

EFFECT OF VALUE ADDITION ON FARM INCOME OF SWEET POTATO FARMERS IN EBONYI STATE.

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ABSTRACT

The study examined the effect of value addition on farm income of sweet potato-based farmers in Ebonyi State, Nigeria. Primary data were collected from 400 small-scale sweet potato farmers using a multi-stage sampling technique. The instruments used for data collection were interview schedule and focus group discussion (FGD). Data collected through these methods were analysed using descriptive statistics, while t-test statistics was used to ascertain the extent value addition of sweet potato has affected income of farmers. FGD was analysed by transcribing responses of the discussants. Findings revealed that traditional processing of sweet potato was predominant in the area. Chips and animal feed were the major value added products from sweet potato in the study area. The result of the t-test analysis showed that the mean annual income of processors and non-processors were ₦336,656 and ₦278,709 respectively. This implies that mean annual income of processors was higher than non-processors with t-value of 2.2889 which was significant at 10% probability level. The results therefore call for policies aimed at enlightening farmers on the importance of forming farmer groups since most training on value addition, information on prices and market opportunities can be easily disseminated through farmer groups and establishment of sweet potato processing centre's where the level of production is higher to enhance value addition and subsequently increase the income of farmers in the study area.

Key words: Value addition, sweet potato, Farm income

INTRODUCTION

Sweet potato (*Ipomea batatas* Lam) is among the world's most important, versatile, and underexploited food crops. It currently ranks as the world's sixth most important food crop on a fresh weight basis. More than 105 million metric tons are produced globally each year; 95% of which is grown in developing countries (FAOSTAT 2009). Nigeria is one of the largest producers of sweet potato in Sub-Saharan African (SSA) with annual production estimated at 4.03 million tons per year with farm size of about 1.7mha and yield of .3t/ha (FAO, 2018). Sweet potato offers a particularly significant potential for increasing food production and income thereby reducing poverty and improving food security level in Nigeria. Sweet potatoes are consumed without much processing in most parts of the tropics. (Ahmad *et al.* 2014).

Sweet potato is not only used for consumption but also as raw materials for agro-based industries. It is consumed in boiled form, it can also be pounded and mixed with gari and eaten with soup or dried and milled into flour or even to prepare a fermented drink called *Kunu* in the north and central Nigeria. It can also be used as ingredient of West African dishes such as *fufu* and *amala*, the leaf is an ingredient to soups (Tewe, Ojieniyi, and Abu, 2003). Sweet potato is an excellent source of vitamin A (orange-fleshed

varieties), carbohydrates and can produce more edible energy per hectare than wheat and rice (CIP, 2003). It has been used in Africa to combat a widespread vitamin A deficiency that results in blindness and even death for 25,000-500,000 African children a year (CGIAR, 2003). It provides as much protein as cereals and beans per hectare. As was reported by Bengie (2005) that sweet potato is rich in antioxidants; it is also identified as anti-aging nutrients. Industrially, its flour can be used to substitute wheat in bread making, blends 15-30% for pastries bakery, brewing of alcoholic drinks and sweeteners in non-alcoholic drinks (Nwokocho, 2009).

The concept of value addition in agriculture in the developing economies is widely becoming an acceptable strategy adopted by both government and non-governmental organisations towards improving the income generation of the rural communities. The former trend in which rural farmers disposed-off their farms produce without processing seemed to drastically reduce the incomes realisable through such transactions. The practice further impoverished the farmers at the instance of the middlemen, as most of them could not raise enough capital to carter for or re-engage in the next cropping season.

Value addition is the transformation of raw agricultural commodities to consumer-ready food

products. It includes local processing, packaging, cooling, drying, extracting or any other types of process aimed at improving the value of raw agricultural produce. Value addition focuses on perishable crops after harvest to reduce losses, enhance financial or nutritional crop-value, and assure safety of our food. Value addition has been identified as a pathway for farmers out of poverty. Value addition entails deliberate activities to change the form of the raw sweet potato into a more refined or usable form thus increasing its value. It is the process of changing or transforming a commodity from its original state to a more valuable product. According to Oluoch *et al.*, (2016) stated that value addition may take various forms that could be summarized in three levels that include:

Level 1- Post-harvest level/primary processing: This includes proper cleaning, sorting, grading and packing sweet potato raw tubers for sale. This is the most common type of value addition practiced by farmers.

Level 2 - Secondary/basic processing: This includes steaming, boiling or roasting the raw tubers. In addition, it can also take the form of grinding sweet potatoes into flour and packing the flour into different respective sizes.

Level 3 - High end processing: involves activities such as frying sliced roots to obtain potato chips, noodles, candy, desserts. In addition, it involves baking breads, buns, cakes, doughnuts and meatpie using sweet potato flour, preparing *mandazi* and *chapatti* using the same grinded flour or making sweet potato juice. This level also involves actual packaging of processed sweet potato products, branding and marketing. Sweet potato can be processed and utilized in various ways for both household and the market purposes.

Sweet potato is a perishable crop which needs to be processed as soon as possible after harvesting. There are several ways through which it can be processed such as peeling, washing, slicing grating, drying, roasting, frying, pounding and blending into floury form however, majority of farmers in Ebonyi State who primarily engage in sweet potato production normally sell at a very cheap price when the supply is higher than demand during harvesting, hence they derive little income from their produce due to lack of value addition. However, an in depth knowledge of the sweet potato value addition is still a prerequisite for farmers if increased production and acceptability of the crop is to be achieved. Hence, this high potential of the crop is yet to be converted into increased output under the present cropping system. One of the reasons identified for the failure to achieve increased sweet potato production in Nigeria is the inadequate basic knowledge of sweet potato value addition prevalent among farmers. This study thereby intends to evaluate the effect of value addition on farm income of sweet potato farmers in Ebonyi State, Nigeria. The study was therefore

designed to describe the socio-economic characteristics of sweet potato farmers in the study area, identify value added products from sweet potato by farmers in the study area, assess the processing technique of sweet potato, and ascertain the extent value addition of sweet potato has affected income of farmers in the study area.

METHODOLOGY

Structured interview schedule and Focus group discussion (FGD) were used as instruments for data collection. The study was carried out in Ebonyi State with all the three Agricultural Zones; Ebonyi South, Ebonyi North and Ebonyi Central which followed a multi-stage sampling procedure. In the second stage, two Local Government Areas (LGA) in zones were purposively selected based on cropping intensity. Afikpo-South and Onicha LGAs were selected in Ebonyi South, Ohaukwu and Abakaliki LGAs for Ebonyi North and Ikwo and Ishielu LGAs for Ebonyi Central. In the third stage, two Council Wards were also purposively selected from each LGA, giving twelve Council Wards. Simple random sampling technique was used to select respondents who are sweet potato farmers and processors in the study area. Consequently, 28 respondents each was systematically selected in four council wards giving a total of one hundred and twelve respondents in Ebonyi Central Zone, because of its higher population. Twenty seven (27) respondents were selected in eight council wards in Ebonyi-North and Ebonyi-South zones each, giving a total of two hundred and sixteen respondents in the zones. Thus, bringing total respondents administered with interview schedule to three hundred and twenty eight (328). One FGD was conducted in each of the twelve selected council wards giving a total of 12 FGDs. Each group is made up of six discussants giving a total number of participants to seventy two (72). In analyzing data generated for the study, descriptive statistics were used to describe the socio-economic characteristics of the farmers, the value added products and processing technique of sweet potato in the study area. In explaining the extent value addition of sweet potato has affected income of farmers in the study area, t-test was used to find out the difference between income of value adders and non-value adders of sweet potato. Analysis of focus group discussion was done by transcribing the responses of the discussants.

RESULTS AND DISCUSSION

The result in Table 1 shows the socio-economic characteristics of the respondents in the study area. From the data obtained, about 46.07% were males while 53.93% were females. This implies that gender distribution among farmers in Ebonyi State is dominated by females in sweet potato production and processing. This is in agreement with the findings of Okwusi *et al.*, (2005) which showed that females

dominate in the production, processing and utilization of sweet potato in Southeast zone of Nigeria. The study also revealed that about 78.01% of the respondents were within the age range of 31-50 years. This implies that young people of active age dominated the activities in sweet potato production and processing in the study area. This finding agrees with Olagunju *et al.*, (2013) who noted that majority of sweet potato farmers in Osun State were in the active productive years. Results showed that 78.1% were married, this implies that majority of the sweet potato farmers in the state were married. The table further shows that the farmers had relatively large-sized households since they believe that getting married with more children is an alternative source of labour *in-lieu* of hired labour. Educational status of respondents indicated that farmers have varying levels of education, about 75.39% had formal education. This implies that majority of the farmers were literate. The high proportion of literate people among the farming population indicates that majority of them are in a better position to access and process innovations on sweet potato production and subsequently value addition.

More (47.12%) cultivated between 1-3ha. Others (26.70%, 5.76%) cultivated between 4-6ha and more than 7ha respectively. This implies that majority of the sweet potato farmers are small scale farmers. This finding is in agreement with the findings of Aniedu (2006) and Mbanaso (2010) who found small-scale farmers dominating the activities of sweet potato production in the South-east zone of Nigeria. The result also corroborate with the findings of Omoare (2014) who stated that sweet potato farmers in Osun and Kwara States operated mostly on a small scale. Farmer's estimated annual income indicated that 10.47% of the respondents had an estimated annual income of less than ₦100,000, 15.18% earn up to ₦100,000-₦200,000 per annum while 53.40% of the respondents had an estimated annual income of ₦201,000-₦300,000 and 20.94% earn up to ₦301,000-₦400,000, per annum. The implication of this result is that majority about 74.34% of the respondents earn between ₦200,000-₦400,000 annually which still indicates that they are small scale farmers they still need income from other crops or other sources to augment the ones they get from marketing sweet potatoes and their products.

The result on Table II revealed that all (100%) of the respondents adopted traditional processing techniques from tuber selection to peeling, washing of tubers, slicing/cutting, roasting, frying and pounding. These operations represent the most labour intensive units of sweet potato value addition. The operations are carried out by the farmers and other household members. However, majority (60.2%) of the respondents used modern processing method for blending the dried sliced tuber to floury form, and 57.07% used modern techniques for

grating of sweet potato roots. The use of these traditional processing techniques greatly limits value addition of sweet potato (Low *et al.*, 2009). Sweet potato bulkiness and perishability is substantially reduced when processed into various products forms such as sweet potato flour, chips among others thus making it more acceptable to the consumers in different forms and ease its transportation over longer distances thereby increasing its shelf life.

The result in Table III shows that 57.59% of the respondents are aware of sweet potato chips while 42.4% were not aware of it, 48.1% of the respondents processes their sweet potato into chips. About 47.12% of the respondents are aware of sweet potato flour, while 52.8% were not aware of it, 14.7% process their sweet potato into flour. About 18.8% of the respondents were aware of sweet potato garri while 81.2% of the respondents were not aware of sweet potato garri, none of the respondents in the study area process sweet potato into garri, it was believed that the few farmers that were aware of the sweet potato garri are those ones that are resident in Abakaliki metropolis that were opportune to receive training from women in agriculture arm of Ebonyi ADP. This has made sweet potato garri not to be well known in the study area because of lack of awareness of the technology as well as the training on value addition of it.

For the use of sweet potato in confectioneries in the production of sweet potato meatpie, sweet potato fruit juice, sweet potato cake, sweet potato chin-chin and sweet potato doughnut, majority of the respondents were not aware of them but the few that were aware of it and practice them are those women farmers that are linked with women in agriculture arm of Ebonyi ADP and has received training on sweet potato value addition. The technology on sweet potato value addition has not diffused in the study area and as such many farmers do not have knowledge about them in the study area.

For sweet potato vegetable, which is the use of sweet potato leaves in cooking soup, stew, porridge and other food items, 50.78% of the respondents were aware of the use of sweet potato leaves in cooking food while 49.22% were not aware of it. About 42.4% of the respondents use sweet potato leaves as vegetable for their food. This implies that the use of sweet potato leaves in cooking is known by some farmers and the make use of it in the preparation of some local dishes in the study area.

Sweet potato kunnu is a traditional fermented, non-alcoholic drink made from many carbohydrate sources. Some producers use sweet potato as the carbohydrate base; while a lot use it as a thickener and sweetener in the Fermented drink. For Kunnu, 33% of the respondents were aware of processing sweet potato into kunnu while 67% were not aware of the use of sweet potato in the production of kunnu, none of the farmers in the study area processes sweet potato into kunnu. This might be because the study

area, Ebonyi State, falls within the south-eastern part of Nigeria where people do not know much about kunnun

For animal feed, this is the use of unmarketable small roots of sweet potato that are not up to 100g to feed livestock. For animal feed, 58.11% of the respondents were aware of the use of sweet potato for animal feed while 41.9% were not aware. Also, 54.5% of the respondents process sweet potato into animal feed. This is a well known practice in the study area since most of the sweet potato farmers still rear livestock. When they harvest their sweet potato, they use the vines and peels to feed the livestock. They also use smaller roots that the farmers could not sell to also feed their animals. They also dry the roots to preserve them for the feeding of their livestock. Both roots and vines (leaves) apart from being used fresh could be made into a dried meal and fermented silage and fed to livestock. This includes pigs, cattle and poultry.

Among these products, sweet potato animal feed and sweet potato chips were always used by sweet potato farmers. The reason adduced for this is that the two products can easily be prepared and processed using traditional processing techniques. The awareness level of the use of sweet potato in the production of chin-chin, cake, bread, meatpie, fruit juice and other high level value added products are very low in the study area and as such, they do not practice them. Despite the fact that all the products mentioned above are widely consumed by the people in the study area, although produced with other raw materials such as wheat flour and cassava, sweet potato is yet to be adequately utilized in confectionaries. The implication of this is that farmers do not have good value addition knowledge of sweet potato because it is underutilized and neglected crop despite its prospective economic importance and high nutritive value.

In line with the findings on sweet potato value addition among the rural farmers, it was also discovered from focus group discussion that farmers still have alternative way of adding value to sweet potato which were not included in the interview schedule instrument. These were the use of sweet potato in the production of moi-moi, flakes, amala and fufu which is a very good delicacy in the study area. These were all highlighted in FGD as follows:

A 58 year old female discussant in Ezzangbo council ward of Ohaukwu LGA stated that:

'Sweet potato moi-moi is a nice delicacy here in our community, we slice and dry sweet potato during the harvest season and store it in sacks, during the off season, we will grind it and mix it with plantain to prepare moi-moi. We also utilize the leaves because it is medicinal; it is used in the treatment of constipation. We also use it in cooking soup and feed for our goat.(FGD, 2019)'

A 60 year old male discussant in Ntezi council ward of Ishielu LGA in a similar response stated thus:

'Sweet potato can be pounded and eaten with soup, it can also be fried and eaten with akara in the morning and it can also be used in cooking beans porridge. We love sweet potato, we do not play with it but we will need training on how it can be used in the production of some products like chin-chin, puff-puff, doughnut, cakes and bread.'(FGD, 2019)

Another 46 year old female discussant in Nkalagu council ward of Ishielu LGA stated that:

'Sweet potato is very good in the production of amala (dried chips that are blended into flour and stirred into food like semovita). We also dry the chips and use it in chewing palm kernel.'(FGD, 2019)

The result in Table IV showed that no additional cost was incurred on fresh sweet potato roots apart from the cost of production. However, estimated average cost incurred in the transformation of fresh root to flakes, flour, chips and bread were ₦90.00/kg, ₦110.00/kg, ₦105.00/kg and ₦165/kg respectively. Also the mean price of unprocessed fresh sweet potato root was ₦150.00/kg while sweet potato flakes, flour, chips and bread were sold for ₦175/kg, ₦250/kg, ₦250/kg and ₦350/kg respectively. This implies that respondents that added value to their sweet potato realized higher returns than their counterparts that sold their sweet potato in raw form. In contrast, there were no much gains on the value added sweet potato products compared to the fresh roots. This is connected with the high cost of adding value which can be attributed to the small quantity of sweet potato processed. The more quantity of sweet potato processed, the lesser the marginal cost of production hence higher gain. Farmers can minimize the high cost of production by bringing their harvested sweet potato together for processing and value addition that will have a positive effect or increment in farmers' income that will help to raise the standard of living of the rural farmers in the study area.

The result from Table V showed that the mean annual income of processors and non-processors were ₦336, 656 and ₦278,709 respectively. This implies that mean income of processors is higher than non-processors with t-value of 2.2889 which was significant at 10% probability level implying significant difference in income between the two groups. This result agreed with findings of Alalade *et al.*, (2019) who found out that the more the value added to the raw tubers at higher level, the higher the household income in geometric rate when compared to the current income. Aniedu *et al.*, (2014) indicated the high acceptability and good competitiveness of the sweet potato baked products, especially in small urban trading centres close to the sweet potato production noting that products containing cooked

and mashed sweet potato were exceptionally highly accepted by consumers who expressed a high level of willingness to pay the same price for sweet potato products as for similar products they have been buying.

CONCLUSION

It was discovered that traditional processing techniques were commonly practised in the study area with sweet potato processing activities ranging from tuber selection, peeling, washing, slicing/cutting, drying, roasting and pounding. Chips, animal feed and flour were the major products that

the farmers derived from sweet potato. The study further concludes that respondents that added value to their sweet potato realized higher returns than their counterparts that mainly sell their sweet potato in the raw forms. It was recommended that farmers should be encouraged to form groups for easy access to technology and also that sweet potato processing industry be established by government in the areas where sweet potato is produced in large quantity to aid processing it to value added products which can store for longer time and command high market prices.

Table I: Socio-economic characteristics of the respondents

Variable	Frequency N= 382	Percentages (100)	Mean
Sex			
Male	176	46.07	
Female	206	53.93	
Age			
21-30	20	5.24	43.1
31-40	118	30.89	
41-50	180	47.12	
51-60	58	15.18	
61&above	6	1.57	
Marital Status			
single	32	8.38	
Married	298	78.01	
Divorced	8	2.09	
widowed	44	11.52	
Household size			
1-5	136	35.60	7
6-10	194	50.79	
11-15	46	12.04	
16-20	6	1.57	
Level of Education			
No formal education	94	24.61	
Primary education	86	22.51	
Secondary education	126	32.98	
Tertiary education	76	19.90	
Farm size			
Less than 1ha	78	20.42	2.8 ha
1-3ha	180	47.12	
4-6ha	102	26.70	
7ha &above	22	5.76	
Annual Income			
Less than ₦100,000	40	10.47	
₦100,000-₦200,000	58	15.18	
₦201,000-₦300,000	204	53.40	
₦301,000-₦400,000	80	20.94	

Source: Field Survey 2019

Table II: Distribution of respondent by their processing pattern/techniques of sweet potato (N=382)

Processing technique	Traditional	Modern
Tuber selection	382 (100)	0
Peeling	382 (100)	0
washing	382 (100)	0
Slicing/Cutting	382 (100)	0
Grating	152 (39.8)	230 (60.2)
Drying	382 (100)	0
Roasting	382 (100)	0
Frying	382 (100)	0
Pounding	382 (100)	0
Blending into floury form	164 (42.9)	218 (57.07)

Source: Field Survey 2019**Multiple responses****Table III: Value added products from sweetpotato (N= 382)**

	Product Forms	Awareness	Not Aware	Utilization of product
i.	Sweet potato chips	220(57.59)	162(42.4)	184(48.1)
ii.	Sweet potato flour	180(47.12)	202(52.8)	56(14.7)
iii.	Sweet potato sparrri	72(18.8)	310(81.2)	-
iv.	Sweet potato meat pie	42(10.9)	340(89)	-
v.	Sweet potato fruit juice	36(9.42)	346(90.6)	-
vi.	Sweet potato cake	70(18.3)	312(81.7)	2(0.52)
vii.	Sweet potato chin-chin	76(19.8)	306(80.2)	-
viii.	Sweet potato vegetable	194(50.78)	188(49.22)	162(42.4)
ix.	Sweet potato kunu	126(33)	256(67)	-
x.	Sweet potato doughnut	68(17.8)	314(82.2)	4(1.02)
xi.	Sweet potato animal feed	222(58.11)	160(41.9)	208(54.5)

Source: Field Survey 2019

Note: Values in parenthesis are percentages.

Table IV: Costs and prices implication of sweetpotato value addition

Variables	Cost of adding value (₦)	Prices (₦)	Average Gain (₦)
Fresh sweet potato roots (kg)	0.0	100-200	150.00
Sweet potato flakes	80-100	150-200	85.00
Sweet potato flour	100-120	200-300	140.00
Sweet potato chips	100-110	200-300	145.00
Sweet potato bread	150-180	200-500	185.00

Source: Field Survey, 2019**Table V: Effect of Sweet potato value addition on farmers' income**

Variable	Mean	Std. Error	Std. Deviation	T
Processors	336656.8	21742.33	276734.6	2.2889*
Non-processors	278709.1	12968.88	192359.6	
Combined	303283.8	11939.28	233351.1	

Source: Computed from STATA

*, **, *** is significant at 10%, 5% and 1% level

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