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Cost and Return Analyses of Pro-Vitamin A Cassava Production among Smallholder Farmers in Abia State

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Abstract

Cassava is an important staple food and cash crop in Nigeria. Its root is rich in starch and contains a significant amount of calcium, phosphorus and vitamins. However, they are poor in protein and other nutrients. Vitamin A deficiency diseases are prevalent in Nigeria, which has led to the bio-fortification of cassava with vitamin A. Vitamin A fortified cassava (yellow root cassava) contains carotenoids that could contribute to reducing vitamin A deficiency. This Paper evaluates the profitability of Pro-vitamin A cassava production in Abia State, Nigeria. The objectives of this research are to describe the socioeconomic characteristics of pro-vitamin A cassava producers; and to estimate the costs and returns to pro-vitamin A cassava production. A multistage random sampling procedure was used to extract data from sixty pro-vitamin A cassava farmers in 2015. Descriptive statistics such as mean, frequency and percentage were used to analyze the socioeconomic characteristics of the farmers while Net Income (NI) analytical model was used to estimate the cost and benefit. The result shows that pro-vitamin A cassava production in Abia State is a high-income-generating business. It is dominated by smallholder-educated female farmers in their active ages with large families and limited access to credit. Adoption of pro-vitamin A cassava in Abia State will improve the well-being of rural farmers and create the desired economic growth.

Keywords: Pro-vitamin A cassava, production, and cost and returns

Introduction

Cassava (*Manihot esculenta*) is a tuberous edible plant of the spurge family (Euphorbiaceae). It is cultivated throughout the tropical world for its tuberous roots. Nigeria is the world's largest producer of cassava (FAO, 2022). The country produces approximately 45 million tonnes of cassava annually. Nigerian cassava production is dominated by small-scale farmers cultivating an average of 0.5 hectares. In Nigeria, cassava is widely grown by both male and female farmers (Ironkwe Mbanaso and Ezebuiro, 2011). It is a hardy crop cultivated throughout the year, making it preferable to other seasonal crops such as yam, sweet potato, cocoyam, and grains. It is resilient to adverse climatic conditions, tolerant to low soil fertility, pests and diseases, and suitable to store its roots for long periods underground– even after its maturity (Harvestplus 2013). Cassava roots are rich in starch and contain significant amounts of calcium, phosphorus and vitamins. However, they are poor in protein and other nutrients. In contrast, cassava leaves are a good source of protein if supplemented with the amino acid methionine, despite containing cyanide (Odoemenen and Otanwa, 2011). Cassava and its derivatives are utilized as food, confectionery, sweeteners and livestock feed (FAO, 2015). Cassava has been identified as a single commodity that could generate desired economic growth, fight poverty and improve food security (Nweke, 2004; Al-Hassan and Daio, 2007). The production of cassava has been increasing over the years (MOFA, 2009; MOFA, 2010). However, the increases are due to land expansion rather than high yield (Hillocks, 2002; Steedman, 2003; Breisinger *et al*., 2010). There is a need for increasing yield per unit of land and labour due to population growth and its associated pressure on land. Technical changes in the form of the adoption of improved agricultural production technologies have positive impacts on agricultural productivity and growth in the developing world (Nin *et al*, 2003). High productivity will increase the food stock of many poor rural households and significantly improve food security in rural areas. The urban consumers will also benefit from increased supply which will enable them to consume more without increasing their total food expenditure.

Today, cassava has become one of the most important staple foods and cash crops in several tropical African countries, especially in Nigeria, where it plays a vital role in the food economy (Agwu and Anyaeche, 2007). Hitherto, cassava was a famine reserve crop (it provided a more reliable source of food during drought and hunger periods) but has in recent times emerged to be both a staple and a cash crop of industrial significance in the world economy (Ani, 2006). Harvestplus, a global leader in developing crops to have higher levels of essential micro-nutrients such as vitamin A, iron and zinc has currently bred and promoted vitamin A bio-fortified cassava (yellow cassava) in Nigeria. This type of cassava contains vitamin A carotenoids that could contribute to reducing vitamin A deficiency. Vitamin A is an essential nutrient lacking in the diets of poor malnourished populations. Its deficiency retards growth, increases the risk of disease and can cause reproductive disorders. Fortifying cassava with pro-vitamin A could significantly improve nutrition and health, especially among children and women in poor communities. Vitamin A deficiency diseases are prevalent in the tropics (WHO, 2009). Efforts are underway to increase the vitamin A content of edible plant tissues, especially cassava through an approach commonly known as bio-fortification (Mayer *et al.,* 2008). Currently, six varieties of vitamin A cassava (UMUCAS; 35, 36, 37, 44, 45, and 46) have been released by the National Root Crops Research Institute (NRCRI), Umudike in collaboration with the International Institute for Tropical Agriculture (IITA), Ibadan (NRCRI News Report, 2015) to cushion the effect of vitamin A deficiency. These efforts have led to the official release of the above-mentioned cassava varieties which are early maturing and high yielding, and also able to tolerate biotic and abiotic stresses. All the varieties are tolerant to the cassava mosaic virus and have moderate resistance to the cassava mealybug pests. The objectives of this research are to describe the socioeconomic characteristics of pro-vitamin A cassava producers; and to estimate the costs and returns of pro-vitamin A (yellow) cassava production.

Methodology

This study was conducted in Abia State of Nigeria which lies between latitude 40.40 and 60°14` North and longitude 70°10` and 80 East. It shares common boundaries to the north with Ebonyi State; to the south and southwest with Rivers State and the east and southeast with Cross River and Akwa Ibom States respectively. The state also has boundaries with Imo State to the west; and Anambra State to the Northwest. Abia State is made up of 17 Local Government Areas (LGAs) and 3 agricultural zones. The zones are Ohafia, Umuahia, and Aba; with 5, 5 and 7 LGAs respectively. A multistage random sampling procedure was used to select samples for the study. In the first stage, the Umuahia Agricultural Zone was purposively selected for the study because of its nearness to the National Root Crops Research Institute (NRCRI), Umudike from where the pro-vitamin A originated. Also, it is believed that the zone has been familiarized with the technology (Pro-vitamin A cassava). Stage two involved the selection of LGA from the selected zone. In this stage, one LGA was randomly selected. Stage three involved the selection of villages. Six villages were randomly selected for the study. Thereafter, farmers were selected in stage four. Six farmers each were selected from each village, hence a total of sixty farmers were randomly selected for the study. Data were collected using a well-structured questionnaire; Local leaders assisted in questionnaire administration, they provided the list of small-scale farmers in the area and this served as a sample frame.

Descriptive statistics such as mean, frequency and percentage were used to analyze the socio-economic characteristics of the farmers while Net Income (NI) analytical model was used to estimate the cost and benefit. The model is specified as follows;

NI = TR (output x price) – TC……(i)

Where

NI = Net income

TR = Total revenue

TC = Total cost (Total variable cost + Total fixed cost)

Results and Discussion

Socio-economic Characteristics of the Respondents in the Study Area

The pro-vitamin A cassava production enterprise in Abia State is female-dominated. Table 1 presents the distribution of the respondents according to their gender. The Table reveals that the majority of the respondents were females. 61.7% of the respondents were females while the remaining 38.3% were males. Female farmers were more involved in pro-vitamin A cassava production than male respondents in the study area. Pro-vitamin A cassava producers in Abia are in their active age. The distribution of the respondents according to their age is presented in Table 2. The result showed that 11.7% of the respondents were within the age range of 25-34 years, 28.3% were within the age range of 35-44 years 51.7% were within the age range of 45-54years, and 8.3% were within the age bracket of 55-64. This implies that the majority of the cassava farmers were within their youthful age and were capable of making decisions. This could be a result of the labour intensity of cassava production in the study area. Most pro-vitamin A cassava production were married. Table 3 displays the marital status of Pro-vitamin A cassava producers in Abia State. The Table indicated that 86.7% of the respondents were married 8.3% were single and 5.0% were divorced. The household size of the respondents is presented in Table 4. The mean household size of the respondents was 7.7. About 10% of the respondents had household sizes of 1-6 persons, 38.3% had household sizes of 1-12 persons and 15% of the respondents had household sizes of 13-18 persons. This implies that the majority of the farmers that produce pro-vitamin A in the study area had large household sizes and this increased their level of utilization of cassava-related products. Larger household sizes mean a reduction in the labour cost of production and can encourage a farmer to adopt the technology. Large household size can be a substitute for

hired labour thereby reducing the high cost of labour. Large households would prefer pro-vitamin A cassava because it would go a long way in correcting the deficiency of this nutrient in the family's diets, particularly those of the poor and vulnerable. Since cassava is still a cheap crop, the beta-carotene variety will go a long way in helping to correct individuals' and households' vitamin A deficiency. Pro-vitamin A cassava producers are educated and can take risks and decisions on which technology to adopt. The distribution of the respondents according to their level of education is presented in Table 5. The mean educational level was 6.4 years. Table 5 indicates that 76.7% have primary education 16.7 have secondary education, and 6.7% have tertiary education. Education is one of the factors that affect the adoption of improved technology positively or negatively. This is at variance with Bolarinwa, (2000), who found that the majority of farmers with higher education levels in rural areas migrated to cities to search for white-collar jobs. Farmers with formal education can make decisions and can adopt new technologies. The distribution of the respondents according to their farm size is presented in Table 6. The result showed that 8.3%of the respondents had farm sizes of about 0.1-1.5 hectares, 6.7% of the respondents had farm sizes of 1.6-2.5 ha and11.7% had 2.6-3.5ha of farm, 20.0% had farm size of about 3.6-4.5ha, 35% had farm sizes of 4.6-5.5ha and 18.3% had farm sizes of about 5.6-6.5ha. This indicates that farmers had smallholdings cultivating less than three hectares of yam. This is in line with Okunmadewa, (2003) who asserted that most of Nigeria's farmers are of small farm holdings. Pro-vitamin A cassava farmers in Abia State have no access to credit. Table 7 presents access to credit by Pro-vitamin A cassava farmers The result showed that the majority (88.3%) of the respondents had no access to credit while 11.7% had access to credit.

Estimating the Profitability of Pro-vitamin A Cassava in the Study Area

The profitability of pro-vitamin A cassava variety was done using the cost and returns analysis. The result was analysed and presented in Table 8. The result of the analysis shows that pro-vitamin A cassava is a high-income generating business as the present Gross Margin is N54330.012, for a representative small-scale. Similarly, the present level of Net Income/Economic Profit per annum is N49174.456, for small-scale. On the whole, variable costs constituted the highest proportion (64.18%) of the total cost of pro-vitamin A cassava production. The cost of transportation, storage and other costs are the highest cost items constituting as much as 28.35, 22.49, and 24.90 percent of the total cost of pro-vitamin A cassava operation. The highest fixed cost (61.21%) is observed in rent and other implements constituting 35.82% of the fixed cost items in the study area, the higher proportion of fixed costs in pro-vitamin A operation is an indication that it has acquired lots of overhead items but it is currently underutilizing the machinery like simple machines and facilities like cutlasses, knives and wooden platforms i.e. the facilities may have depreciated and less efficient in production. The efficiency level of the cassava production was 3.41 indicating that the pro-vitamin A cassava variety is an efficient business considering the health benefit of the variety when compared to other varieties of cassava in the study area. The need for better access to a larger amount of investment capital to scale up the production of pro-vitamin A cassava to enjoy higher returns on investment by the producers becomes inevitable.

Conclusion

The prevalence of vitamin A deficiency diseases in the tropics has led to the development of pro-vitamin A cassava. Yellow root cassava (vitamin A fortified cassava) is rich in carotenoids, which could contribute to reducing vitamin A deficiency. This Paper evaluates the cost and returns to Pro-vitamin A cassava production in Abia State, Nigeria. The result shows that pro-vitamin A cassava production in Abia State is a high-income-generating business. It is dominated by smallholder-educated female farmers in their active ages with large families and limited access to credit. Adoption of pro-vitamin A cassava in Abia State will improve the well-being of rural farmers and create the desired economic growth. Agricultural projects targeted to emancipate women from poverty should focus on yellow-root cassava production.

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Table 1: Distribution of the Respondents according to Gender

Gender	Frequency	Percentage
Female	37	61.7
Male	23	38.3
Total	**60**	**100.00**

Source: Field Survey, 2015

Table 2: Distribution of the Respondents according to Age

Age	Frequency	Percentage
25-34	7	11.7
35-44	17	28.3
45-54	31	51.7
55-64	05	8.3
Total	**60**	**100.00**

Source: Field Survey, 2015

Table 3: Marital Status of Pro-vitamin A cassava producers in Abia state

Marital status	Frequency	Percentage
Married	52	86.7
Single	05	8.3
Divorce	03	5.0
Total	**60**	**100.00**

Source: Field Survey, 2015

Table 4: Household Size of Pro-vitamin A cassava Producers in Abia state

Household Size	Frequency	Percentage	Mean
1-6	6	10.0	7.7
7-12	23	38.3	
13-18	09	15.0	
Total	**60**	**100.00**	

Source: Field Survey, 2015

Table 5: Level of Education of Pro - Vitamin A cassava producers

Level of education	Frequency	Percentage	Mean
Primary education	46	76.7	6.4
Secondary school	10	16.7	
Tertiary education	04	6.7	
Total	**60**	**100.00**	

Source: Field Survey, 2015

Table 6: Farm Size of Pro-vitamin A cassava producers in Abia State

Farm Size	Frequency	Percentage
0.1-1.5	5	8.3
1.6-2.5	4	6.7
2.6-3.5	7	11.7
3.6-4.5	12	20.0
4.6-5.5	21	35.0
5.6-6.5	11	18.3
Total	**60**	**100**

Source: Field Survey, 2015

Table 7: Access to Credit by Pro-vitamin A cassava producers

Access to credit	Frequency	Percentage
No	53	88.3
Yes	7	11.7
Total	**60**	**100.00**

Source: Field Survey, 2015

Table 8: Cost and Returns Analysis of Pro-vitamin A cassava

S/N	Items N	Unit (kg)	Naira	Percentage
A	Total Revenue	250kg	63566.67	
B	Variable cost			
	Transportation		2618.88	28.35
	Storage cost		2077.78	22.49
	Cost of bundle		600.00	6.49
	Cost chemicals		140.00	1.51
	Labour		1500.00	16.24
	Other cost		2300.00	24.90
	Total variable cost (TVC)		9236.66	64.18
C	Fixed cost			
	Rent		3155.56	61.21
	Other implement		2000.00	38.79
	Total fixed cost (TFC)		5155.56	35.82
D	Gross margin (TR-TVC)		54330.01	
E	Profit = TR -(TVC+TFC)		49174.46	
F	Efficiency level = Profit/total cost		3.41	

Source: Field Survey, 2015