed at home % (1 st)	30.32± 12.17	27.09± 10.38
2 nd Data	14.28± 10.18	20.15± 17.23

Source: Data analysis from food survey, 2012/2013

Table 2: Food Expenditures in Ondo State and Ekiti State (values in parenthesis indicate the Figures for the Ekiti State)

Food Expenditures	All Household	Food Sufficient	Moderate FIS	Highly FIS
Distribution of households (%)	100	45.83 (42.2)	31.59 (36.38)	22.42 (21.40)
Household size (%)	4.18 (4.2)	4.27 (4.08)	5.18 (5.75)	4.18 (4.95)
Dependent ratio	40.15 (47.1)	44.83(49.2)	51.27 (55.4)	64.28 (67.1)
Usual expenditure on food/week (N)	1631 (1831)	1787 (1937)	1836 (2064)	1343 (1340)
Usual per capita expenditure on food (N)	390 (436)	418 (475)	355 (341)	321 (270)
Minimum weekly need for spending on food per household (N)	1891 (1621)	1806 (1705)	1981 (1851)	2342 (2417)
Minimum per capita need for spending on food (N)	453 (450)	423 (442)	382 (322)	560.157895
Minimum spending for food /vis-à-vis other	1.16 (1.03)	1.01 (0.93)	1.08 (0.89)	1.74 (1.83)
Minimum amount spent on food per income generated	0.92 (0.69)	0.84 (0.75)	0.61 (0.53)	0.55 (0.41)
Average monthly income (N)	40668(30672)	43125 (32159)	31215 (25813)	22190 (19175)
Upkeep allowances (monthly) N	37348(21274)	36132 (23825)	19013 (13615)	12124 (8030)

FIS = Food Inadequacy

Source: Data analysis from food survey, 2012/2013

Table 3: Food inadequacy Lines (Z Values) and status of farm-households by States (N = 300)

States	Food Inadequacy line /month (N)	P ₀	P ₁	P ₂
1st Data Collection	3782.57	0.580	0.239	0.138
Ondo State	3549.25	0.520	0.275	0.197
Ekiti State				
2ndData Collection	3913.45	0.460	0.241	0.113
Ondo State	3612.18	0.420	0.273	0.180
Ekiti State				

Source: Data analysis from food survey, 2012/2013

Table 4: Food Security Status Transition Matrix From 2012-2013 (N = 150) Ondo State

	Survey 2 (2013)			
	Food Sufficiency	Food Inadequacy Moderate	Food Inadequacy Core	Total
Survey1 (2012)	% N	% N	% N	% N
Food Sufficiency	46.21 (54)	27.1 (21)	1.38 (3)	52.0 (78)
Food Inadequacy Moderate	32.40 (25)	21.6 (18)	1.58 (3)	30.7 (46)
Food Inadequacy Core	18.7 (17)	12.4 (5)	1.69 (4)	17.3 (26)
Total	64.0 (96)	29.33 (44)	6.67 (10)	

Source: Data analysis from food survey, 2012/2013

Table 5: Food Security Status Transition Matrix From 2012-2013 (N = 150) Ekiti State

	Survey 2 (2013)			
	Food Sufficiency	Food Inadequacy Moderate	Food Inadequacy Core	Total
Survey1 (2012)	% N	% N	% N	% N
Food Sufficiency	42.18 (53)	25.3 (20)	0.89 (5)	52.0 (78)
Food Inadequacy Moderate	38.15 (22)	20.17 (12)	1.63 (6)	26.6 (40)
Food Inadequacy Core	21.30 (12)	11.8 (7)	19.28 (13)	17.3 (32)
Total	64.0 (87)	29.33 (39)	6.67 (24)	

Source: Data analysis from food survey, 2012/2013

Table 6: Food adequate /Food Inadequate Households Transition Matrix, 2012-2013

2012	2013		
	Food adequate Households	Food Inadequate Households	
Food adequate Households	107	48	155
Food Inadequate Households	76	69	145
Total	183	117	300

Source: Data analysis from food survey, 2012/2013

Table 7: Simple Entry and Exit Probabilities

Year	Probability of numbers of respondents under food inadequacy status	Probability of number of respondents who are under the food adequate category	Respondents (%)	% of households moving out of food inadequacy
2012	0.25	0.38	34.5	33.0
2013	0.29	0.38	35.7	34.2

Note: Headcount is for the second year

Source: Data analysis from food survey, 2012/2013

Table 8: Tobit Regression Analysis of Transition to Food Inadequacy in 2013

Item	Estimates
Household	-0.331*
Education	-0.033 **
Age	-0.146 **
Marital Status	0.382 *
Gender	0.211 **
Farming/fishing experience	0.019
Hired Labor	-0.52
Dependency ratio	-0.23 **
Expenses on food	-0.189 **
Farming/fishing income	-0.20 **
Farm size	0.013 **
Expenses on non-food items	-0.695
Non-farm Rural Activities Income	-0.112
Access to extension facilities	0.033
Expenses on inputs	-0.351
Income Consumed Outputs	-0.695
Asset status	-1.058
Market facilities	-0.046
Access to credit facilities	0.003 **

Note: ** P<0.05, * P<0.01 N = 300

Source: Computer Results

Table 9: Marginal Effects of the significant variables in the Tobit Regression Model on Food Security Status of Respondents

Selected Variables	Food secure	Food insecure (moderate)	Highly food insecure
Household size	-0.0008	0.0013**	0.0028*
Education	0.0158*	-0.0014	-0.0020
Age	0.00145**	-0.0023**	-0.0072**
Marital Status	0.038**	-0.010*	-0.0062**
Gender	0.035*	-0.0172**	-0.0372
Dependency ratio	-0.0074*	0.00351	0.0214
Expenses on food	0.00963*	0.00051**	0.00198**
Farming/fishing income	-0.0017*	-0.0017*	-0.00025**
Non-farm Rural			
Activities Income	0.0011*	-0.0008**	-0.0006***
Income Consumed	0.0079*	-0.00021**	-0.00021
Outputs			
Access to extension facilities	0.0017**	0.0014*	0.00052**
Access to credit facilities	-0.00031	0.00023**	0.00019

Note:** P<0.05, * P<0.01 N = 300

Source: Computer results