Effect of Yam-Based Production on Food Security Status of Farm Households in Edo South, Nigeria

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Abstract— The study assessed the effect of yam-based production on the food security status of farm households in Edo south, Nigeria. Specifically, the objectives of the study were to examine the socio-economic characteristics of the respondents, analyse the contribution of yam-based production to the income profile of the households, estimate their mean per capita daily calorie intake and examine the determinants and the probability of households being food secured.

A multi-stage sampling technique was adopted in selecting 120 farm households from Edo South agro-ecological zone of Edo-State data were collected with the aid of well – structured interview schedule on households socio-economic variables which included sex, age, marital status, level of education, farm size, household size and household income and expenditure profile among others. Data collected were analyzed by appropriate statistical analysis which included frequency counts, percentages, mean, standard deviation, and Logit regression model.

The results showed that 97 males, represented majority of the households with (80.8%) and females 23, represented 19.2%of the house heads. The mean age of household reads was 50 years, of which (92.5%) of them were married, 53% owned houses and 58% had farming experience of 11.20 years the mean household size was estimated as seven persons with a mean farm size of 1.35 hectares. The mean annual household income in the study area was estimated as N 496.850.88 out of which farm income contributed N 62.4307, and off income contributed (37.57%). The mean monthly household expenditure was N 40,934.31 out of which food expenditure accounted for 40 .22%. The results also showed that the area was fairly food - secured with 52.5% being food secured and 47.67 being food insecure with mean per capita calorie intake of 36,0kcal and 120.2 kcal respectively.

Finally, the results also revealed that three variables in the logit model were significant in explaining variation in the food security status of the households. These are farm size, form income and off-income. It was recommended that government should provide bigger plot of land for those farmers who are determined to take farming as business.

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Keywords—food security status, Determinants, Economic status and Policy recommendation

I.   INTRODUCTION

A silent crises is raging in Nigeria as a result of the prevalence of food insecurity, hunger and malnutrition. Each year, no less than one million Nigeria children die before their fifth birthday. Lactating and pregnant women are not spared by the scourge (World Bank, 2004)

Available evidence indicated that children, pregnant and lactating women on the aggregate are not receiving adequate energy and protein to meet their recommended daily requirement. Available data indicate that Nigeria has chronic under nutrition problem. Recent anthropometric survey D.H.S, (2006) has indicated serious acute and chronic nutrition problems among pre-school Children. Food is a basic human need and the only source of nutrients required for the sustainance of life. Food security indicates the availability and access to food by those in need (Okunmadewa et al., 1999). The Bali-declaration of Non-Aligned movement and other developing countries defined food security as "access to food for healthy life by all people at all time (NAM, 2004). It recongnises that inspite of a substantial increase in the world's food output the number of people suffering from hunger and malnutrition has increase during the decades in many developing countries.

The incidence of food insecurity and malnutrition has become more severe in the urban settings than in rural areas in recent years. Farm sizes can be an indication of food insecurity. Results of studies (world bank, 2006) indicted the 20-30% of farm families with smallholdings (1 ha or less) in the northern states suffer from chronic food insecurity. On the other hand, over 4% of the households in the southern states of Nigeria have less than 1.2 ha, considered minimum for sustaining a household in the south of Nigeria.

One of the manifestation of food insecurity is malnutrition, the definition of malnutrition vary depicted by the range of estimates available from international and national agencies faced with the task of measuring malnourishment globally and nationally, it is essentially a deficiency in amount of calories consumed per day (Grigg, 1995) .

Putting an end to food insecurity among farmer is very essential due to its concormittant effects. And since the source of livelihood of majority of the poor in the rural areas is agriculture, research has shown that yam-based production, if improved is capable of doubling income and enhancing food security status of yam farmers. This is because yam, a staple crop, is the most important source of dietary calories in Nigeria and Ghana. And for many people in the region, they rank above other tuber and root crop in terms of preferred choice. Dorosh (2000), found a positive income elasticity of demand for yams. Indicating a household preference for yam when their purchasing power improves, it was not surprising therefore, for Bill and Melinda Gates foundation to award a grant of US12million to support the yam improvement for income and food security in west Africa (YIIFSWA). Project spread across Nigeria and Ghana, in the belief that it could mitigate the problem of food insecurity

II.　RESEARCH METHODOLOGY

Three local government areas (L.G.As). ie Orhionmwon, Ovia North East and Uhunmwonde L.G.As were used for this study

A multi-stage sampling process was adopted in selecting three-blocks out of the seven blocks making up Edo South agro-ecological zone this was based on the researcher's prior knowledge of the intensity of yam production activities, population of yam producers and the availability of market for yam products in the study area.

The second stage involved a simple proportional sampling of five (5) villages from each and finally fourteen (14)., ten (10) and six(6) ADP contact farmers from Orhionmwon, Ovia North-East and Uhunmwonde L.G.As' villages respectively. This was done with respect to the intensity of yam activities using the agricultural development programme list of contact farmers from each village in all, 150 yam-based farmers were interviewed in the state using trained enumerators under supervision of the researcher who administered well-structured questionnaire

Estimation of Contribution of Yam-Based Calories

To estimate the contribution of yam-based production to respondents per capita daily calorie consumption, the equation set in what follows, highlight the calories consumption: food intake records collected were cooked food except in few cases where food needs to be cooked before consumption (fruits, garri etc)

$$C1 = \sum_{i=1}^{m} Ai, Bj - - - - - - - Equ\ 1$$

Source; (Oguntona and Akinyele, 1995)

Where;

Ci = per capita daily calories (kcal) intake level of the ith individual in the study area.

Aij = the weight in grams of the average daily in take of food commodity j by ith individual

Bj = the standardized food energy content of the jth food commodity as the case may be.

So, the nutrient intake status was estimated for each household this is referred to as the household per capita daily calorie intake this was done by averaging the weight sum of the individual's nutrient (calorie) intake using male adult equivalent.

LOGIT MODEL

The determinant of food security status among farm households in the study areas were estimated by using logit regression model (omonona, B.T, Oni, O.A, Uwagboe, A.O. 2006), it is often the widely use model to identify factors influencing food security status (Gujarati, 2004) specified the logit model as:

Logit (γ) = natural log (odds) = in $\dfrac{\pi}{1-\pi}$ = $\alpha + \beta x$

Ln = natural variable

γ = dependent variable

π = probability of interested outcome

α = intercept parameter

β = regression coefficient and

x = independent variable

for multiple predictors (x1 x2, x3, x4,) a complex logistic regression for y is as follows

Logit (γ) = In $\frac{\pi}{1-\pi} = \alpha + \beta$ 1 x1 + β2 x2 + ...+ βk xk + u, where;

U = error term

X1 = sex of household head dummy (x1) (1 = male, 2 = female)

X2 = age of household head (years)

X3 = educational level of household head

X4 = household size (on head count basis)

X5 = farming income (N)

X6 = off farm income (N)

X7 = farm size (h)

X8 = farming experience (years)

III.   RESULTS AND DISCUSSION

SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

Results of the socio-economic characteristics of farm household heads presented in Table 3.1 below indicates that 80.8% of the households were headed by males while females headed 19.2% of surveyed households. This result further attests to the fact that males owned and controlled most farmlands in the survey area. This could be due to social, cultural and economic limitation which a patrimonial society like ours imposes on women. However, there is a gradual trend towards the prevalence of female-headed households in third world countries FAO (2003). The average age of farmers in the study area was about 50 years. This agrees with USAID (2005) who estimated the average age of West Africa famer to be 50 years and above. Also 92.5% of those sampled confirmed that they were married. This forms majority of the sampled respondents, corroborating the findings of Ekong (2003), that society places high value on marriage with married people assumed to be more responsible than the unmarried. The results further showed that 2.5% had no formal education, 16.7% of household heads had primary education, 64.2% had secondary education while, 16.7% had tertiary education. The moderate level of education in rural areas is a rapidly emerging trend and is thought to have positive influence on the calorie intake of household's members (as an appreciation of nutritive values of food is expected to be positively correlated with level of education). This view is also buttressed by Benson (2004). Another advantage that might be enjoyed by the respondents due to their level of education is the development of their curiosity to adopt and utilize technologies which could increase agricultural production. Finally, the advantage on the side of moderate educational level is the prospect of getting better off-farm jobs.

The mean farm size was estimated to be 1.35 ha, farm size is expected to be positively related to food security, Sanginga (2012), observed that there are three million smallholder farming families across Ghana and Nigeria, 90% of whom cultivates less than 2.5 ha and this agree with the 1.35 ha of this study. The small farm size cultivated is a strong pointer to food insecurity. On the average, households in the study area had a mean farming experience of 14.6years. experience in farming is desirable to improve skills and knowledge of farming operations, especially where such skills and knowledge are modern and this will in the long run impact positively on food security status.

TABLE 3.1
SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

Category	Frequency	%	Mean(x)
Sex: female	23	19.2	
Male	97	80.8	
Total	120	100	
Age: (range)	4	3.3	
30 & below			
31-40	13	10.8	
41-50	46	38.3	(x=49.67 yrs)
51-60	46	38.3	
61-70	11	9.2	
Total	120	100	
Marital status:	111	92.5	
Married			
Single	5	4.2	
Widow	4	3.3	
Total	120	100	
Educational level:			
No formal education	3	2.5	
Primary education	20	16.7	
Secondary education	77	64.2	
Tertiary education	20	16.7	
Total	120	100	
Farms size:	49	40.8	
I ha & blow	38	31.7	
1.1-2.0	15	12.5	(x=1.35ha)
2.1-3.0	11	9.2	
3.1-4.0	7	5.8	
>40	120	100	
Total	35	29.2	
1-10	58	48.2	
11-20	24	20.2	(x=4.58yrs)
21-30	3	2.5	
>30	120	100	
Total			
House ownership	63	52.5	
Total	120	100	
Household size 1-4	26	21.7	
(range) 5-8	59	49.2	(x=6.50)
9-12	35	29.1	
Total	120	100	
Crop farming status			
Part-time	65	54.2	
Full-time	55	45.8	
Total			
Cropping pattern			
Sole cropping	25	20.8	
Mixed cropping	95	79.2	
Total	120	100	

Source: Field survey, 2014

This study further found that 52.5% of the house heads owned their houses. This could be of economic relief to the household heads while 47.5% did not have houses. About 71% of the household had household size between one and eight persons on head count basis, with the mean being seven people. The relatively high household size could pose a threat to the nutritional need of the household members, especially the low income group and this is particularly so if the increase in household size translates into increasing number of children who do not contribute to the total household income.

Finally, with respect to crop farming status, 54.2% of the survey households heads were farming on part-time basis, while 45.8% did farming on full-time basis. The long –run advantage of part-time farming is that income can be sourced from off-

farm jobs and can help in the event of crop failure and natural disaster. It therefore acts as mitigation strategy against adverse condition.

THE EFFECT OF YAM PRODUCTION ON ECONOMIC STATUS OF RESPONDENT

Per capita income of respondents with respect to yam production the result of the study presented in Table 3.2 indicate that yam production had contributed significantly toward improvement in the per capita income of the respondents without income from yam production majority (73.3%) of the respondents, had per capita annual income of less than N 45,000 with an average of N 35,704.5, this is below the poverty line of N 57,600 per annum. But with yam production, this average per capita annual income of respondents increased to N 53.731 with 40% of yam producer having per capita annual income above N 57,600, as against 26% for respondents whose income were from sources outside yam production. Evidently, yam production increased the per capita income of the respondent by over 50% and this is significant at 1%, this shows that yam production is a vital enterprise for boosting food security status of respondents in the study area. The average per capita annual income of the respondents in this study was however, slightly higher than the average per capita annual income of N 30,33600 for smallholder farmers reported by Njokuoma and Ogbe (2010).

TABLE 3.2
THE EFFECT OF YAM PRODUCTION ON ECONOMIC STATUS OF RESPONDENT

Per capita annual	Without yam production	With yam production	Difference in mean income	Increase in income due to yam production	T value
<1000	0	0	0		
1,000-14,500	37	31	14	12	
15,000-29,500	34	28	26	21	
30,000-44,500	17	14	20	17	
45,000-59,500	9	8	20	17	
60,000-74,500	6	5	14	12	
75,000-89,500	8	6	8	6	
>90,000	9	8	18	15	
Total	120	100	120	100	
Man annual	₦280,112.5		₦310,228.33		
Income					
Mean per capita	₦35,704.05	₦53,751			
Income			18.047	50.54	2.657

Source: Field survey, 2014

FOOD SECURITY STATUS AND YAM PRODUCTION

Estimated food security status for the study are shown in table 3.3 the results revealed that 63 households with yam based production where food secured while only 57 households without yam production were food secured, giving 37% for food secured household with yam production against 43% of food secured household without yam production, the results show a 14% increase in food security with yam production compared to household without yam production, this corroborate the findings that yam production has capacity of contributing significantly to the calories of the farming households. The

headcount index for the food secured household with yam production was 0.57 while the headcount index for the food secured household without yam production was 0.47. the food secured household with yam production enterprise need 43% of the recommended calories (RDA) to completely meet up with the FAO recommended daily calories allowance (RDA) while food secured household without yam production enterprise needs 57% of the recommended daily calories allowance (RDA) to meet up with the FAO recommended daily calories allowance. The food secured households with yam production enterprises had a mean per capital calories intake of 3,614.69 Kcal which was above the 2260 Kcal FAO recommended threshold level ,whereas the majority of food secured households without yam production has a mean per capita calorie intake level of 1200Kcal, which was below the 22600Kcal recommended. Based on this study, there is still food security problem on account of the fact that about half of the persons are not food secured., so if the farmers are empowered to double their farm size this will double their income and as such enhance their food security status

TABLE 3.3
FOOD SECURITY STATISTIC FOR THE STUDY AREA

Variable	Food secure	Food secured	Household
	With yam production	Without yam production	
Number of household	63	57	120
Headcount ratio (H)	0.53	0.47	
Incidence (fo)	0.55	0.47	
Depth (f1)	0.40	0.488	
Severity f2	0	0.259	

Source: Field survey, 2014

ASSESSMENT OF OTHER BENEFITS DERIVED FROM YAM-BSED PRODUCTION ENTERPRISES

Besides the income generation from yam-based production on the economic status of the respondents as well as the obvious improvement in their calories consumption, the study also identified other benefits derived by the farmers from yam-based production based on the agreed perception of the respondents from the information on Table 3.4, the target respondent all agreed that they derived benefit in all the areas outlined in the Table; put another way, all benefits under consideration were significant (means 2.5) however, the first five most significant benefits in order of scores;the respondents agreed that they were able to build personal houses (mean=3.55), they also agreed to the fact that they were able to pay for hospital bills (mean =3.48), they further confirmed that they moved to better rented houses in town (mean=3.41), there was increase in their household gadgets and they also generally agreed to the fact that there was hardly hunger in the family (mean =3.40), confirming the findings of FMANR (1997), that famine hardly existed where yam was produced this suggests that the problem of food insecurity in Nigeria will be minimized by boosting yam production. Other benefits outlined were ability to train children in schools with ease, ability to pay house rent with ease, ability to buy clothes, purchase cars and the capacity to fund traditional title rites.

TABLE 3.4 PERCEIVED CONTRIBUTION OF YAM-BASED ENTERPRISE TO LIVELIHOOD SECURITY

No	Perceived Benefits	Mean	S.D
1	Able to build my personal house	3.55	0.77
2	Able to pay for hospital bills	3.48	0.83
3	Movement to a better rented house	3.41	0.86
4	Increase in the number of electronics gadgets	3.41	0.86
5	Hunger hardly existing in the household	3.40	0.94
6	Able to train children in school with ease	3.39	1.20
7	Able to pay my house rent with ease	3.36	1.20
8	Able to buy clothes	3.24	1.34
9	Able to buy cars/vehicles	3.03	1.20
10	Able to take traditional titles	2.95	1.40

Source: Field survey, 2014   **(Agreed mean > 2.50)**

FACTORS INFLUENCING HOUSEHOLD FOOD SECURITY STATUS

The results of the logit regression model presented in table 3.5 showed that 3 variables were significant in the model. These are farm size ($p < 0.05$) with odd ratio of 1.355. the overall model has a chi-square statistic of 18.06 and overall percentage classification of 62.6%.

The implication of this result is that only the three afore-mentioned variables had effect on the food security status of the target households. Farm size was a positive indicator of food security. Household with large farm sizes are about two times more likely to be food secured than households cultivating small farm sizes; this is in accordance with a prior expectation. The households' farm income had a positive and significant effect on food security status of the respondents as the product market is a function of consumers' income. Empirical evidence from Senauer (1990), recognized income as crucial to the development of sound food and nutrition policies for a country. Households with farm income were likely to be 1.5 times more food secured than households without farm income.

The respondents' off-farm income also had a positive and significant effect on the household food security status. This agrees with a prior expectation that there are risks associated with farming and this off-farm income can be used to mitigate food insecurity shocks and financing of feeding during stack periods before harvest. Although the other variables included in the model are not significant and do not deserve further discussion, however, the signs carried by these factors, are worth noting. For instance, the respondents' age, level of education and household size are negatively signed. This implies that an increase in these sets of factors decreases the probability of the households being food secured while the positively signed, sets of factors would raise the probability of an household being food secured.

TABLE 3.5
LOGIT REGRESSION ESTIMATES OF FACTORS INFLUENCING FOOD SECURITY STATUS OF FARM HOUSEHOLDS IN THE STUDY AREA

Variable	Coefficient	Standard errors	t-statistics	Odd ratio
Constant	-0.625	1.802	-0.347	0.535
Sex	0.191	0.605	0.316	1.210
Age	-0.029	0.028	-1.036	0.971
Education 2	-0.254	0.382	-0.665	0.776
Farming size	0.572*	0.210	2.724	1.772
Farming experience	0.027	0.031	0.871	1.028
House ownership	0.065	0.471	0.563	1.303
Household size	-0.008	0.089	-0.0900	0.922
Farm income	0.403*	0.176	2.290	1.526
Off-farm income	0.344*	0.155	2.219	1.355

Omnibus tests of model coefficient (χ^2) = 18.06 df = 9; $p < 0.050$
Coefficient of determination (R square) = 0.223)
Overa 1%age classification = 67.6%
Source: Field survey, 2014

IV.   CONCLUSION

It has been established that yam production significantly improved the living standard of the farmers and that more improvement might have been achieved if the farmers had expanded their production base. It can be inferred from the study that yam-production is a veritable tool for food security improvement in the rural areas. Based on the findings, the following recommendations are made:

A. The positive influence of larger farm size on food security of rural households necessitates that farming on large scale should be encouraged among household in rural areas. Thus efforts should be directed by both government at all levels and individual toward empowering farmers or farmer's empowering themselves by joining co-operatives to have fund to lease large farm size.

B. A well-fed nation is a wealthy nation, that is able to supply the needed man-power for its economic growth and development. Thus, a well-planned and executed nutritional programme should be directed at the vulnerable groups in the study areas.

C. A kind of enlightenment campaign (through the media) on nutritional status and intake can be embarked upon at the grass root level for all

D. The government at the grassroots can vigorously pursue the meal subsidy and food aid for all, especially those of farming age so that the target audience will be actual beneficiary.

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