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Increasing Smallholders' Intensity in Cassava Value Web: Effect on Household Food Security in Southwest Nigeria

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Abstract

Although cassava production and processing is on the increase in Nigeria, there is still a large gap to be filled in meeting the food and raw material needs of the country in terms of cassava products and by products. The reported increase in area cultivated to cassava has not translated to efficiency of resource use or productivity and, thus cassava smallholders have low physical and economic returns on their activities. This has serious implications for their wellbeing attributes, chiefly food security. A value web system, involving multiple enterprises within interconnected value chains, has been proposed as a strategy for smallholders to increase resource use efficiency and financial benefits. This study examined the levels of intensity by which cassava smallholders utilize the cassava biomass using available resources. It also isolated the determinants of the different levels of participation in the cassava biomass value web. The study further investigated the effect of higher intensity of cassava biomass utilization by small holders on the food security status of their households with respect to their calorie intake and dietary diversity. The study also profiled the different risks to food security based on the level of intensity of the smallholders' participation in the cassava value web. The research used data from a survey of 150 cassava smallholders, from 7 local government areas in Ogun state Nigeria. The results revealed that food security status of households using the cost of calorie index generally increased with increasing intensity of participation in the cassava value web. Dietary diversity of households also increased with an increase in the intensity of participation in the cassava web. Small holders who are multitasking are also less vulnerable to food insecurity. The study also found that smallholders are rational and respond to changes in market conditions for their products and are willing to take more active roles in the cassava value web. Policy thrust should thus focus on increasing market opportunities for smallholders which will serve as incentives to take more active roles in the cassava value web, with consequence for their productivity, income and hence food security.

Introduction

Cassava remains one of the major crops grown in Nigeria, (Oyekanmi and Okeleye 2007) and cassava food products like garri, fufu, akpu are major staple food items Although, Nigeria is one of the largest producers of fresh cassava roots globally, (IITA 2014); much of the cassava produced in Nigeria is for subsistence with relatively small marketable surplus for industrial uses and foreign markets, (Nweke, 2005). Consequently, smallholder cassava farmers are still deprived in terms of terms of many welfare attributes, especially food security.

Food insecurity, the limited or uncertain availability of nutritionally adequate and safe foods, is still a pervading issue in developing countries, Nigeria inclusive, (USDA 2014). The food insecurity situation in Nigeria is particularly worrisome, with the relatively high population growth rate of 2.8% by current estimates, (NBS, 2012), and food demand higher than available food. This is made worse a decline in aggregate agriculture value added to less than 2%, between 2013 and 2014 (CBN, 2014, Trading Economics, 2015). Food inflation currently in the range of 9.4%, (CBN, 2015) has also led to a state of food inaccessibility. In addition, inefficient agricultural production and processing techniques of the farmers, aggravated by exposure to the vagaries of weather and fluctuating market prices, as well as (Oriola, 2009). Post-harvest losses and low quality products make them vulnerable to food insecurity, (Langat *et al.*, 2010). Recent advances in agricultural systems that focus on the biomass value web have been advocated, but their impacts on smallholders' welfare and food security need to be assessed and hence the relevance of this study.

Materials and Methods

The study used a sample of 150 cassava smallholders from Ogun state, Nigeria. A multistage sampling procedure was used in which the state stratified into ADP zones and two ADP zones randomly selected (ABEOKUTA AND IJEBU ZONES). Within the ADP zones, cells proportionate to the size of the ADP zones were randomly selected. Four cells were selected in Abeokuta ADP zone and three cells from the IJEBU ADP zone. Smallholder cassava households were randomly selected from the cells.

Data Analysis

Principal Component Analysis (PCA)

The PCA is used to give weights to individual households based on their responses to the 13 item questions on levels of cassava biomass web activities. Following, Abafita and Kim, (2013);the formulation for the weight is:

$$CI_j = \sum \frac{F_i(X_{ji} - X_i)}{S_i}$$

; where CIj is the intensity value for the jth household intensity index ;Fi is the weight of the ith variable in the PCA model from the first component; Xji is the jth household value for the ith variables; Xi is the mean of the ith variable and Si is the standard deviation for the value of the ith variable. The values of the Cij obtained for each household is categorized into tercile groups to place respondents into low, medium and high level intensity in the cassava biomass web.

Cost of Calorie food Security measure

Foster Greer and Thobecke, 1984 cost of calorie index food security measure was used to determine food security status of the households. To determine the food security line from the cost of calorie measure, the following holds:

$$\ln h = a + bC;$$

Where h is the adult equivalent food expenditure, and C is the adult equivalent calorie consumption per household. The food security line is given as: $Z = e^{a+bL}$; where Z is the food security line, below which household s are classified as food insecure; L is the recommended daily energy level in KCAL, given as 2710 for developing countries. Households will be classified as food secure (1) and food insecure (0)

depending on whether their cost of calorie is greater than/equal to or below the food poverty line calculated.

Probit Model

The probit model is specified as:

$y^* = \beta_i x_i' + \varepsilon_i$;

y* is the unobserved latent variable ranging between 0 and 1; Xi's are the independent variables, εi is the vector of error terms. The dependent variable is the food security status of households; 1=food secure; 0= food insecure. The independent variables are the socioeconomic characteristics and the indices of cassava value web intensity of the respondents.

Results and Discussion

Socioeconomic distribution shows that the mean age for the household heads is 50 years old. Gender distribution shows that there are more male headed households in the study area. Mean household size, dependents and income earners are 6, 4 and 2 respectively. Average number of years of farming experience is 25 years, with 21 years being average years of cassava production and 14 years being number of years in cassava processing.

From Table 2 respondents were classified into low, medium and high participants in the biomass web. The table reveals that although cassava has a multiplicity of uses, only about 33% of the respondents are taking advantage of its value web to improve their income and wellbeing status. A larger percentage of the respondents have low intensity level within the value web; implying that the smallholders do not see cassava as a source of sustainable income.

Based on the calculated food poverty line of N5668.86; 78% of the respondents households' are found to be food insecure, while 22% are food secure. Table 3 shows that food security status improves of households with increased participation such that it is 48.8%, 36.4% and 15.2 percent for households classified as high, medium and low in the value web respectively.

Table 3: Classification of Food Security of Households by Cassava Biomass Web Intensity

Food security/Cassava intensity	Low	Medium	High	Total
Food Insecure	51(43.59)	33(28.21)	33(28.21)	117(100)
Food Secure	5(15.15)	12(36.36)	16(48.48)	33(100)
Total	56(37.33)	45(30.00)	49(/32.67	1500(100.00)

Source: Computation from field survey.

Factors that Determine Food Security status of cassava smallholder households

The result of the probit model to isolate the factors that determine food security status of cassava smallholder households is presented in Table 5. The result shows that increased participation in cassava value web intensity increases food security significantly by 0.5%. Being married and higher levels of education also significantly increases the probability of being food secure. However, household size significantly reduces the probability of being food secure by a margin of 10%.

Conclusion

The study examined the effect of increased participation in the cassava value web on food security of smallholder households in the study area. The results revealed that higher intensity of participation the

cassava value web improves the food security status of the smallholder households. The study recommends provision of access to infrastructure that make it possible for smallholders to become multitasking in the cassava value web.

Table 5: Factors Determining Food Security Status of Cassava Smallholders in Ogun State, Nigeria

Variables	**Coefficient**	**Marginal effect**
Cassava Value web intensity	0.271**	0.053**
Gender*(base=female)*		
Male	0.256	0.048
Age of household head	-0.004	-0.000
Household Size	-0.549***	-0.107***
Marital Status*(Base=Single)*		
Married	1.880*	0.219***
Education*(base=Non Formal)*		
Primary	0.227	0.035
Secondary	1.016**	0.195**
Tertiary	1.514**	0.316**
Savings*(Base=No)*		
Savings- Yes	0.574	0.103
Wealth Status*(Base=Poor Class*)		
Middle class	0.338	0.065
Rich class	0.289	0.054
Proportion of land given to cassava production	-2.04	-0.398
Constant	0.14	

Source: Analysis of survey data; 2015; *, **, *** represent significance at 10%.5% and 1% respectively

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