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Value Addition of Sweet Potato (*Ipomoea batatas L. Lam*): Impending Factors on Household Food Security and Vitamin A Deficiency (VAD) In Southwest and Northcentral Nigeria

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Abstract: *Nigeria is the single largest producer of sweet potato in Africa with 3.46 million metric tonnes and second to China globally. Despite the clear potential of sweet potato in helping to meet Nigerian's food needs, full exploitation and utilization is constrained by its bulkiness, perishability and low farmers knowledge on its value addition. Hence, this study was carried out to assess value addition of sweet potato (Ipomoea batatas l. lam) as impending factors on household food security and vitamin A deficiency (VAD) in Southwest and Northcentral Nigeria. Multi-stage sampling techniques were used to select 750 sweet potato farmers/processors in the study area while data obtained were analysed with both descriptive and inferential statistics. The study revealed that the mean age of the respondents was 41.60 years with 87.10% of the respondents married and 65.70% of the respondents did not have formal education. 63.70% of the respondents were females and had spent 11 – 20 years in sweet potato farming. Most (98.90%) of the respondents consumed Cream flesh (46.40%), White flesh (32.20%), and Orange Flesh Sweet Potato (OFSP) (21.40%) varieties which were obtained from their farms. Almost all (99.60%) the respondents neither aware that OFSP is very rich in vitamin A nor encouraged their children and pregnant women to eat. But sweet potato was commonly processed in the forms of boiled, roasted or fried chips (88.20%). Most (85%) of the respondents preferred sweet potato to food fortified with vitamin A because it was readily available, relatively cheap, and easy to cook (77.30%). Majority (86.30%) of the respondents were food secured with sweet potato. Results of chi-square showed that significant relationships existed between household consumption of sweet potato and food security at $p < 0.05$. Meanwhile, the result of t-test showed that there was no significant difference in the value addition of sweet potato in Southwest and Northcentral ($t = 0.87$, $p = 0.38$) at $p < 0.05$. The study concludes that the farmers did not aware that OFSP is very rich in vitamin A while they preferred sweet potato to food fortified with vitamin because it was readily available, relatively cheap, and easy to cook. The study recommends promotion of farmers' awareness and enlightenment on OFSP as vitamin A source through vigorous campaign, trainings and seminars.*

I. Background of the study

Nigeria is one of the largest producers of sweet potato in Sub-Saharan African (SSA) with annual production estimated at 3.46 million tonnes per year (FAO, 2008). Despite this, the crop has received comparatively little attention in the country, perhaps because of low prioritization by the government due to a paucity of basic information on the potential of the crop. Its bulkiness and perishability with a low shelf life after harvesting limit its economic viability (Abidin, 2004). Hence, it is both desirable and necessary to process sweet potato into storable products forms to add value to the crop in order to contribute significantly to food security, nutrition, income generation and enhanced livelihoods for the farmers (Ndunguru, 2003). However, the limited range of ways and availability of adapted processing technologies in which sweet potato is utilized in Nigeria seriously undermine the potential benefits of the crop to farmers, consumers and other chain actors (Mmasa et al., 2013). In Nigeria, meeting the food and nutrition needs of the ever-increasing population has been a huge task for every successful government, how well this objective is achieved is often used to judge the performance of any government. Food security refers to a situation in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active healthy life (International Food Policy Research Institute, 2002). Food availability, stability of supplies and food access are related determinants of food security. Inconsistent food security results in inadequate dietary intake, which leads to malnutrition. Malnutrition is the most serious consequence of food insecurity. The problem of food and nutrition security in Nigeria has not been adequately and critically analyzed. In spite of the role of sweet potato as one of the World's most important food and vegetable crop, playing an important role in combating vitamins and other nutritional deficiencies, it is still regarded as a minor crop and food for the poor. There is little commercial processing into chips or flour, which could be stored for

all year round consumption in Nigeria. Hence, it is rated low in the food priority list. 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. Since the majority of Nigerians live in rural areas, an assessment of the food and nutrition security status of rural dwellers through sweet potato value addition will provide a clear picture of what needs to be done to increase production and consumption of OFSP variety in Nigeria with the attendant improvements in nutrition status. This study thereby assessed the contributions of sweet potato (*Ipomoea batatas L. Lam*) value addition to rural households' food security and as vitamin A supplement in Southwest and Northcentral Nigeria.

1.4 Specific Objectives were to:

i. describe the socio-economic characteristics of the respondents
ii. examine the households consumption of OFSP
iii. assess the common sweet potato varieties and in what forms have they processed them for ease of consumption
iv. assess sweet potato contribution to the household food security

1.5 Hypotheses of the Study

H_{01}: There is no significant relationship between household consumption of sweet potato and food security.
H_{02}: There is no significant difference in the Value Addition of Sweet potato in Southwest and Northcentral.

II. Research methodology

2.1 Sampling techniques and sample size

This study was carried out in some selected States of Southwest and Northcentral areas of Nigeria. Simple random sampling technique was used to select three States namely: Ogun, Osun and Kwara States. Multistage sampling technique was used to select respondents in the study area. A total of 750 respondents were selected for the study but only 735 respondents were physically present and interviewed.

Table 1: Multistage Random Sampling Procedure and Sample Size

S/N	States	Zones	Selected zones (2)	Blocks	Selected blocks (50%)	Cells	Selected cells (50%)	No. of registered farmers in the selected cells	No. of selected farmers (25%)
1	Ogun	Abeokuta	Abeokuta	6	3	54	27	640	160
		Ikenne	Ilaro	4	2	28	14	360	90
		Ijebu-Ode							
		Ilaro							
2	Osun	Iwo	Osogbo(2)	10	5	64	32	684	171
		Osogbo		10	5	48	24	429	107
		Ife/Ijesa	Ife/Ijesa						
3	Kwara	A	A	6	3	30	15	387	97
		B	B (2)	6	3	30	15	500	125
		C							
		D							
	TOTAL		**6**	**42**	**21**	**254**	**127**	**3,000**	**750**

Source: OGADEP, OSSADEP, KWARADEP, 2011

2.2 Data Collection

Data for this research exercise was collected in batches by five trained enumerators and the research team between October 2014 and May 2015. In the selected communities there were face to face interviews with the respondents by the trained enumerators and community leaders. Data were collected on Socio-economic characteristics of the respondents, Awareness and consumption of OFSP as a good source of vitamin A, Sweet potato cropping system, Awareness of various products forms of sweet potato, Farmers' Sources of information on sweet potato production, Household food security and Challenges to sweet potato value addition. R-statistics software was used to analyse the data.

2.3 Validity of the instrument

The instrument was subjected to face and content validity involving supervisors' assessment, experts in Agricultural Extension and Rural Development, their criticisms and suggestions were positively utilized for a more valid instrument.

2.4 Reliability of the instrument

The reliability test for the instrument was conducted using test re-test method. Administration of the instrument was done for twenty sweet potato farmers who were not included in the actual study sample. Scores were assigned to the responses of the selected respondents. Total scores for each period were computed and Pearson Product Moment Correlation (PPMC) was used to determine the relationship between the two set of scores. The instrument was considered reliable with a reliability coefficients (r) range from 0.79 to 0.89.

2.5 Measurement of variables

Household consumption of sweet potato was measured at nominal level as Yes (1) and No (0) while rate of consumption was measured as Daily (1), Weekly (2), Monthly (3) and Never (0). Food security status measured at nominal as Yes (3), I don't know (2) and No (1). The food security status were categorized as Low and High with scores of 23 – 25 and 26 and above respectively.

2.6 Method of Data analysis

Data collected were subjected to descriptive statistics such as frequency distribution, percentages and mean were used for objectives of this study. Chi-square and t-test were used to test the hypotheses for the study.

III. Results and Discussion

3.1 Socio-economic characteristics of the respondents

Result in Table 2 showed that the mean age of the respondents was 41.60 years with standard deviation of 1.08. Most (83.10%) of the respondents were between 30 - 50 years of age, thus revealing the presence of respondents that are economically active (Oladoja et al., 2006). This implies that the activeness of the farmers can be channeled to a more productive sweet potato production and value addition in the study area. Some (16.90%) of the respondents were above 51 years of age. This could be as a result of the rural-urban migration of the youth which has led to ageing population in the rural areas of Nigeria. Many (63.70%) of the respondents were females while few (36.30%) were males. This indicates the dominance of the female farmers in sweet potato value addition. This finding indicated that women are more involved in the processing and marketing of food crops are often the chores of women (Adisa and Okunade, 2005). The implication of this is that women in the study area should be encouraged and trained to embrace modern processing techniques. Most (87.10%) of the respondents were married while 9% were single and 3.10% were widowed. It is assumed that married people are expected to be stable, have family responsibility and enough experience to coordinate and organize their homes and farms operations. This result further confirmed the findings of Fakoya, (2000) and Oladoja et al. (2008) who asserted that marriage confers some level of responsibilities and commitments on individual who are involved. Also, those who are married need to generate additional income to sustain members of their household. Results of this study also revealed that a large proportion (65.70%) of the respondents did not have formal education, 25.20% had primary education, while only a relatively small proportion (9.10%) of the respondents had secondary education. This showed that a good number of the respondents did not have formal education and this will affect the rate of adoption of innovations on sweet potato production, marketing, processing and ultimately value addition of the crop. Education is a viable tool for change and adoption of innovation. Members of the farmer's household constitute its household size. However, the findings of this study showed that 52.80% of the sweet potato farmers in the study areas had less than 5 members in their household while 1.20% had more than 9 people, and 42.60% had between 6 - 10 persons in their household. This indicated that the household size of respondents was not too large. This would have implications on the available family labour input into the value addition activities. The respondents will have to go for hired labour since family labour may not be sufficient due to their number. The findings of this study also agree with that of Tecklewold et al. (2006) which explained that individual in the household is a potential source of labour and their availability reduces labour constraints faced during the peak period of the farming seasons. Years of farming experience usually play a vital role in any farming enterprise (Abiona, 2010). The findings of this study showed that the mean year of farming experience for sweet potato was 16.40 years while the standard deviation was 7.14. The result also indicated that 2% of the respondents had been in sweet potato farming for more than 31 years, while 43.50% had been cultivating sweet potato for 11 – 20 years. Few (28.60%) of the respondents had been into sweet potato farming for less than 10 years. This further showed that sweet potato production is not a new enterprise/crop to the farmers in the study area making them to be more experienced and knowledgeable in sweet potato production activities. The implication of this is that since the farmers in the study area have wealth of experience in sweet potato production they can easily be trained on the value addition of the crop which will in turn generate additional income for them. Almost all (98.50%) of the respondents were members of agricultural cooperative societies. This is in agreement with Ebii, (2002) and Oladele and Afolayan, (2005) who indicated that high levels of social participation and linkages can give rise to high level of innovation dissemination, mass adoption and increased productivity due to group dynamism. The agricultural cooperative societies provide the platform for the

members to have access to loan facilities, agricultural information on sweet potato production, marketing, processing and value addition, and other inputs as well as enhanced ability to adopt innovations. The relevance of membership of association for this study came from the fact that these different associations are one of the possible avenues of mobilizing farmers for collective action. These groups usually serve as an entry point for farmers to adopt innovation. Abiodun et al. (2002), and Abiona, (2010) have pointed out the importance of group networking in adoption of various technologies.

Table 2: Socio-economic characteristics of the respondents (n = 735)

Variables	Frequency	Percentage	Mean	Std. Dev.
Age (yrs.)				
≤ 30	160	21.80	41.60	1.08
31 – 40	208	28.30		
41 – 50	243	33.10		
≥ 51	124	16.90		
Sex				
Male	267	36.30		
Female	468	63.70		
Marital status				
Single	66	9.0		
Married	640	87.10		
Widow	23	3.10		
Divorced	06	0.80		
Educational status				
Primary education	483	65.70		
Secondary education	185	25.20		
Tertiary education	67	9.10		
Household size				
≤ 5	388	52.80	6.00	
6 – 10	313	42.60		
11 – 15	25	3.40		
≥ 09	09	1.20		
Experience (yrs.)				
≤ 10	210	28.60	16.40	7.14
11 – 20	320	43.50		
21 – 30	190	25.90		
≥ 31	15	2.00		
Membership of association				
Agricultural cooperative	11	1.50		
Non-agricultural cooperative	724	98.50		

Source: Field survey, 2015

3.2 Household consumption of sweet potato

The result revealed that 62.90% of the respondents were household head and taken feeding responsibility of the family. Most (98.90%) of the respondents consumed sweet potato in their households. Almost all (98.20%) of sweet potato consumed in the households were obtained from the farms while very few (1.20%) were purchased in the markets. Food availability relates to the supply of food through production, distribution, and exchange (Gregory et al., 2005). The common sweet potato varieties to the households were Cream flesh (46.40%), White flesh (32.20%), and Orange flesh sweet potato (21.40%). Sweet potato varieties exist in many colours of skin and flesh, ranging from white to deep purple, although cream and orange flesh are the most common (Adam, 2005). The reason for the low percentage of Orange flesh sweet potato (OFSP) variety as compare to the other two varieties is that the other two varieties are the local varieties that the farmers are used to planting while orange flesh has just been introduced to the farmers because it is a source beta-carotene. Also, cream flesh and white flesh sweet potato varieties possess high market price, high yielding with early maturity characteristics. The results imply that OFSP variety has not yet widely circulated among the farmers in the study area. Vitamin A deficiency is a serious health problem affecting young children between the ages of 0 to 6 years, and pregnant women in Sub Sahara Africa. Meanwhile, orange flesh variety contains beta-carotene-rich that the body uses to produce vitamin A, which is both an excellent source of energy and important nutritive substances and it can contribute to the nutrient status of the rural dwellers (Burris, 2011). Also, it was reported by WHO, (2005) that several nutritional disorders can be easily alleviated by consuming the orange flesh sweet potato that contains high levels of Vitamin A. The result in Table 3 further showed that almost all (99.60%) the respondents neither aware that OFSP is very rich in vitamin A nor encouraged their children and pregnant women to eat it. This reason may not be unconnected with low coverage of extension service that can introduce and educate the rural dwellers on the need to consume OFSP.

Table 3: Household consumption of sweet potato (n = 735)

Variables	Frequency	Percentage
Head of household		
Yes	462	62.90
No	273	37.10
Responsible for household feeding		
Yes	467	63.50
No	268	36.50
Consumption of sweet potato products in your household		
Yes	727	98.90
No	08	1.10
Source of sweet potato available in your household		
Purchased	09	1.20
Cultivated	722	98.20
Sweet potato varieties in your household		
White flesh SP	237	32.20
Cream flesh SP	341	46.40
Orange flesh SP	157	21.40
Awareness on OFSP		
You aware that OFSP is very rich in vitamin A		
Yes	03	0.40
No	732	99.60
You encouraged your children and pregnant women to eat OFSP		
Yes	03	0.40
No	732	99.60

Source: Field survey, 2015

3.3 Common processed sweet potato forms

Bulkiness and perishability affect production and post-harvest system of sweet potato because the crop has a very short shelf life after harvesting, hence it is both desirable and necessary to process sweet potato into storable products forms (Abidin, 2004). Results in Table 4 revealed that most common (88.20%) processed sweet potato in the study area was in boiled, roasted, fried and chips forms. Sparri was not very common (0.50%) in the diet of rural dwellers in the study area. The reason adduced for this is that sweet potato can be easily boiled and roasted without much effort. This result corroborates the findings of Fawole, 2007 that the common processed products forms of sweet potato are boiled and roasted processed forms. In Africa, sweet potato is generally eaten boiled or roasted. However, various utilization methods such as making of chips, blending of sweet potato flour with wheat flour for products like chapatti, mandazi or porridge has not been fully developed in Nigeria (Tewe et al., 2003) whereas when sliced, dried (usually in the sun), and ground, it gives flour that remains in good condition for a long time (Amamgbo et al., 2010).

Table 4: The common available processed sweet potato found in the study area (n = 735)

Processed sweet potato	Frequency	Percentage
Boiled/Roasted	11	1.50
Boiled/Roasted/Fried	72	9.80
Boiled/Roasted/Fried/Chips	648	88.20
Chips/sparri	04	0.50

Source: Field survey, 2015

3.4 Rate of consumption of various sweet potato products

Over 80% of the sweet potato produced in SSA is consumed fresh by man (Nungo et al., 2004). The remainder is either processed for starch or used for animal feed. The tubers are mainly starch and soluble carbohydrates, but the leaves and vines are high in amino acids, essential minerals and vitamins. From the results in Table 5, it was shown that sweet potato as animal feed (61.50%), flour (12.80%) and chips (10.50%) were commonly used on daily basis while 59.20% and 45.40% of the respondents consumed sweet potato flour and chips respectively every week. According to Nungo et al., 2004 over 80% of the sweet potato produced in SSA is consumed fresh. In most other rural areas, it is a secondary staple consumed 2-4 times per week when in season. Boiled and steamed roots often serve as a breakfast food. Sweet potato plays a more limited role in urban diets, often as a breakfast or snack food. In Africa there is often a cultural perception that sweet potato is a "sweet" food most appropriate for women and children (Low et al., 2007). Similarly, adults prefer high starch content varieties, while children prefer the softer, lower starch roots (Low et al., 2005). In contrast, sweet potato doughnut (100%), cake (99.60%), vegetable (99.60%), sparri (99.10%), chin chin (98.80%), and starch (97.80%) were never consumed by the respondents. In Japan, sweet potato starch is used in the production of noodles and is also fermented in the production of distilled spirits called shochu.

Table 5: Rate of consumption of various sweet potato products (n = 735)

S/N	Products forms	Rate of consumption			
		Daily	Weekly	Monthly	Never
1	Sparri (sweet potato garri)	04 (0.50)	03 (0.40)	0 (0.00)	728 (99.10)
2	Sweet potato starch	16 (2.20)	0 (0.00)	0 (0.00)	719 (97.80)
3	Animal feed (fodder)	452 (61.50)	230 (31.30)	11 (1.50)	42 (5.70)
4	Chips	77 (10.50)	334 (45.40)	258 (35.10)	66 (9.00)
5	Sweet potato meat pie	0 (0.00)	03 (0.40)	16 (2.20)	716 (97.40)
6	Sweet potato flour	94 (12.80)	435 (59.20)	172 (23.40)	34 (4.60)
7	Sweet potato cake	0 (0.00)	03 (0.40)	0 (0.00)	732 (99.60)
8	Sweet potato chin chin	03 (0.40)	0 (0.00)	06 (0.80)	726 (98.80)
9	Sweet potato vegetable	0 (0.00)	03 (0.40)	0 (0.00)	732 (99.60)
10	Sweet potato doughnut	0 (0.00)	0 (0.00)	0 (0.00)	735 (100)
11	Sweet potato soup	16 (2.20)	12 (1.60)	51 (6.90)	656 (89.30)

Source: Field survey, 2015
Values in parenthesis are percentages

3.5 Household food security status

The results on household food security status showed that most of the respondents had enough of the kinds of sweet potato to eat (94.60%) but could not know when the sweet potato stock was exhausted (96.90%).

The respondents confirmed that sometimes they (97%) did not have money to purchase sweet potato within 12 months yet they (92.90%) could still afford to buy some sweet potato for their households. Also, most (97.60%) of the respondents ate sufficient sweet potato products even when the cash at hand was not enough (99.60%).

Poverty can limit access to food, and can also increase how vulnerable an individual or household is to food price spikes (Ecker and Breisinger, 2012). It was further revealed that many (58.20%) of the respondents did not lose weight because majority (92.50%) of the respondents ate their diets daily. 88.30% of the respondents indicated that there was no day they did not eat and felt satisfied when the family (84.20%) ate sweet potato products. Almost every month, many of (44.80%) had access to food fortified with vitamin A (92.70%). This is in line with United Nations World Food Summit of 1996 that food security is a situation when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life (FAO, 1996). Many (85%) of the respondents showed that they prefer sweet potato to food fortified with vitamin because it was readily available, relatively cheap, and easy to cook, and have sweet taste (77.30%).

Unfortunately, there were no any national/state/local programs to promote improved vitamin A status through dietary change to orange flesh sweet potato (99.60%) and no community-based forum that emphasizes consumption of orange flesh sweet potato as a good source of vitamin A to rural dwellers (100%) in the study area. Poor policies have greatly affected the food security in Africa. The problem arises when the focus on policies, structures and institutions is put above that of the people themselves (Oyediran, 2015). Results in Table 6b showed that majority (86.30%) of the respondents fell into category of high food security while 13.70% were in the category of low food security. It implies that availability of sweet potato and its convenience in cooking and cheap price encouraged rural households to consume it in respective of their financial status so that they could overcome hunger and food insecurity. Therefore, sweet potato serves as means of achieving food and nutrition security in the study area.

Table 6a: Household food security status (n = 735)

S/N	Statements	Frequency
1	**Products eaten in your household**	
	Enough of the kinds we want to eat	695 (94.60)
	Enough but not always the kinds we want	03 (0.40)
	Sometimes not enough to eat	37 (5.00)
2	**The sweet potato that I bought just didn't last**	
	Yes	08 (1.10)
	I don't know	712 (96.90)
	No	15 (2.0)
3	**I didn't have money to get more in the last 12 months**	
	Sometimes true	713 (97.00)
	Never true	22 (3.00)
4	**I couldn't afford to eat processed sweet potato (my household) in the last 12 months**	
	Sometimes true	52 (7.10)
	Never true	683 (92.90)
5	**Did you ever eat less than you felt you should**	
	I don't know	18 (2.40)
	No	717 (97.60)
6	**Were you every hungry but didn't eat because there wasn't enough money**	
	I don't now	03 (0.40)

	No	732 (99.60)
7	**Did you lose weight because there wasn't enough money for sweet potato products**	
	I don't know	307 (41.80)
	No	428 (58.20)
8	**Did you ever not eat for a whole day**	
	Yes	10 (1.40)
	I don't know	41 (6.10)
	No	680 (92.50)
9	**How often did you not eat for a day**	
	Almost every month	04 (0.50)
	Some months but not every month	57 (7.80)
	Only 1 or 2 months	25 (3.40)
	I don't know	649 (88.30)
10	**When your family eats sweet potato products, do they satisfy their hunger**	
	Yes	619 (84.20)
	No	116 (15.80)
11	**Access to food fortified with vitamin A such as wheat flour, sugar, milk, margarine, etc**	
	Yes	681 (92.70)
	No	48 (6.50)
	I don't know	03 (0.40)
12	**How often did you consume food fortified with vitamin A**	
	Daily	55 (7.50)
	Weekly	65 (8.80)
	Almost every month	117 (15.90)
	Some months but not every month	329 (44.80)
	Only 1 or 2 months	157 (21.40)
	I don't know	12 (1.60)
13	**Do you prefer consuming orange flesh sweet potato to food fortified with vitamin A**	
	Yes	625 (85.00)
	No	110 (15.00)
14	**Reasons for your prefer sweet potato to food fortified with vitamin A**	
	Readily available/relatively cheap/easy to cook	167 (22.70)
	Readily available/relatively cheap/easy to cook/sweet taste	458 (77.30)
15	**Any national/state/local programs to promote improved vitamin A status through dietary change to orange flesh sweet potato**	
	Yes	03(0.40)
	No	732 (99.60)
16	**Any community-based forum that emphasizes consumption of orange flesh sweet potato as a good source of vitamin A to rural dwellers**	
	Yes	0 (0.00)
	No	735 (100)

Source: Field survey, 2015; Values in parenthesis are percentages

Table 6b: Categorization of food security status

Food security status	Scores	Frequency	Percentage
Low	23 – 25	101	13.70
High	26 and above	634	86.30

Source: Field survey, 2015

3.6 Testing of hypotheses

H_{01}: There is no significant relationship between household consumption of sweet potato and food security.

Result of chi-square in Table 7 showed that no relationship existed between household consumption of sweet potato products like sparri (χ^2 = 1.33, df =4), starch (χ^2 = 1.19, df =2), animal feed (χ^2 = 10.14, df =6), meat pie (χ^2 = 3.67, df =4), vegetable (χ^2 = 0.57, df =4), doughnut (χ^2 = 4.37, df =6) and food security at $p < 0.05$. This situation is not unconnected with their low level of awareness about the various value added sweet potato products. But, there was significant relationship between the household consumption of sweet potato chips (χ^2 = 17.09, df =6) and food security at $p < 0.05$. The reason is that the few available sweet potato chips are well utilized by the respondents which enhanced their households' food security. It can be inferred that households that have access to various products forms of sweet potato will increase its consumption and consequently households' food security. At the household level, food security implies an adequate access to food over time. This is possible when there is adequate food availability to the household, and an adequate income capacity for the purchase of the available food (IFPRI, 2002). Hence, the null hypothesis that "there is significant relationship between the household consumption of sweet potato products and food security" is accepted.

Table 7: Relationship between household consumption of sweet potato and food security

Variables	χ^2	df	p-value	Decision
Sparri (sweet potato garri)	1.33	4	0.85	NS
Sweet potato starch	1.19	2	0.55	NS
Animal feed (fodder)	10.14	6	0.12	NS
Chips	17.09	6	0.01	S
Sweet potato meat pie	3.67	4	0.45	NS
Sweet potato vegetable	0.57	4	0.78	NS
Sweet potato doughnut	4.37	6	0.63	NS

Source: Field survey, 2015

3.7 Test of Difference in Value Addition of Sweet potato in Southwest and Northcentral

H_{02}: *There is no significant difference in the Value Addition of Sweet potato in Southwest and Northcentral*.

Result in Table 8 presented the t-test of significant difference in the Value Addition of sweet potato in Southwest and Northcentral. The results showed that there was no significant difference in the value addition of sweet potato in Southwest and Northcentral ($t = 0.87$, $p = 0.38$). The two geo-political zones have good vegetation that support sweet potato production at subsistence and commercial levels but the producers' knowledge of value addition is still very low. Consequently, the two geo-political zones practice similar value addition which is limited to boiled, roasted and fried forms. Therefore, the null hypothesis that "*there is no significant difference in the value addition of sweet potato in Southwest and Northcentral*" is accepted.

Table 8: Result of t-test of significant difference of sweet potato value addition in Southwest and Northcentral

Value addition	Mean diff.	Std. deviation	Std. mean error	df	t	p- value	Decision
Southwest and Northcentral	0.18	3.06	0.20	221	0.87	0.38	NS

Source: Field survey, 2015
NS = Not significant at 0.05 level
df = degree of freedom

IV. Conclusion

The study concludes that sweet potato value adders were predominantly females, economically active and innovative, married, experienced and operated on a small scale but had low level of literacy, and they did not aware that OFSP is very rich in vitamin A. Sweet potato was processed in forms of boiled, roasted or fried. Many of the respondents preferred sweet potato to food fortified with vitamin because it was readily available, relatively cheap, and easy to cook, and have sweet taste, and the farmers were food secured through sweet potato. Household consumption had significant relationship with food security. Sweet potato value addition practices in Northcentral and Southwest, Nigeria were found to be similar.

4.1 Recommendations

Based on the findings of this study, the following recommendations were made in order to improve sweet potato production, and ensuring sustainable household nutritional and food security through OFSP:

1. Adequate financial support by commercial banks and cooperative societies should be made available to farmers involved in sweet potato production and value addition.
2. Since farmers in the study area have low knowledge on sweet potato diverse products, extension services should organize trainings and workshop to sensitize the farmers on sweet potato value addition in the study area.
3. Promotion of farmers' awareness and enlightenment on OFSP as vitamin A source through vigorous campaign, trainings and seminars should be put in place.

Acknowledgment

It is in view of the objectives of Federal College of Education, Abeokuta that the research team sought and obtained the approval of the institution to undertake research survey and give report of the assessment, contributions, constraints and recommendations to improve the cultivation, value addition and consumption of Orange Flesh Sweet Potato (OFSP) to improve household food security in the study area. Food security is currently both a fundamental objective and an expected outcome of development policies in Nigeria, as the country currently faces a challenge in meeting the basic food needs of its population. To undertake this Research, Tertiary Education Trust Fund (TETFUND) assistance was sought through the Institution which was granted in September 2014, hence with the TETFUND support and together with the research team, community

leaders and sweet potato farmers we were able to undertake the exercise whose findings and recommendations are contained in this report. It is our sincere hope that the institution will find the report useful in designing and implementing program on rural households' food security, and in tackling vitamin A deficiency among the vulnerable.

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