**Impact of Women’s Share of Income on value chains of staple Food in South East Nigeria**

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**Abstract**

The main message of this paper is to: (i) determine the socio-economic characteristics of men and women in south east Nigeria (ii) determine the cropping systems and profitability of the major enterprises (iii) explain the patterns of household enterprises (iv) determine the impact of women’s and men’s share of household income on the performance of various value chains activities in south east Nigeria using a bargaining model of household behavior; (v) extrapolate on the policy implications of gender-specific control of household incomes We used a sample of 400 households constituting 2520 members from November 2016 to April 2017 disaggregated by gender. We found that increasing women’s share of incomes raises the budget share of food preparation, planting, weeding, processing and storage and negatively related to clearing, cultivation and not significant with marketing. Our results suggest that any strategy by policy makers in southeast Nigeria to improve any of the value chains should target the gender that will more likely spend their money on the value chains activity concerned. Targeting the right gender will enable achievement of the United Nations (UN) Sustainable Development Goals (SDGs)

 **Keywords:** Women-income, value chains of staple food, women’s-role, women-empowerment.

**Introduction**

 Women produce to satisfy household food needs or make profit or both. Whether the interest is to produce for home consumption or for market, the duty of married women is to acquire and prepare food for all the members of the family. The African gender ideologies attach important to responsibility of women for household work especially good mothering including provision of food for the households. Therefore in order to play their roles in providing food diversity for the household, rural women engage in value chain activities of staple food and some are also wage workers. By contrast, this believe in the duty of women to provide food for the household support the notion that rural men can spend their money without contributing to expenditure on food but to personal spending money the way they like.

 The impact of share of women’s income on rural households staple food expenditure has attracted greater attention in recent years because they play significant roles in African’s staple foods value chains including their production, processing, storage, transportation, marketing and utilization (Akresh, Chen, & Moore, 2016; Barr, Dekker, Janssens, 2018; Kebede, & Kramer, 2018; Bernard, Doss, Hidrobo, Hoel, & Kieran, 2020; Doss, Meinzen-Dick, Quisumbing, & Theis, 2018). Women engage in value chains of roots and tubers, vegetables, fruits, grains, and fish products among others that leave the farms and make their way to the consumers’ mouths to provide food for the family and earn income (Opata & Ezeibe, 2018). They also earn income from employment and private businesses. In doing so, they contribute to national agricultural output, maintenance of environment and contribute to households food security and income. They dominate in almost all phases of root and tubers such as cassava, sweet potatoes, cocoyam; grains like maize, rice, beans, wheat; vegetables such as telferia, amaranth and fruits such as garden egg, yellow pepper, tomatoes and processing of oil palm, cocoa and coffee except yam production (Enete & Amusa, 2010). They have also undertaken the rearing of small farm animals and execution of certain intricate farm operations. Not only do women play significant roles in food production on family farms, they also work on their personal farms and are now also mastering those aspects of agriculture that used to belong exclusively to men. For instance, women help with the strenuous jobs of cutting trees and clearing bushes and they were found working all the year round on activities such as food production, processing, storage, transportation and marketing for their income while men performed only pre-planting tasks and staking of yam that occupy small parts of the agricultural year.

 While men specialized in certain tasks like clearing bush or forest, cultivation, felling or pruning trees, ploughing or tiling the land, women, have been estimated to do 70 percent of hoeing and weeding, 60 percent of harvesting, 80 percent of transporting crops home and 90 percent of food processing such as threshing, winnowing, shelling, dehusking, parboiling, drying, marketing and food preparation (Paula, Campos, Covarrubias, & Patron, 2016). However, productivity of female farmers is often hampered by their limited access to productive resources and opportunities. The limited access to resources by women farmers could lead to improper techniques in value chain activities, leading to food loss and waste and these impede food security. Statistics from AgroNigeria indicate that staple foods worth US$ 8.9 billion rot away annually due to subsistence nature of all the value chain activities in Nigeria (AgroNigeria, 2017).

 As men’s participation in agriculture declines, the role of women in agricultural value chain activities increases. In Mozambique, for example, for every 100 men working in agriculture there are now 153 women (Agadjanian & Hayford, 2017). Through traditionally, women do not have land of their own, they operate family plots for home consumption, rent land in distance farms for market and perform various value chains activities to secure food that will enable them perform their traditional roles and sale some for other family needs. Through increased participation in agriculture, women have influenced family decisions on what to produce, how to produce, the sale of small food surpluses to meet their needs and labour-supply (Bernard et al., 2020).

 It is obvious that women are very active in food production and this widely held is the heart food security in rural households (Akresh et al., 2016; Diiro, Seymour, Kassie, Muricho, & Muriithi, 2018). More emphatically, women are the backbone of African agriculture and Nigeria in particular. Doss *et al*, (2018) indicate that increasing the women’s share of household income will lead to not only women empowerment but also a means to achieve better production and consumption outcome. Therefore, gender dynamics with respect to targeting women or men on the techniques that will add value to value chains activities performed by the gender that will be more likely perform the activities will enable attainment of Sustainable Development Goals (SDGs) on gender equality (Goal number5), zero hunger (Goal number 2), no poverty (Goal number 1), and Goal number 12 which aims at achieving responsible consumption and production by 2030. Most specifically, with reference to food losses and wastes this goal emphasizes actions for ‘halving per capita global food waste at the retail and consumer levels and reducing food losses along production and supply chains including post-harvest losses by 2030 (Goal 12 target number 3) and gender equality is relevant for achieving all the SDGs.

 FAO, (2010) report estimates showed that women contributed over 50 percent of the labour force in 56 countries out of 82 developing countries in the world. These figures show the importance of women in the agricultural development process. Palacios-Lopez, Christiaensen, & Kilic, (2017) observed that most African women are significantly engaged in subsistence agriculture; emphasizing and they classified them as the backbones or pillars of small peasant farmers in Nigeria. Women in Africa make up more than one third of the labour force. CTA Strategy, (2016) showed that women account for 70% of agricultural workers, 80% of food producers, 100% of those who process basic foodstuffs, and they undertake 60-90% of the marketing. Women also make decisions about what their family eats, and therefore, empowering them has a disproportionate beneficial effect and that an increase of US$10 in a woman’s income has the same impact on household food and nutrition security as an increase in a man’s income of US$110 (CTA Strategy, 2016).

 Globally, it is well established that women spend incomes differently from men. While some studies found that increases in earnings of low income wives contribute significantly to the family’s cash incomes and therefore in production and consumption of staple food (Doss, 2016), others have shown that neither raise in per capita food energy intake nor increase in the quality of food calorie sources for households in rural south-western Nigeria would be attributed to redistributing household income from men to women (Aromolaran, 2004, 2010). Yet other studies such as (Hoddinott and Haddad, 1995) argued that expenditure patterns of household food consumption in the household tend to depend on who earns incomes in the family. Similarly, related studies exist globally on gender and performance of activities such as food production, processing, storage, transportation, marketing and preparation of roots and tubers, vegetables, fruits, grains, and fish products among others until the food is in consumers’ mouths, with a view to finding answers to some of the thorny issues affecting them (Akresh et al., 2016; Bernard et al., 2020; Paula et al., 2016). However, not only that none of these studies investigated the influence of women’s share of income on value chains of staple food in southeast Nigeria, the data set they used in the analyses were not reliable because of two reasons: they did not use gender disaggregated data. Again the methodologies adopted by some of these studies were regarding households as a unitary entity that assumes income pooling as if the family members are maximizing a single welfare. This proposed study will contribute to the ongoing empirical debate by analyzing the impact of women’s share of income on value chains of staple food in south east Nigeria.

 The comparison between the women’s share of income and men’s share of income on value chains of staple is relevant to policy. This is because it enables the researchers to empirically estimate and test for the impact of women’s share of income on value chain activities such as clearing, cultivation, planting, weeding, processing, storage, transportation, marketing and food preparation of staple food of roots and tubers, vegetables, fruits, grains, and fish products from farms to fork. Income that was used for the performance of the value chains activities were estimated from the Net Farm Income (NFI) per hectare obtain for different enterprises and other non-farm income (i.e. the proportion of household income accruing as cash to men and women from the sale of crops and livestock from their personal and family farms, non-farm income from activities such as private businesses and employment). Estimates of total expenditure per hectare of budget share of each value chains activities such as clearing, cultivation, planting, weeding, processing, transportation, storage, marketing and preparation of staple foods were used for the study. These understanding will provide scientific evidence on the effect of women’s share of income as well as men’s share of income on the value chains of staple foods. These would help in devising appropriate policies to target the gender that will more likely spend their income on the value chains activity concerned. The policy is expected to devise ways dissemination good practices for all the value chain activities of staple food. Hence, the key policy question is: what is the impact of women’s share of household income on value chains of staple foods? What are the patterns of staple food value chains expenditure using a bargaining model of household behavior? What is the policy implication of gender-specific control of household income?

 The objective of this paper is to(i) determine the socio-economic characteristics of men and women in south east Nigeria (ii) determine the cropping systems and profitability of the major enterprises (iii) explain the patterns of household enterprises (iv) determine the impact of women’s and men’s share of household income on the performance of various value chains activities in south east Nigeria using a bargaining model of household behavior; (v) extrapolate on the policy implications of gender-specific control of household incomes. An attractive nature of this model is that it does not assume that income is pooled within the household. Instead, the share of household expenditure devoted to particular activity in the value chains is a function of the intra household distribution of income. The value chains of staple food budget items considered for the study are clearing, cultivation, planting, weeding, processing, storage, marketing and preparation of staple foods such as root and tubers, cereals, legumes, vegetables, fruits, fish, meat.

**Materials and methods**

 **Study area, data and variables**

 The study area is South-east geopolitical zone of Nigeria. Five states constitute this zone: Abia, Anambra, Ebonyi, Enugu, and Imo respectively, an area covering latitude 40 50’N to 70 10’ N and longitudes 60 40’E to 80 30’E. The zone spreads over a total area of 78,618 km2, representing 8.5% of the Nigeria’s total land area. The area has a total population of 16,381,729, (National Population Commission, 2007).

 Six-stage sampling procedure was employed for the study. In stage one, two states were randomly selected from the five states using a simple random sampling technique. The two states were Enugu and Abia. In stage two, all the three zones in Abia were selected while three zones from the six zones of Enugu states were selected using simple random sampling technique. Zones from Abia were Aba, Umuahia and Ohafia while those from Enugu were Enugu, Awgu and Nsukka zones. Stage three involves selection of Local Government Areas, twelve rural local government areas were selected from the thirty-four Local Government Areas using random sampling techniques. Stage four involved selection of rural communities. This stage involved random selection of two rural communities from each of the twelve (12) rural Local Government Areas selected. This amounted to twenty-four (24) rural communities that were used for the study. Stage five involves selection of villages, a list of villages that make up each of the twenty-four (24) communities was gotten from the community head. From this list two (2) villages were randomly selected from each of the sampled twenty-four (24) communities. This amounted to forty-eight (48) villages. Stage six is the selection of respondents. Here, list of respondents was gotten from the village heads where there are women farmers, and from there eight or nine (8 or 9) household farmers were randomly selected from each village. This amounted to four hundred (400) household farmers. In each selected households, relevant female or females, male and children were interviewed amounting to 2520 individuals. The researcher’s reason for this was because the work needed gender disaggregated data to achieve the objectives and the needed information was collected through the use of interview schedule/questionnaires that were personally administered by the field supervisors. Prices of output from the sale of crops and livestock of farm products were obtained from the community market surveys. Quantities estimates of value chains expenditure spent on clearing, cultivation, planting, weeding, threshing, winnowing, shelling, dehusking, parboiling, drying, transportation, storage, marketing and preparation of staple foods such as root and tubers, cereals, legumes, vegetables, fruits, fish, meat, were collected from each member of the household using recall method. Uniform costs of labour per hectare for each of the value chains considered were used for all the households. Information on household income and expenditure on crop cultivated were collected from each crop-owner member of the household. Each household was visited two times per month for six months to reduce measurement error in the household income and expenditure.

 Expenditure data were also aggregated into sixteen categories and expressed as a share of total expenditure on staple food value chains. Each of the shares of the sixteen variables to total household expenditures on staple food was used as dependent variables. Each of the dependent variables was explained by women’s share of income after controlling for household demographic composition, and total expenditures. These regressands are: value chains such as; clearing, cultivation, planting, weeding, processing, storage, marketing and preparation of staple foods of root and tubers; cereals, legumes; vegetables; fruits; fish; meat as defined in Table 1.

**Data analysis methods**

 The household bargaining model is the framework of analysis adopted for this study. The model of household assume that household is a form of collective entity where bargaining occurs amongst members and not a unitary entity that assume income pooling as if the family members are maximizing a single welfare so that the effect of income distribution among men and women in the household on performance of value chain activities of staple food could be determined (Aromolaran, 2004, 2010; Hoddinott and Haddad, 1995; Valérie Lechene and Preston, 2005).

 In this paper, the assumption of the model is that the compositions of the household are: a man (m), a woman (w), and non-income earners who are also members of the household (c); there are different value chains activities preferences performed by each members of the household; and none pooling of household income. Assuming that utility is derived from two composite value chains activities of staple foods that are performed by each individual in the household, and suppose man and woman did not agree in the way in which preferences of a minimum of a sub set of these value chains activities of staple foods should be ordered. If a vector of value chain activity of staple foods is performed using woman income is represented by $X\_{w}$ while those performed with man income by $X\_{m}$. Note that $X\_{w} $can include all the value chains activities performed or hired with money that give rise to staple food prepared and consumed by men, women and communally by members of the household. If women’s share of income is denoted by $y\_{w}$ and the men’s share of income by $y\_{m}$ while the summation of men and women income by y and p represents the vector of prices associated with each value chain activity. Nash non-pooling solution will be used in this study. During the household expenditure decision on each of the value chains, women takes $X\_{m}$ as given and selects $X\_{w}$ such that

max$ u\_{w}$ ($X\_{m}$, $X\_{w}$) subject to p $X\_{w}$≤ $y\_{w}$

There exists a unique $X\_{w}$ for this such that demand function/reaction could be evaluated

$X\_{w}$ = $R\_{j}$($X\_{m}$, p, $y\_{w}$) (1)

There exists a similar reaction/function for $X\_{m}$ giving by:

 $X\_{m}$ = $R\_{m}$ ($X\_{w}$, p, $y\_{m}$) (2)

The Nash equilibrium is the pair of $X\_{w}$and $X\_{m}$that satisfy (1) and (2), simultaneous1y.

Demand for these value chain activities will depend on *p,*$ Y\_{m}$and $y\_{w}$

 There are several illustrations that can be derived from this model. First, suppose that one person is earning the major share of household income. The Nash equilibrium model can be used to show that the preferred allocation of that person’s expenditure can be sustained. Valérie *et al*, (2005) argues that as the share of household income of woman (rises across the zero to one range, the expenditures share on the set of value chains activities performed by woman will rise; the expenditures share on the set of value chains activities performed by man will fall, and the share of the ‘value chain activities’ to be performed will depend on whether man or woman has the strongest relative dislike for the value chain activities. Third, the framework suggest that only members that have strong commitment to perform a certain set of value chain activities can pre-commit the household to a minimum expenditure on those value chain activities of staple foods. Thus the contribution of individual member is related to the person’s ability to enforce their preferential ordering of the value chains activities concerned.

 The proportion of expenditures on a value chain activity is determined by the log of total per capita expenditures, the log of household size, the share of different demographic groups and dummy variables to show location of households. In addition, we include an πf as an independent variable; here computed as the percentage share of women’s income estimated from the (proportion of household income accruing as cash to women from the value chains of crops and livestock, non-farm income such as processing, storage, transportation and marketing activities, employment and businesses) after controlling for household demographic composition, household size, location and total expenditure on budget share of each products. Women’s share of household income appears as the independent variable (for example, in the budget share food preparation). Thus each activity in the value chain is regarded as a component of all the value chains required from farm to fork were the dependent variable while the percentage share of household income accruing as cash to women, per capita expenditure etc were the independent variable.

The determinants of expenditure on each staple food were estimated as follows:

$w\_{j}$ = $⍺\_{j}$ + $β\_{ij}.$1pcexp + $β\_{2j}$.1siz + $\sum\_{k=1}^{k-1}δkj$. $dem\_{k}$ + $\sum\_{k=1}^{k-1} ϕ\_{sj}$.z +$β\_{3j}$. πf + e (3)

$w\_{j }$represents the proportion of budget for the *jth* staple food;

1pcexp logarithm of total per capita expenditures;

 1siz logarithm of size of household;

 $dem\_{k}$ share of demographic group *k* in the household;

 $z\_{k}$ vector of dummy variables showing household location;

 πf women’s share of household cash income;

$e\_{j}$is the error term; and

$⍺\_{j}$ , $β\_{j} β\_{1j} β\_{2j}$ $β\_{3j}$ $δ\_{kj}$ and $ϕ\_{sj}$parameters to be estimated.

 There is urgent need for measures to identify the identity of persons performing various value chain activities of the staple food for policy intervention. Sources of men’s and women’s share of income are from sale of crops and livestocks, wage employment and owned business activity. This work analysed gender disaggregated data showing women’s and men’s share of household income in southeast Nigeria. An innovative feature of this paper is that the analysis is based on household consumption, income, and expenditure data disaggregated by gender and thus gives us a rare opportunity to examine the effect of changes in share of women’s income on value chains activity in the food systems.

**The farm budgeting model**

This tool was used to determine the profitability of different enterprises in south east Nigeria. The gross margin (GM) and the net farm income (NFI) that made up the farm budgeting model are expressed as:

$GM=\sum\_{}^{}Q\_{y}P\_{y}-\sum\_{}^{}X\_{i}P\_{xi}$.......................…………………………………………… (3.7)

NFI = GM – TFC………………………………………………………………….. (3.8)

Where:

$GM=$ Gross Margin (₦/ha)

$Q\_{y}=$ Crop output (Kilogram /ha)

$P\_{y}=$ Unit price of crop output (₦/kg)

$Q\_{y}P\_{y}=$ Total farm revenue generated (₦/ha)

$X\_{i}=$Quantity of variable input (kg/ha)

$P\_{xi}=$ Price per kg of the ith input (₦)

$X\_{i}P\_{xi}=$ Total cost associated with the ith input per hectare (₦)

$∑=$Summation sign

NFI = Net farm income (₦)

TFC *=* Total fixedcost (₦)

**Results and discussions**

**Summary statistics of the survey data**

 The distribution of respondents by Farm size showed that 59.1% cultivated up to 0.5 hectares (ha) of land, 34.4% cultivated between 0.51-1.9 hectares, while 6.5% cultivated 2 hectares and above. The result revealed a mean farm size of 1.0 ha. The majority of the farmers cultivated a relatively small size of land indicating that the respondents were mainly small farmers. Since they are small scale producers, their crop output and consequently profits obtained from their farm lands would be small. The result is in line with that of (Ayoola, (2014) who reported that 58% of the farmers under irrigation system of farming in Kogi and Benue States cultivated less than 2 hectares of farm size. Usman, Adeboye, Oluyole, & Ajijola, (2012) found a similar result among the small scale dry season tomato farmers in Adamawa State in which 60% of the farmers had farm sizes ranging from 0.5 – 2.0 ha. The result also agrees with several empirical studies that most of the Nigerian farmers are small scale farmers who cultivated between 0.1 and 2.00 hectare yet, they are the major producers of food and cash crops in Nigeria (Adamu, 2015). The small scale farmers are said to be more efficient than large scale farmers (Okon, Enete, & Bassey, 2010).

 Labour is a very essential input in any agricultural production process. It is a primary factor of production that involves physical and mental effort undertaken to accomplish a task for some monetary reward.The types of labour farmers use for their farm operations include family labour, hired labour or both. The distribution of respondents on the basis of the type of Labour used is shown in Table 1. It indicated that 40% used women self labour, 24% used man self labour, 12% used children in the family and while the rest 24% were done by hired labour. The majority of the respondents used hired labour to perform stannous activities such as clearing, cultivation while men did most of the staking of yam. This could be because their children may be of school age and may not be available to help in farm work.

 Household size refers to the number of persons in a family (parents and their children) living together in the same house. Members of the household could easily provide family labour for execution of important farm activities such as clearing, cultivation, planting, weeding, processing, peeling, marketing etc. Depending on the structure of the household size, a large household size reduces the cost of hired labour and hence reduces total variable cost of production leading to increase in the income level of the farmers. The household sizes showed that 60.6% had a household size of 1-4, while 24.9% had between 5-10 members and 14.5% of the respondents had a household size of more than 11 people. The mean household size was 6.3.

In this sub-section, we described the general descriptive statistics of the survey data including the share of women’s income for each value chain activities performed for both family farms and private farms are given in Table I.

**Table 1:**

**Crop Combination Patterns of staple food crops**

 Farmers have different reasons for the cropping systems adopted and the enterprises combined. Some of the main reasons of mixed cropping include high crop yield, better spread of production over the growing period, improved quality of product and reduced risk of total crop failure (Felix, Judith, Jonathan, & Munashe, 2013). Although mixed cropping system is a characteristic feature of traditional agriculture, it is also based on the adaptability of the crops to a particular season and domestic needs of the farmers. The distributions of cropping systems are presented in Table 2. The result revealed twelve (12) cropping systems namely; sole rice, sole cocoyam, yam/maize/cassava pepper/tomatoes/cassava, pepper/maize/cassava, tomato/telferia/cassava, pepper/maize/cassava, garden egg/amranthus/telferia, tomato/pepper/maize, tomato/pepper/cassava, tomato/maize/cassava, pepper/maize/cassava and are dominant in the study area. The study showed that the farmers practiced both sole and mixed cropping system. Sole cropping accounted for 19% of the cropping systems and 10% of the total hectares (ha) allocation, while mixed cropping system accounted for 81% of the cropping systems and 90% of the total hectares allocation. The result shows that the respondents preferred mixed cropping to sole because of risk minimization, home consumption and for stable income. They must had through experience found out that growing only one crop could lead to total crop failure and that mixed cropping was more profitable. In mixed cropping, if one crop fails the other will succeed and by that, total lose is avoided. They also might have been allocating their resources efficiently among the different enterprises which had led to the sustainability of the mixed cropping system. In the mixed cropping some of the crop is cash crop while others are for home consumption. Most of the pepper, tomatoes, garden egg, amaranths, telferia, rice, yam are sold while cassava are mainly used for consumption. From the result, pepper based enterprises accounted for 55% of the cropping systems and 75% of the total hectares allocation. The results showed that pepper-based enterprise was the highest cropping combination being practiced by the respondents. This indicates that pepper is an important crop both in terms of cash crop while cassava is for domestic use in the family

 From the result, pepper-based enterprise accounted for 55% of the cropping systems and 75% of the total hectares allocation. The result showed that pepper-based enterprise was the highest cropping combination being practiced by the respondents. This indicates that pepper is an important crop for cash crop as there is highly flavoured yellow pepper that is highly marketable and this encourages farmers to combine it with staple food. Other crops in the mixture were also for domestic and as a source of higher income among the respondents. The total hectares allocation to all the crop mixtures production among the respondents was estimated to be 400ha with women and men covering 203 ha and 197 ha respectively. Women also owned a total of 56% of the crop enterprises while men owned 44% of the enterprises

**Table 2:**

 **Profitability of Crop Production**

 Farmers both men and women undertake farming in order to achieve some production goals which includes profit making. The results of the cost and returns from where the Gross Margin per Hectare (GM/ha) and the Net Farm Income per hectare (NFI/ha) were obtained for the different crop enterprises are presented in Table 3. The Tables showed the GM/ha and NFI/ha of three major crop enterprises. Pepper/tomatoes/cassava enterprise had the highest GM/ha of N193,149.59 with a NFI/ha of N175,891.53 while Tomato/pepper/maize had the second highest GM/ha of N175,732.26 with a NFI/ha of N169,389.93, followed by pepper/garden egg/ maize with GM/ha of N167,789.46 with a NFI/ha of N161,251.00. This showed that the respondents produced more of a crop or combination of crops due to its market demand. Pepper therefore was produced more because of the high demand for it. Sole rice enterprise had the least GM/ha of N56,337.90 with a NFI/ha of N53,489.24. The demand for cereal crops was not as high as that of vegetables and farmers complained of lack of inputs and the attack by herdsmen. Cassava was intercropped with the vegetables when it has taken off, so that cassava will not overshadow the vegetable and to avoid competition between the two crops in the uptake of nutrient.

 The TVC/ha in all the enterprises ranged from N42,885.00 for tomato/pepper/cassava to N71,648.80 for yam/cassava/maize. Production of yam is costly due to costs of seed yam, stakes and staking. During peak production periods, cost of farm inputs such as seeds, agrochemicals and hired labour become more costly due to farmers operating at the same time thereby increasing variable cost.

**Table 3:**

able 3 showed that the average net farm income for the three major enterprises is 175,891+ 153,759+54,004 = 127,884. Thus women get an average of 127,884 naira from these enterprises.

 Table 4:

**Estimation Issues**

Using the variables described in the previous section, the amended version of the Working-Leser expenditure function was estimated for the eight budget shares to show their proportion to total expenditures. There are two econometric issues worth noting, First, all equations were estimated using the generalized least squares estimation procedure proposed by (White, 1980). Second, the log of per capita expenditures and women's share of cash income may be endogenous, reflecting a decision to consume goods rather than leisure. If this were the case, then correlation with the disturbance term will generate inconsistent parameter estimates. In addition, if a particular good accounts for a large share of total expenditures, Ordinary Least Square (OLS) estimation of equation (2) effectively involves regressing a variable on itself, leading to correlation between an explanatory variable and the error term. Hausman, (1978) specification tests did not lead to unambiguous rejection of the hypothesis that either variable was exogenous, consequently, we use two stage least squares estimation.

Table 5 presents the results of the two stage least squares estimation. There were eight categorical dependent variables that were expressed as a share of total expenditure. Each of them was used as regressand or dependent variables. Each of the dependent variables was explained by women’s share of income after controlling for household demographic composition, location and total expenditures. After the control, wives share of cash income was found to significantly affects the budget shares of a number of household goods.

*Table 5*

Specifically, there are positive and significant coefficient of women’s share of income on the budget share for food preparation, processing, weeding, and planting and negative and significant effect on clearing and cultivation. It has no significant effect on marketing. The impact of women’s share of income is positive and significant at 5% on food preparation, planting, weeding, storage, and processing. It also has a coefficient of 7.3% on food preparation, 5.7% on planting, 4.0 % weeding, 7.7% on storage, and 3.7% on processing. It also has a negative and significant impact on cultivation, clearing and it is not significant with marketing. The coefficient of women’s share of income on cultivation is 8.0%, clearing is 6.0% and 9.8% for marketing.

The result provide a sound empirical evidence to contribute to the previous literature on gender ideologies which attach important to responsibility of women for good mothering including provision of food for the households. Therefore in order to play their roles in providing food diversity for the household, rural women engage in producing and adding value to staple food and some are also wage workers. By contrast, this believe in the duty of women to provide food for the household. However, men’s income is significant with clearing and cultivation and these roles are crucial for crop production. The negative effect of increases in women’s' share of income on cultivation, clearing and marketing, the results implies that raising husbands' share of income will increase the expenditures on clearing, cultivation and marketing.

 **Conclusion**

The main message of this paper is to: (i) determine the socio-economic characteristics of men and women in south east Nigeria (ii) determine the cropping systems and profitability of the major enterprises (iii) explain the patterns of household enterprises (iv) determine the impact of women’s and men’s share of household income on the performance of various value chains activities in south east Nigeria using a bargaining model of household behavior; (v) extrapolate on the policy implications of gender-specific control of household incomes. We found that women used an average of 1ha of land and owned an average of 56 percent of the crop enterprises. The net farm income was found to be an average of 127,000 naira. We usednon-joint household decision-making process of household expenditures model to analyse the impact of women share of income on value chains of staple food. We found that increasing women’s share of cash income raises the budget share of food preparation, planting, weeding, storage and processing and reduces the budget shares of clearing, cultivation and marketing. The paper suggested that modeling of household should be in a way that they are regarded as a collective entity where bargaining occurs amongst members and not a unitary entities that assume they are maximizing a single welfare. Our results suggest that a goal of improving value chain activities of staple food should be by targeting the gender that are more likely spend their income in the value chains activities concerned

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**Table 1: Percentage distribution of respondents by value chains activities and type of labour used**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Crop production operations | women (%) | men (%) | Other family labour (%) | Hired Labour (%) | Total % |
| Bush clearing | 10 | 14 | 10 | 61 | 100 |
| Cultivation | 10 | 25 | 09 | 64 | 100 |
| Planting | 55 |  07 | 28 | 10 | 100 |
| Weeding | 35 |  05 | 10 | 50 | 100 |
| Processing  | 50 |  15 | 10 | 25 | 100 |
| Transportation | 40 |  20 | 12 | 28 | 100 |
|  Storage  | 60 |  30 | 05 | 05 | 100 |
| Fertilization  | 30 | 30 | 20 | 20 | 100 |
| StakingHarvesting | 0550 | 8030 | 1010 | 0510 | 100100 |
| Marketing | 60 | 30 | 05 | 05 | 100 |
| Food preparation | 74 | 01 | 15 | 10 | 100 |
| Total  |  479 |  287 |  144 |  283 |  1,200 |

**Table 2: Distribution of men and women by the type of enterprises and cropping systems**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cropping systems | Women owned enterprise (%) | Men owned enterprise (%) | Total farm size in Ha | Total farm size in % | Women share of farm in % and in Ha in parenthesis  |
| Sole rice | 10 | 90 | 40.15 | 10.00 |  1.00 (4) |
| Sole cocoyam | 51 | 49 | 30.50 | 07.60 |  3.88 (16) |
| yam/maize/cassava | 05 |  95 | 65.50 | 16.40 |  0.82 (3.3) |
| Pepper/tomatoes/cassava |  65 |  35 | 35.55 | 08.90 |  5.79 (23.1) |
| Pepper/maize/cassava | 70 |  30 | 25.35 | 06.30 |  4.40 (17.7)  |
| Tomato/telferia/cassava | 75 |  25 | 30.25 | 07.70 |  5.78 (22.7) |
| Pepper/maize/cassava | 60 |  40 | 40.40 | 10.10 |  6.06 24.2) |
| Gardenegg/amranthus/telferia | 90 |  10 | 30.50 | 07.70 |  6.93(27.5) |
| Tomato/pepper/maize | 75 | 25 | 34.00 | 08.50 |  6.38 (25.5) |
| Garden egg/pepper/cassava |  75 | 25 | 20.00 | 05.00 |  3.75(15) |
| Tomato/maize/cassava |  50 |  50 | 20.55 | 05.00 |  2.50(10.8) |
| Pepper/maize/cassava |  50 |  50 |  27.25 |  06.80 |  3.40(13.75) |
| Total |  676 |  524 |  400.00 |  100 | 50.69(203ha) |

**Field survey, 2017**

**Table 3: Costs and Returns per Hectare of Irrigated Crop Farmers**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Crop enterprise | Variable input | Variable cost (₦/ha) | % share in TVC/ha | Returns (₦) |
| i) pe/to/ca | Fertilizer | 4,216.13 | 5.88 | GR/ha: 264,798.39 |
|  | Seeds | 5,164.52 | 7.21 | GM/ha: 193,149.59 |
|  | Labour | 39,174.60 | 54.68 | TFC/ha: 17,258.06 |
|  | Agrochemicals | 1,482.26 | 2.07 | TC/ha: 88,906.86 |
|  | Cultivation  | 12,800 | 17.86 | NFI/ha: 175,891.53 |
|  | Manure  | 2,800 | 3.91 |  |
|  | Transport | 6,011.29 | 8.39 |  |
|  | TVC/ha | 71,648.8 |  |  |
|  |  |  |  |  |
| ii) pe/to/ma | Fertilizer | 6,155.17 | 11.02 | GR/ha: 219,348.07 |
|  | Seeds | 3,420.69 | 6.12 | GM/ha: 163,483.89 |
|  | Labour | 24,896.45 | 44.57 | TFC/ha: 9,724.14 |
|  | Agrochemicals | 2,648.28 | 4.74 | TC/ha: 65,588.87 |
|  | Cultivation  | 12,800 | 22.91 | NFI/ha: 153,759.75 |
|  | Manure | 2,800 | 5.01 |  |
|  | Transport | 3,144.14 | 5.63 |  |
|  | TVC/ha | 55,864.73 |  |  |
|  |  |  |  |  |
| iii) pe/ge/ma | Fertilizer | 8,727.20 | 16.13 | GR/ha: 117,480.57 |
|  | Seeds | 3,863.43 | 7.14 | GM/ha: 63,389.82 |
|  | Labour | 18,512.20 | 34.22 | TFC/ha: 9,384.87 |
|  | Agrochemicals | 3,924.41 | 7.26 | TC/ha: 63,475.62 |
|  | Cultivation  | 12,000 | 22.18 | NFI/ha: 54,004.95 |
|  | Manure  |  2,250 |  4.16 |  |
|  | Transport | 4,813.51 | 8.90 |  |
|  | TVC/ha | 54,090.75 |  |  |

**Source: Field Survey, 2017**. Pe = pepper; to = tomatoes; ge = garden egg; ma = maize

**Table 4: Summary statistics of the survey data**

|  |  |  |
| --- | --- | --- |
| Variables  | Mean  | Standard deviation |
| **Dependent variables (budget shares)**Clearing CultivationPlantingWeeding ProcessingStorage Marketing Food preparation **Independent variables**Per capita expenditures (log)Household size (log)Share of cash income accruing to wifeProportion of household members:Men, aged 15-59Women, aged 15-59Boys, child of head, 6-15Girls, child of head, 6-15Male, child of head, < 6Female, child of head, < 6Male. not child of head, 6-15Female, not child of head, 6-15Male, not child of head. < 6Female, not child of head, < 6Male, 60-69Female, 60-69Male, 70 or olderDummy variables for household located in:EnuguAwguNsukkaAbaUmuahiaOhafia | 0.13000.30900.01100.10000.25110.08010.10340.080013.8171.80000.34560.24300.25800.09500.08900.06700.06600.04300.05500.02400.02900.01900.01800.01000.19300.18900.17900.16200.14300.1550 | 0.00400.00700.00500.00700.00010.02040.00910.00500.34210.17610.12200.23400.16600.04300.03200.02300.00100.00800.07890.02010.00150.00450.02200.03300.3290.2980.3110.2870.3450.342 |

**Field survey, 2017**

*Table 5 Two stage least squares budget share regressions*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | Food preparation | Marketing  | planting | Weeding  |  |
| Per capita expenditures (log)Household size (log)Share of cash income accruing to wivesProportion of household members:Male, aged 15-59Male, child of head, 6-15Female, child of head, 6-15Male, child of head, < 6Female, child of head, < 6Male. not child of head, 6-15Female, not child of head, 6-15Male, 60-69Female, *60-69*Male, 70 or olderFemale70 or olderDummy variables for household located EnuguAwguNsukkaAbaUmuahiaOhafiaInterceptF-statisticsAdjusted R2 Sample size | -0.135 (11.98)\*\*-0.067 (8.01)\*\*0.073 (2.56)\*\*-0.174(3.52)\*\*-0.137(3.02)0.167(2.88)\*\*-0.213(3.98)\*\*0.118(1.56)\*-0.127(2.01)\*\*0.271(2.99)\*\*0.186(2.11)\*0.098(0.99)-0.041(0.95)0.025(0.87)0.009(1.02)0.045(2.11)\*\*0.091(2.66)\*\*0.023(1.33)0.021(1.45)0.034(1.99)\*\*3.345(17.33)\*\*52.03\*\*0.562520 | -0.075 (7.23)\*\*-0.054 (1.7)0. 071(1.16)0.006(3.31)\*\*0.004(4.23)\*\*0.045(2.09)\*\*-0.123(3.19)\*\*0.098(2.56)\*\*-0.087(2.01)\*\*0.206(1.99)\*\*0.316(2.11)\*0.068(0.99)-0.038(0.95)0.085(0.87)0.027(0.79)0.034(2.89)\*\*0.0 67(4.34)\*\*0.044(2.15)\*\*0.036(2.11)\*\*0.027(1.78)\*-2.34(15.78)\*\*62.37\*\*0.572520 | -0.035 (1.3)-0.0(3.01)\*\*0.057 (3.16)-0.174(8.42)-.137(3.02)\*.07(2.88)\*\*.12(1.78)\*0.078(1.56).009(1.71)\*0.006(2.99)0.156(2.11)0.058(0.99)-0.048(0.95)0.045(0.87).024(1.72)\*0.004(1.29)0.007(1.48)0.006(1.22)0.031(0.93)0.051(0.68)0.031 (1.25)0.41\*\*0.372520 | -0. (1.9)\*0.06(8.01)\*\*0.04 (2.56)\*\*0.17(4.52)\*\*-0.137(3.02)\*1.17(2.0)0.123(3.98)\*\*0.098(1.56)\*-0.157(2.01)\*0.206(2.99)\*\*0.186(2.11)\*0.098(0.99)-0.068(0.95)0.085(0.87)0.056(3.44)\*\*0.035(2.1)\*\*0.019(1.70)\*0.032(1.8)\*0.044(1.08)0.056(2.21)\*\*-0.075 (0.48)0.50\*\*0.422520 |

Note: statistics in parentheses \*\*significant at 5%; \*significant at 1%

*Table 5 continues*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | Processing  |  Storage  | Cultivation | Clearing |  |
| Per capita expenditures (log)Household size (log)Share of cash income accruing to wifeProportion of household members:Male, aged 15-59Male, child of head, 6-15Female, child of head, 6-15Male, child of head, < 6Female, child of head, < 6Male. not child of head, 6-15Female, not child of head, 6-15Male, 60-69Female, *60-69*Male, 70 or olderFemale70 or olderDummy variables for household located inEnuguAwguNsukkaAbaUmuahiaOhafiaInterceptF-statisticsAdjusted R2 Sample size | -0.13(11.98)\*\*-0.047 (8.01)\*\*0.077 (3.56)\*\*-0.174(4.52)\*\*-0.137(3.02)\*0.067(2,88)\*\*-0.023(3.98)\*\*0.078(1.56)\*-0.157(2.01)\*0.106(2.99)\*\*0.086(2.11)\*0.098(0.99)-0.078(0.95)0.065(0.87)0.015(2.18)\*\*0.023(0.88)0.043(01.71)\*0.036(0.96)0.041(0.46)0.056(.72)\*0.535(2.56)\*\*67.01\*\*0.622520 | -0.135 (11.9)-0.067 (8.1)\*0.037 (2.6)\*\*.079(2.52)\*\*-0.107(1.01)0.071(1.07)-0.053(1.07)0.043(0.56)-0.211(0.01)0.421(0.99)0.036(1.11)0.082(0.99)-0.065(0.95)0.034(0.87)0.023(5.41)\*\*-0.041(1.72)\*-.034(2.81)\*\*-.027(3.12)\*\*-.038(2.88)\*\*0.005(1.12)0.145(7.73)\*\*51.03\*\*0.452520 | -0.135 (1.98)-0.067 (.01)\*-0.06 (2.6)\*\*0.074(4.02)\*\*-0.007(3.02)\*0.067(2,88)\*\*0.003(3.9)\*\*0.008(1.56)\*-0.157(2.01)\*0.206(2.0)\*\*0.126(2.11)\*0.068(0.99)-0.088(0.95)0.025(0.87)0.019(3.56)\*\*0.008(0.56)0.006(0.99)0.006(0.45)-0.002(0.33)0.003(0.22)-0.023(1.32)32.03\*\*0.232520 | -0.135 (.9)-0.06 (81)\*-.08 (2.56)\*0.074(3.12)-0.107(0.02)0.147(0.08)0.123(1.08)0.098(0.66)-0.157(0.91)0.040(0.19)0.006(0.11)0.053(0.76)-0.088(0.28)0.085(0.87)-0.007(1.7)\*0.004(1.8)\*0.009(1.9)\*\*0.013(2.1)\*\*0.011(2.3)\*\*0.033(1.7)\*0.038(3.1)\*\*4.75\*\*0.182520 |

Note: statistics in parentheses \*\*significant at 5%; \*significant at 1%