Determinants of Food Consumption Expenditure among Agro-Based Firms Workers in Southern Nigeria: Simultaneous Equation Approach

Sunday B. Akpan[1*], Ini-mfon V. Patrick[1], Samuel J. Udoka[1] and Uwemedimo E. Okon[1]

[1]*Department of Agricultural Economics and Resources Management, Akwa Ibom State University, Ikot Akpaden, Mkpat Enin, Akwa Ibom State, Nigeria.*

Authors' contributions

This work was carried out in collaboration between all authors. Author SBA designed the study, analyzed the data collected and was in charge of result interpretation. Authors IVP, SJU and UEO were involved in data collection, drafting of the manuscript, introduction, literature review and recommendations as well as proof reading of the entire manuscript. All authors read and approved the final manuscript.

Research Article

ABSTRACT

The study determines factors that affect food consumption expenditure of agro based firm workers in Cross River State, Southern Nigeria. Cross-sectional data were collected from 250 randomly selected workers of five rubber estates in the region. Descriptive statistics and two-stage least squares method of simultaneous equation model was used in the analyses. Results of the descriptive analysis of the socio-economic characteristic of respondents reveal that, the rubber sub- sector is dominated by the middle age workers who are predominantly males. More than 70% of workers in the industry had some years of formal education; while majority of them had moderate family size. In addition about 97% of the workers have invested more than one year in the sampled estates. Also, 76.8% of respondents belong to the local cooperative society; while only 6% depended solely on their salaries. Furthermore, the results of the regression analysis reveal that

*Corresponding author: E-mail: sundayakpan10@yahoo.com;

salary, tax, family size, non-food consumption expenditure and farm income determined the food consumption expenditure of rubber plantation estates' workers in Cross River State. The study has identified that remuneration among workers in the sub sector is generally low and this has a marginal positive effect on the food consumption expenditure. To improve workers food consumption expenditures, increase in salary in line with changes in the macro-economic variables in the country is advocated. In addition, policies targeted towards reducing household size and tax as well as the provision of amenities and infrastructures in the rural areas are recommended, as these would upsurge the agro-based workers' food consumption expenditure and increase productivity in the rubber sub-sector.

1. INTRODUCTION

Household food consumption expenditure is a critical issue in most developing countries [30]. In Sub Saharan Africa, food consumption expenditure constitutes greater percentage in the household income share compared to saving. In Nigeria, food consumption pattern had undergone remarkable changes over the last few years. There has been an increase in the consumption of starchy foods like cassava, yams, maize and rice and some decrease in the consumption of protein based food items such as fish and meats [29]. Average protein intake by Nigerians is only at the threshold of adequacy [28]. The daily per capita calorie supply as a proportion of requirement was 90% in 1988-1990 and 85% in the period 1992-1996 [27]. On the other hand, aggregate protein consumption was 61.1g/cap/day in 2002 [28]. These protein consumption figures fall short of the critical human body requirement which was put at 70g /cap/day by Food and Agriculture Organization [28].

Food consumption plays an important role in the economic growth and development of both developed and developing nations [1]. It has a considerable impact on the circular flows of income in the economy, meaning that, it has a significant effect on the economic activities of a country. In the agricultural sector, increase in the productivity of the sector has a positive linkage with the size of food consumption expenditure, size of disposal income and proportion of net income saved by farmers [4]. It therefore implies that, agro based industry productivity to a large extent, will depend on workers' remuneration and the proportion of its consumption and savings [22].

In Nigeria, salaries and wages paid by most agro-based firms are low; as a consequence, there is a general decline in labor welfare in the sub-sector [9]. Natural rubber sub-sector is an example of agro-based firm that fell in this category despite its contribution to economic development of Nigeria [32]. Rubber plantation firms are basically rural based agro-firms; as a result of this, majority of workers are rural dwellers whose income depend considerably on the viability of these firms. To an extent, the sustained productivity of the sub-sector is crucial in combating the scourge of rural poverty and unemployment in the country. Unfortunately, sustained productivity cannot be achieved in the sub-sector without improved workers' welfare which is directly linked to workers' food consumption expenditures. Aggregate household savings and the cost of household consumption have often been used as measure of consumer's welfare [20,24].

Food expenditure among workers in the agro-based firms can be described as unsatisfactory based on the poverty index of rural dwellers in the country [31,28]. This is evident in the decline of worker's ability to provide for their consumption expenses as well as basic necessities [5]. As advancement in agricultural sector in the country has remained unsatisfactorily low, the wriggling productivity among most agricultural firms in the country, apart from environment and policy instability has often been linked to workers' commitment which is directly related to their food consumption expenditures or welfare [1].

The satisfaction of an agro-based firm worker derived from his food consumption, depends on his budget constrain. Apart from income and budget limitation, other variables are responsible for the decisions by agro-based workers to channel part of their remunerations to food consumption [5]. The purchase decisions of agro-based firm workers are often affected by various factors (Bamidele *et al.,* 2010). Income, prices, educational status of the individuals, occupation, age, and socio-cultural factors are the main ones [26,31]. In the midst of these factors, the welfare of these workers is enhanced when they maximize their benefits by giving priority to the purchase of goods and services that avail the most and putting off purchases of the least needed goods and services due to income-bound. Thus, differences emerge according to the worker's behavior and effect of other factors determining these behaviors [8].

Undoubtedly, the rubber sub- sector has contributed immensely to the overall development of the Nigeria's economy. Given the increase market opportunities for the rubber products in the rapidly expanding Nigeria's economy, its increase demand at international market including its socio- economic impact on the lives of Nigerian [32], there is an overwhelming need to ensure sustained production through good management technique that is evolved around improved workers' consumption expenditures or welfare. The study focused specifically on workers of rubber plantation estates in the South- South region of Nigeria. There are many rubber estates scattered in the rain forest belts of Nigeria. This agro-based firm employed all categories of labour in its production and processing activities. The need for the study on food consumption expenditure behavior among rubber plantation estates' workers in the region is justified by the following reasons: in spite of the high unemployment rate and the saturated labor market in the region, labour are not steadily attracted to this high labour demanded agro-based outfits; and the issue of frequent in and out movement of labour in the estates as well as the rationale for low societal ranking of the estate workers compared to other job areas available in the region. Identification of variables that motivate the agro-based firm workers to allocate good proportion of their disposable income to food consumption is one of the prerequisites to understanding the well-being of this category of workers.

The study, therefore aimed at determining factors affecting food consumption expenditure among rubber plantation estate workers in Cross River State in Southern region of Nigeria. Being a rural based firm; the study assumes that the workers depend on job remuneration and farm income. Following the classical income theory, the household income is either consumed or saved. In addition, the study assumes that leakages and injection into the circular flow of income cycle of these agro-based workers in the rural setting are negligible. A simultaneous equation model was used to specify the savings and consumption function. Also a definitional equation that relates income to consumption and saving was also specified. The use of the simultaneous equation model helps to reduce the influence of endogenity of explanatory variable (s) or exogenous variable--error term correlation. This problem usually occurs when multiple regression model based on Ordinary Least Squares estimation technique is used to estimate consumption function [15].

1.1 Literature Review

Huston [14] and Bruck [7] showed that non- economic factors (that is education, sex and family size) are important determinants of consumers' decisions. Hopkins et al. [13] in Niger found that changes in female annual income while controlling the male income, impacted positively on household food expenditure for both earned and non-earned income. Hoddinoth and Haddad [12] in *Cote D' Ivoire* found a positive, but small marginal effect of women's income share on household food budget share. According to him, increasing household disposal income may not be effective strategy for increase food consumption. Gupta [11] and Avery and Kannickel [6] in their separate empirically studies discovered that increase income positively influence food consumption. Adebayo [2] discovered that expenditure elasticity of per capita calorie intake in South-Western Nigeria is between 0 to 4 percent meaning that calorie intake does not get a substantial share of the marginal increase in household income. Adewale [3] in Oyo State Nigeria found that household size and level of formal education affect consumption of Soybean. While studying factors affecting pork meat consumption in South Africa; Oyewumi and Jooste [19] showed that non-economic factors are becoming increasingly more important when consumers have to make purchasing decision regarding pork meat consumption. Emerole et al. [10] used multiple regression model to d*etermine* consumption expenditure and its share to total income in small farm households in Ikwuano, Abia State, Nigeria. Results showed that per- household-member income, and per- household-member wealth was the major determinants of consumption expenditure.

Also, Ukoha et al. [24] analyzed the determinants of farmers' welfare in Ebonyi State, Nigeria. Standard welfare function was specified and estimated using Ordinary Least Squares Regression. The results showed that microcredit and household size have significant negative effect on welfare. On the other hand, incomes, physical assets, level of education and age of household heads have significant positive effects on welfare. Matthews-Njoku et al. [16] studied determinants of Pork Consumption among rural households in Rivers State, Nigeria. The study found that consumption level of pork was affected by cultural belief, household size, cost and supply. Onyemauwa [18] analyzed household consumption expenditure of cassava products in South-East Nigeria. His findings revealed that household size, household income and cost of substitutes were important variables that affect the consumption of cassava products in the area. Odusina et al. [17] discovered that household size and expenditure on substitutes affect the consumption of protein among rural households in Oyo State, Nigeria. Seid [21] examined the determinants of household expenditure on Teff in Ethiopia. The double hurdle model for Teff consumption suggested that the household head age, household size, dependency ratio, education, employment status and gender were significant determinants of Teff consumption. Cağlayan and Melek [8] investigated the determinants of household consumption expenditure in Turkey. The empirical results showed that the age, income, marital status, insurance and the size of the household were important variables affecting household consumption expenditure. Terano and Zainalabidin [23] analyzed the food expenditure of farm households in Malaysia. Their expenditure function indicated that, off-farm income and number of family members are the major determinants of food expenditure.

From the reviewed literature, it is evident that most researches on consumption expenditure determinants in Nigeria, used multiple regression models [3,10,24,16,17,18]. This model does not take into consideration the inherent endogenity problem of household income among the explanatory variables. The prevalence of this econometric problem usually lead to inconsistent regression estimates [15]. As a consequence, this could lead to faulty policy

variables and recommendations. Also, most of the researches focused on arable crop farmers [10,23,24] without due consideration to tree crop farmers. Others analyzed determinants of food consumption expenditure based on specific food products [3,16,19,18, 17,21]; while few researchers [14,7,6,11,8,12] dealt on the general household without distinctively clear definition of the type of households used. However, this study differs from other related researches as it employed simultaneous equation model to solve the problem of endogenity in household income. It also focused specifically on the determinants of rubber plantation workers household food consumption expenditure.

2. METHODOLOGY

2.1 The Study Area, Data Collection and Sampling Technique

The study was conducted in the Southern Senatorial District of Cross River State in the Southern region of Nigeria. The area hosts most of the viable rubber estates in the region. Primary data were collected from respondents with the aid of well structured questionnaires. Personal interview of some respondents were also conducted to re-assess and validate some data collected. Five rubber estates owned by several private companies in the region were randomly selected and used for data collection. 50 agro-based workers were randomly selected from each of the estates. A grand total of two hundred and fifty (250) sample size was used in this study. Baseline information on the socio-economic characteristics, saving, income and consumption expenditures as well as the off-job engagement were collected and analyzed.

2.2 Analytical Framework

Income, saving and consumption are closely related. Several economic studies have shown that income is among the primary determinants of consumption and saving. When the household income increases, the increment is channeled to saving and consumption. Household savings is thus, the complement of consumption. In this study we assumed that agro based worker salary is either save or spent on household consumption. Economic facts have shown that some variables that affect household savings also affect consumption expenditures [5]. Income is one of such economic variables that impact household saving and consumption simultaneously. Implicitly, the relationship between saving and consumption can be expressed as shown in equations (1), (2) and (3). This relationship usually causes the problem of endogenity of income in the econometric analysis.

$$Sav = \beta_0 + \beta_1 Inc + \beta_2 X_1 + \beta_3 X_2 + \beta_4 X_3 + \beta_5 X_4 + \beta_6 X_5 + \beta_7 X_6 + \beta_8 X_7 + U_2 \quad \text{.......................} \quad (1)$$

$$Con = \Psi_0 + \Psi_1 Inc + \Psi_2 X_1 + \Psi_3 X_2 + \Psi_4 X_3 + \Psi_5 X_4 + \Psi_6 M_1 + \Psi_7 M_2 + \Psi_8 M_3 + U_1 \quad \text{...........} \quad (2)$$

$$Inc = Con + Sav \quad \text{...} \quad (3)$$

Where
Inc = Salary of i_{th} worker in naira
Sav = Monthly savings for ith worker in (₦).
Con = Household consumption expenditure (Con = Inc- Sav) in (₦)
X_1 = is a predicted tax (Tax*) derived from (Tax = t + tInc) and expressed in (₦), where
Tax = Monthly tax on salary of ith worker.
X_2 = Years of formal education of worker.

X_3 = Household size in Number.
X_4 = Sex of worker (Dummy 1 for male and 0 for female).
X_5 = Age of the worker.
X_6 = Experience in job measured in years.
X_7 = Membership of local Association (worker's cooperative society) in years.
M_1 = Monthly Income of other family members (₦).
M_2 = Monthly Household non–food consumption expenditure as a proportion of total income (salary + farm income) (₦).
M_3 = Monthly farm income of i_{th} worker (₦).

2.3 Identification of the Structural Model

Since a unique relationship exist among income, saving and consumption; the OLS estimation of any behavioral equation in the above structural model will yield bias and inconsistent estimates [15]. Therefore, the behavioral equations (i.e. equation 1 and 2) were identified to determine whether a unique estimate of parameters of the specified structural equation can be obtained by applying appropriate simultaneous equation model. To do this, we employed the order and rank conditions of identification [15]. The processes and the result of the exercise are shown below:

2.3.1 Order condition test

Order condition is a necessary condition of identification. In a model of G simultaneous equations, in order for a equation to be identified, the number of predetermined variables excluded from the equation must not be less than the number of endogenous variables included in that equation less than 1 (33), that is, $K - M \geq G$. (Where K = total number of variables in the model, M = total number of variables in each equation and G = total number of endogenous variables in the model) [15]. The order identification process is shown below;

For equation 1			For equation 2		
K -M	≥	G – I	K -M	≥	G – I
13 - 8	>	3 – 1	13 - 9	>	3 – 1
5	>	2	4	>	2

The result of the order identification shows that equation 1 and 2 in the structural model fulfilled the first order condition for the identification (i.e. K – M > G – 1).

2.3.2 Rank condition test

The rank condition is a sufficient condition for identification. As a prerequisite, the order condition must be fulfilled before this condition is tested for. According to (33), a model that contains G equations and G endogenous variables is identified, if and only at least one nonzero determinant of order (G-1) (G-1) can be constructed from the coefficient of the variables (both endogenous and predetermined) excluded from that particular equation but included in the other equations of the model. The processes involve the tabulation of the structural coefficients as shown below;

0	=	-Sav	+β_1Inc	+ β_2X_1	+ β_3X_2	+β_4X_3	+ β_5X_4	+β_6X_5	+β_7X_6	+β_8X_7	+0c	+0M_1	+0M_2	+0M_3
0	=	0Sav	+Ψ_1Inc	+ Ψ_2X_1	+ Ψ_3X_2	+Ψ_4X_3	+Ψ_5X_4	+0x_5	+ 0X_6	+0X_7	-1c	+Ψ_6M_1	+Ψ_7M_2	+ Ψ_8M_3
0	=	Sav	-Inc	+0X_1	+0X_2	+ 0X_3	+0X_4	+0X_5	+0X_6	+0X_7	+1c	+0M_1	+0M_2	+0M_3

Matrix of coefficient

-1	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	0	0	0	0
0	Ψ_1	Ψ_2	Ψ_3	Ψ_4	Ψ_5	0	0	0	-1	Ψ_6	Ψ_7	Ψ_8
1	-1	0	0	0	0	0	0	0	1	0	0	0

The second step involves the striking out of coefficients of the row in which the equation under consideration appears. The next step is the striking out of column corresponding to nonzero cell in the row of equation under consideration. After the above step, the table will contains only coefficients of variables included in the system but not in the equation under consideration. The result of the above processes for equation 1 and 2 are shown below;

For equation 1

-1	Ψ_6	Ψ_7	Ψ_8	2x2 sub-matrix		-1	Ψ_6
1	0	0	0	Determinant = 0 - Ψ_6 = - Ψ_6		1	0

For equation 2

-1	β_6	β_7	β_8	2x2 sub-matrix		-1	β_6
-1	0	0	0	Determinant = 0 - β_6 = - β_6		1	0

The next step involves constructing sub-matrices of order G -1 (i.e. 2 X 2 sub matrices) from the matrices derived from the previous step for the two equations. Rank condition is fulfilled if one of the sub-matrixes has a nonzero determinant. The result of the identification shows that the structural model is over- identified, since $K - M > G - 1$ (order condition) and the rank conditions are fulfilled. This implies that the two-stage least squares estimation method is appropriate for estimating equations (1) and (2). From equation (1) and (2) we investigated the relationship between the error terms and established that, the Cov $(U_1, U_2) = 0$; meaning that U_1 and U_2 are contemporaneously independent. This further confirmed the relevance of the 2- stage least squares method of simultaneous equation model specification over others. A reduced formed model for income was specified and its estimated value was used to correct for the endogenous variable (or income) specified as exogenous variable in the consumption function present in the structural model (i.e. equation 2). Hence,

$$Inc = \pi_0 + \pi_1 X_1 + \pi_2 X_2 + \pi_3 X_3 + \pi_4 X_4 + \pi_5 X_5 + \pi_6 X_6 + \pi_7 X_7 + \pi_8 M_1 + \pi_9 M_2 + \pi_{10} M_3 + U_1 \dots \dots (4)$$

The OLS estimates of equation (4) was used to generate the predicted values of "Inc" (i.e. Inc*). This was incorporated into the consumption equation (i.e. equation 2) which is the equation of interest in this research work. It follows that, the food consumption expenditure function to be estimated, given the variables and the transformation is as shown below.

$$Con = b_0 + b_1 Inc^* + b_2 X_1 + b_3 X_2 + b_4 X_3 + b_5 X_4 + b_6 M_1 + b_7 M_2 + b_8 M_3 + U_2 \dots \dots \quad (5)$$

Where variables are as defined previously in equation 1, 2 and 3.

2.4 To Test for Multi-Collinearity among Specified Variables in the Model

Multi-collinearity is among the common econometric problems of the cross sectional data analysis. This property of econometric was tested among explanatory variables to ensure

the consistency of the consumption function estimates. The variance inflation factor (VIF) and the tolerance factor (TOL) were estimated and used to test for the presence of the multicollinearity. For VIF, the minimum possible value is 1.0; while value greater than 10 indicates a probably collinearity between the explanatory variable in question and the rest of the predictors in the model. VIF was estimated using the formula stated below:

$$VIF_j = 1/\{1 - R^2{}_j\} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

Where $R^2{}_{(j)}$ is the multiple correlation coefficient between variable X_j (one of the independent variable) and the other specified explanatory variables X_j^s as shown in equation 7.

$$X_j = \delta_0 + \delta_1 X_1 + \delta_2 X_2 + \cdots, + \delta_n X_n + e_n \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

On the other hand, tolerance (TOL) is an inverse of VIF. A small tolerance value indicates that the variable under consideration is almost a perfect linear combination of other independent variables in the equation and that it should not be added to the regression equation. In other words; when $R^2{}_j$ =1 (i.e. perfect collinearity), $TOL_j = 0$ and when $R^2{}_j = 0$ (i.e. no collinearity), TOL_j will be equal to 1. Hence, both VIF_j and TOL_j can be used interchangeably (33).

3. RESULTS AND DISCUSSION

3.1 Test Result for Multi-Collinearity among Specified Variables in the Model

Table 1 presents the Variance Inflation Factors (VIF) and Tolerance (TOL) test results for the collinearity status of the explanatory variables used in the consumption function.
The result reveals that, the problem of multicollinearity in the data set could be tolerated since it has not exceeded the threshold mark. This means that the VIF has not reached the 10th point mark; on the other hand, the tolerance factor is above 0.1 point mark for all the explanatory variables in the model. The result implies that the estimates of the consumption function are consistent.

Table 1. The Variance Inflation factors (VIF) and Tolerance factor test results for the collinearity of explanatory variables used in the model specify in equation 5

Variable	VIF Estimate	Tolerance factor
Salary	2.545	0.393
Tax	1.987	0.503
Education	1.876	0.533
Family Size	2.453	0.408
Income from others	1.453	0.688
Non-farm income	7.854	0.127
Gender	2.894	0.346
Farm income	3.812	0.262

Source: Computed by authors. Note: for the variance inflation factor (VIF), the minimum possible value is 1.0; while value greater than 10 indicates a probably collinearity problem. Low tolerance factor implies high probability of collinearity

3.2 Socio-Economic Characteristic of Respondents

Table 2 presents the socio economic characteristics of respondents in the study area. The results reveal that, the rubber sub- sector in the south-south region of Nigeria is dominated by middle age workers who are predominantly males.

Table 2. Socio-Economic Characteristics of Respondent

Characteristic	Freq. and %	Characteristic	Freq. and %
Age (Yrs)		Family size (No.)	
< 20	26 (10.40)	<3	38 (15.20)
20 – 30	58 (23.20)	3 – 5	102 (40.80)
> 30	166 (66.40)	> 5	110 (44.00)
Total	250 (100.00)	Total	250 (100.00)
Sex (No)		Experience (Yrs)	
Female	55 (22.00)	<1	6 (2.40)
Male	195 (78.00)	1 – 10	116 (46.40)
Total	250 (100.00)	>10	128 (51.20)
		Total	250 (100.00)
Education (Yrs)		Association	
No schooling	58 (23.20)	Membership(Yrs)	
Primary School	119 (47.60)	0	58 (23.20)
Secondary School	60 (24.00)	< 1	15 (6.00)
Tertiary	13 (5.20)	1 – 10	107 (42.80)
Total	250 (100.00)	> 10	70 (28.00)
		Total	250 (100.00)
Av. Monthly Farm Income (₦)		Av. Monthly Salary (Non Farm Income) (₦)	
0	15 (6.00)	< 10000	75 (30.00)
< 5000	120 (48.00)	10001- 20000	130 (52.00)
5001-10000	90 (36.00)	> 20000	45 (18.00)
> 10000	25 (10.00)	Total	250 (100.00)
Total	250 (100.00)		

Source: Field survey, 2010 and 2011. Note; Values in parentheses are percentages

More than 70% (192) of the workers had some years of formal education; while majority have moderate family size. In addition, about 98% (244) of the workers have invested more than one year in the various estates sampled. Also, about 76.8% (192) of respondents belong to the local cooperative society (Osuzu) in the estate which is basically a saving oriented cooperative group. The result further indicates that only 6% (15) of the workers depended solely on their salaries, while the remaining 94% (235) depended on farm income in addition to their monthly pay from the estate. The monthly income distribution shows that about 18% (45) of the workers have above ₦20, 000 monthly incomes. This cadre of workers are mainly administrative and management staff.

3.3 Empirical Result (the consumption function)

The estimated food consumption expenditure functions are presented in Table 3. The linear function was picked as the lead equation (L**). The choice of the linear form is consistent with the similar research results reported by; Adebayo (34); Onyemauwa (18) and Bamiro

(35) in Nigeria. The lead equation has the highest coefficient of determination (R^2 = 0.819) and more significant explanatory variables compared to other models estimated. The values of the RESET test (11.985***) and the normality test (12.459***) for the linear form behave better than in other models. This means that the structural rigidity of the linear model is stronger than in other models. The normality test is highly significant in the linear form which justifies the use of the ordinary least squares (OLS) method of estimation. The F-statistic (8.830***) in the linear model is greater than in other models and is highly significant at 1% level of probability. This implies that, the estimated R^2 is significant and the model has goodness of fit for variables specified.

The result revealed that the slope coefficient of the agro-based workers' salary (Inc*) is statistically significant at 1% probability level and positively related to the food consumption expenditure. This implies that, as the salary of the agro-based worker increase by one naira, the food consumption expenditure also increase by 17.45 naira. This result however indicates that, for every one naira increase in the worker salary, a larger increment would occur in the food consumption expenditure. In other words; 10% change in a worker's salary will lead to less than equivalent 10% change in food consumption expenditure of workers. This result explains the less positive influence of the agro based workers' salaries to their food consumption expenditures. The salaries of these workers are relatively constant over a period of time; the farm proceeds inform of income or farm products plays a major role in influencing the workers food consumption expenditure in the short run. Similar result had been obtained from empirical studies conducted by Gupta [11], Matthews-Njoku et al., [6]; Ukoha et al., [24]; Onyemauwa [18]; Caĝlayan and Melek [8] and Terano and Zainalabidin [23].

Monthly tax on workers' salaries has a significant negative effect (at 5% significance level) on food consumption expenditure of the rubber plantation estate workers in southern region of Nigeria. This means that, the current tax system adopted by the government of the region reduces the purchasing power of workers in the rubber sub- sector. One naira increase in the tax paid by the worker, would reduce food consumption expenditure by 60.35 naira. This also gives an insight why workers income cannot adequately take care of their consumption expenditure.

A naira tax imposed on workers' salaries would reduce disposable income by ₦60.35. Given the current instability in macro-economic variables in Nigeria's economy, the propensity of tax reduction among these workers is almost negligible. Thus, the workers take home pay might continue to play a less significant positive role in providing for workers food consumption expenses in the rubber sub-sector in the region.

The estimated coefficient of education (X_4) is negative and statistically significant at 5% probability level. This means that, a unit increase in the year of formal education of workers' decrease the household expenditure by ₦637.55. This result confirms the fact that most of the workers have lower years of formal education and hence will prefer necessary commodities to luxury ones in attempts to curtail consumption expenditures. This result corroborates the empirical findings of Huston [14]; Adewale [3]; Bruck [7]; Seid [21] and Ukoha et al., [24].

Table 3. The OLS estimates of the 2 stage-least squares consumption regression

Variable	Exponential	Linear (L**)	Semi-log	Double-log
Salary (Inc*)	0.00709*** (3.553)	17.485*** (3.891)	2812.99 (0.098)	0.585 (0.378)
Tax (X_1)	-0.0244*(-1.833)	-60.35*(-1.874)	4540.55(0.071)	0.351(0.102)
Education (X_4)	0.005(-1.294)	85.604**(-2.251)	-729.35**(-2.000)	-0.205 (-.042)
Family size (X_6)	0.055*(1.811)	782.03**(2.022)	2005.010*(1.870)	0.157**(2.266)
Income of other Family Members (X_7)	-0.000049(-0.3.42)	-0.0.63(-0.216)	-330.148(-0.109)	-0.062(-0378)
Non-food expenditure (M_1)	-0.08112*(-1.650)	-800.17**(-2.316)	-135.503(-0.034)	-0.134(-0.625)
Gender (M_2)	0.243(1.506)	637.55(0.453)	-966.61**(-2.370)	-0.370*(-.688)
Farm income (M_3)	-0.5913***(-2.895)	-2345.11***(-4.751)	-1757.14(-0.773)	-0.093(-0.761)
Constant	21.707**(2.522)	357.9***(3.925)	188.20**(2.105)	6.402*(1.665)
R^2	**0.797**	**0.819**	**0.346**	**0.284**
F-stat	**6.891*****	**8.830*****	**2.185****	**1.998***
RESET test	**9.123*****	**11.985*****	**1.765**	**0.954**
Normality test	**10.675*****	**12.459*****	**1.987**	**0.765**

*Where *, ** and *** represent 10%, 5% and 1% significant levels respectively. Values in parenthesis are t-value while (L**) is the lead equation*

The non-food consumption expenditure of the workers had a significant adverse effect (at 5% significance level) on food consumption expenditure. This means that, as workers purchase non- food items, their food consumption expenditure is negatively affected. This result indicates that 10% increase in the expenditure on non-food items would lead to about 800.17 naira reductions in household food expenditure. The result may be attributed to the distance of the rubber estates to the metropolis where most of these non-food items are purchased. The proximity between the estates and the metropolis is the measure of the transportation cost incurred by workers when they want to purchase household items and other necessary home accessories. This additional cost reduces the worker's disposable income and also increases the food consumption expenditure. It is also striking to note that, most of the rubber plantation estates lack standard schools, well equipped clinics and other infrastructures. Hence, most workers have to pay heavily to sponsor their wards to attend good schools in the nearby towns and for their health care needs. These responsibilities increase their monthly non-food consumption expenditure while drastically reducing the household food consumption expenditure.

The family size has a significant positive impact (at 5% significance level) on food consumption expenditure of rubber plantation estate workers in the southern region of Nigeria. That is, a number increase in the household size of the worker would result in ₦782.03 increase in household consumption expenditures. This implies that, workers that have large family size would have increment in food consumption expenditure. This means that, the larger the worker's household, the more difficult it will be for the worker to meet the basic food consumption requirement of the family. Since rubber estates are located in the rural areas, most of the workers are not exposed to modern methods of family planning. In addition, low years of formal education and the rural community influence, perhaps contributed to the mental orientation of most workers having large families. Another possible reason for this result could be the low remuneration to workers which prevent them from accessing modern information and facilities for effective family planning. As a consequence, the family consumption expenditure increases as the family size increase. This result is in consonance with the research reports of Huston [14]; Bruck [7]; Adewale [3]; Emerole et al., [10]; Ukoha et al., [24]; Matthews-Njoku et al., [16]; Onyemauwa [18]; Seid [21]; Cağlayan [8]; Odusina [17] and Terano and Zainalabidin [23].

The coefficient of farm income of workers is statistically significant at 1% probability level and negatively related to food consumption expenditure. The result shows that for every one naira increase in the worker's farm income, about ₦2345.11 worth of household expenditure is saved. This means that, majority of workers are engaged in subsistence farming activities; implying that most of their farm products are consumed by them. This result reveals the important of farming engagement to the welfare of agro-based workers in the region. The possible reasons for this result could be the low level of formal education among workers and the remoteness of the estates which cut them off from accessing luxuries commodities. Given this result, it implies that farm income plays a more significant role in the agro-based worker's food consumption expenditure than the salary earned.

4. SUMMARY AND CONCLUSION

The study used the simultaneous equation model to estimate the household food consumption expenditure function for rubber plantation workers in southern region of Nigeria. Rubber firm and workers' related factors were specified in the estimated model. The estimated linear consumption expenditure model reveals that salary, monthly income tax, education, family size, non-food expenditure and farm income are significant determinants of

consumption expenditure of rubber plantation workers in Cross River State in the South-South region of Nigeria.

The contribution of the natural rubber sub-sector to the economic development of the Southern region of Nigeria cannot be undermined. Improving food-consumption expenditure of workers in the rubber estates will directly increase the productivity of the sub-sector in the region. The study has identified that remuneration in the natural rubber production sub sector in the southern region of Nigeria is generally low and this has a marginal or minimal positive effect on the food consumption expenditure of workers. The study identifies that this hindrance is among the fundamental reasons labor is not steadily attracted to this agro based industry despite saturated labor market in the region. In reaction to this situation, most workers complement their salaries with farm income which has a significant effect on the food consumption expenditure. Apart from the above reasons, the results imply that the rural area where the rubber estates are located and the negative impact of the non-food consumption expenses on food consumption expenditure in addition to the poor facilities and infrastructures in the production areas are among possible reasons for the low societal ranking of workers of these agro based firms; and unsteady labor movement in the sub sector.

5. POLICY IMPLICATIONS AND RECOMMENDATIONS

The results of the study identified monthly tax, years of formal education and non-food consumption expenditure to have significant negative impacts on rubber plantation estate workers' food consumption expenditure in the southern region of Nigeria. In addition, the study has revealed that workers' salary and family size have significant positive relationship with food consumption expenditure. Based on the above findings, the following policies were recommended. The employee or owners of the rubber estates should endeavor to increase the workers' salaries periodically in line with the changes in the country macroeconomic and microeconomic variables in the country. Also policies which reduce agricultural production restraints will increase the workers farm income and subsequently improve their food consumption expenditure through increase in their disposable income. Policies which reduce tax and household size will improve food-consumption expenditure of rubber plantation estate workers in the region. Direct tax cut and appropriate birth control measures for these set of workers are advocated. Non-food consumption expenditure has a negative effect on food consumption of the workers. This suggests that government of the region should adopt policies targeted towards development of rural areas through provision of amenities, re-creational facilities, schools, well equipped hospitals and other necessary infrastructures. These will reduce the non-food expenditure while part of the unspent income would be channeled to household food consumption.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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