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Scaling up Potato Economic Opportunities: Evaluation of Youths Participation in Potato Value Chain in Nigeria

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***Abstract*—**The potato value chain when harnessed can engage numerous youths and aid in the fight against poverty, malnutrition and unemployment. This study seeks to evaluate the level of youth participation in the potato value chain in Nigeria. Specifically, this study will examine the extent of youth participation in potato value chain, analyze the cost, benefits and sustainability of youth participation in the potato value chain, identify the factors that can propel or hinder youth participation in the potato value chain and make recommendations that will result in the increase in youth employment in the potato value chain. This study was conducted in the North Central and South East geopolitical zones of Nigeria. A multi stage sampling procedure was used to select 540 youths from the study areas. Focused group discussions and survey approach was used to elicit the required data. The data were analyzed using statistical and econometric tools. The study revealed that the potato value chain is very profitable.

***Keywords*—**Potato, youths, value, chain, participation.

I. Introduction

ONE of the challenges facing the world today is hunger, malnutrition and food insecurity. United Nations Organization estimated that the world will need to increase food production by over 70% to feed the growing population estimated at 9 billion by 2050, which will be dominated by the youths [3]. Majority of the youths in Nigeria are vulnerable to these challenges due to lack of economic opportunities. Agriculture in general and agribusiness in particular provides youth economic opportunities against unemployment. Among the various agricultural value chains, potato value chain provides huge capacity to scale up market and economic opportunities for youth in Nigeria. Poverty is the greatest challenge facing humanity, it is reported that more than 31.1% of Nigerians are extremely poor. In Nigeria the youth constitute bulk of the population. Youth play a central role in production processing and marketing of agricultural products, they are responsible for potato production which provides additional income earning opportunities and enhances their ability to contribute to household food security [8]. Youth participation in potato production in Nigeria reduces unemployment status in the country and increases revenue generation as well as provision of raw materials for industrial development. Youth involvement in the potato value addition enterprises is vital to facilitate the production of food and poverty alleviation. Therefore, the development and enlightenment of the youth in potato food processing and value addition is central to the strategic blueprint to reduce unemployment in Nigeria.

Potato (*Salanum tuberosum L.)* is an important root crop both economically and nutritionally. In order to emphasize its importance 2008 was declared as the potato year [2]. Potato is strategic in addressing challenges of food and nutrition insecurity. The chains of value in potato are numerous, which will result in the development of many small scale enterprises. The value added products from potato include potato flour, potato chips and potato starch among others. The products from potato form part of the world high sought diets and industrial raw materials. The link between value chain and post-harvest losses is positive. Reference [9] observed that poor value chain results in between 20-67% post-harvest loss of potato. Reference [6] observed that developed countries add about USD150 of value by processing of agricultural products, whereas developing countries generate only USD40. This difference in value is as a result of various value chain activities.

In Nigeria, the potato produced are either consumed raw or with little value addition. This is a huge gap that can be harnessed to create the much needed employment opportunities by enthusing youth participation in value chain activities.

Objectives of the Study

The broad objective of the study is to evaluate economic opportunities in potato value chain and determine youth participation in the value addition. The specific objectives include:

i. identification of the available value addition activities and technologies in the study areas;
ii. identify level of youths participation in potato value addition;
iii. ascertain determinants of youths participation in the potato value chain;
iv. analysis of the cost, benefits and sustainability of youth participation in potato value addition.

II. Methodology

This study was conducted in two phases; the first phase was

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carried out in the South Eastern, Nigeria while the second phase was carried out in the North Central Nigeria. The choice of the two geographical zones is based on their productive capacity of root and tuber crops in Nigeria.

A. Phase I

The phase one of the study covered South Eastern of Nigeria. The zone lies between latitude 6^{o} and 9^{OE} and 4^{o} and 7^{oN} longitude with a total area of 10, 952, and 400 hectares. The zone has a population of about 16 million people [13]. The states in this zone are Ebonyi, Enugu, Imo, Abia and Anambra State.

B. Phase II

The second phase of the study was carried out in the North Central Zone of Nigeria. North Central region of Nigeria and extends roughly from latitude 6^{0} 50'N to 9^{0}30'N of the Equator and longitude 7^{0}30'E to 10^{0}00'E of the Prime Meridian. The total population of the North Central Zone is 20,266,257 [13]. The states in this zone are Kogi, Niger, Benue, Kwara, Plateau, Nassarawa and the Federal Capital Territory.

C. Data Collection

The study used mainly primary data during investigation.

Primary Data

The multi stage sampling technique was adopted. The first stage involved a random selection of three states from each of the zones in the two phases of the study. In the second stage each state was divided into three agricultural zones with the aid of Agricultural Development Programme (ADP) in each state. In the third stage, three Local Governments Areas (LGA) were randomly selected from each of the agricultural zones.

In the fourth stage 281 potato based enterprises were identified and visited. During the visits, surveys were issued to 450 youths participating the value addition process of the enterprises. It is important to note that the enumerators held group discussion with the youths. The youths were purposively selected.

D. Methods of Data Analysis and Reporting

Data were analyzed using descriptive and quantitative techniques such as means, percentages, charts, graphs, multiple regression analysis benefits and costs analysis and sustainability index. The linear multiple regression adopted is specified as follows

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + e_i$$

where, y = value addition (cost of value addition in naira), b_0= constant, X_1= level of education (time spent in school/skill acquisition), X_2= income in naira, X_3 = technology awareness (yes = 1, no = 0), X_4 = credit in naira, X_5 = labour size (number), X_6 =production capacity (output as kg/day), X_7 = number of machines and equipment, X_8 = gender (male = 1, female = 0), e = error term.

III. Results and Discussion

TABLE I
AGE DISTRIBUTION OF THE OWNERS OF THE POTATO ENTERPRISES VISITED

Age of the potato enterprise owners	Frequency	percentage
18 to 25	34	15.6
26 to 30	56	25.69
31 to 35	32	14.68
36 to 40	18	8.257
41 to 45	19	8.716
46 to 50	24	11.01
51 to 55	22	10.09
56 to 60	13	5.963
Total enterprises	218	100

Table I shows the age distribution of the owners of potato enterprise that were visited. From the result, it was ascertained that a greater percentage of youth (55.97%) was involved in the potato value chain process. The youths who are usually between the ages of 18-35 [12], [4] were actively involved in the potato value chain process, since they are full of energy and looking forward for prospects to boost their financial strength. Those within the age bracket of 18 to 25 years were 15.6% while those within the age bracket of 26 to 30 and 31 to 35 years were 25.69 and 14.68% respectively [4], [5]. A lesser percentage of 16.053% shares of the population under study were attributed to individuals who are above the age 50 years.

TABLE II
AGE DISTRIBUTION OF POTATO ENTERPRISE WORKERS

Age of the potato enterprise workers	Frequency	Percentage
18 to 25	202	31.415
26 to 30	248	38.569
31 to 35	70	10.886
36 to 40	45	6.9984
41 to 45	19	2.9549
46 to 50	24	3.7325
51 to 55	22	3.4215
56 to 60	13	2.0218
Total enterprises	643	100

Table II shows the age distribution of the potato enterprise workers in the study area. The result indicated that a greater population (248) of the workers where between the ages of 26 to 30 years. This was seconded by those between the ages of 18 to 25 with a population of 203 persons and 31 to 35 years with a population of 70. These populations show that a greater number of workers in potato enterprise are usually made up of youths who are active and can work effectively in the enterprise with their youthful strength. This coincides with study of [10], which reveals that a good percentage of 79% of youths were involved in agricultural activities.

Fig. 1 shows the potato washing methods adopted by the enterprise under study. 73% indicated that they adopted the manual washing method while 27% indicated that they adopted the automated washing method. Result obtained by [7] reveals that majority of farmers in sub-saharan Africa are small holder farmers. This indicates that most potato

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producers engage in subsistence level production using rudimentary production capital.

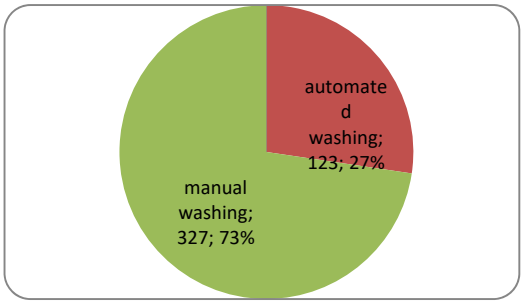


Fig. 1 Washing method by the potato enterprises

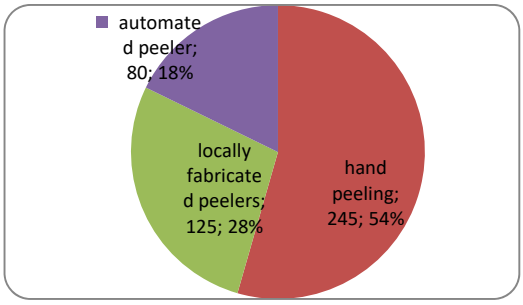


Fig. 2 Peeling methods by the potato enterprises

As shown in Fig. 2, 54% of the enterprises adopted the hand peeling method in the peeling of the potatoes while 18% and 28% indicated that they used the automated peeler and locally fabricated peelers respectively in peeling their potatoes.

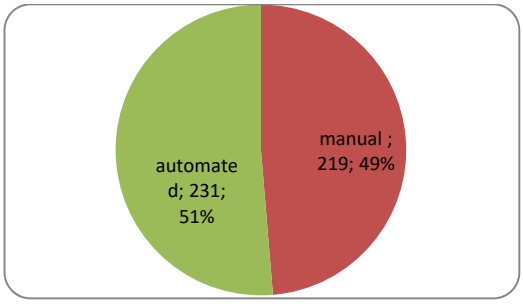


Fig. 3 Slicing and grating techniques

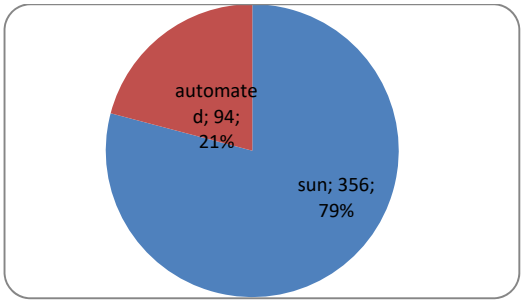


Fig. 4 Methods of drying

In slicing and grating of the potato as shown in Fig. 3, 51% of the enterprises indicated that that they adopt automated machines for the slicing and grating of potatoes in the process of value addition while, 49% indicated that they do slice and grate their potatoes manually.

79% of the enterprises dried their potatoes under the sun while a small percentage (21%) of the population adopted the automated drying technique in reducing the moisture of the potato during the production process.

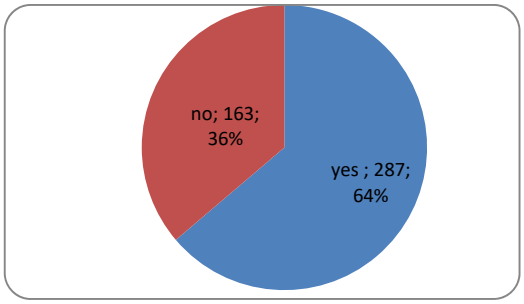


Fig. 5 Packaging

Fig. 5 shows the acceptability rate of those who package their potato products to those that do not. The findings revealed that 64% of the respondents agreed that they package their value added potato products while 36% of the respondent do not package.

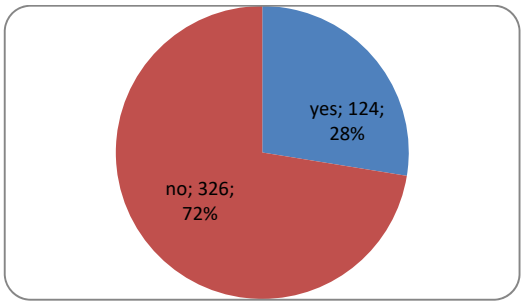


Fig. 6 Labelling

From Fig. 6 it was ascertained that 72% of the individuals do not label their potato products while 28% label.

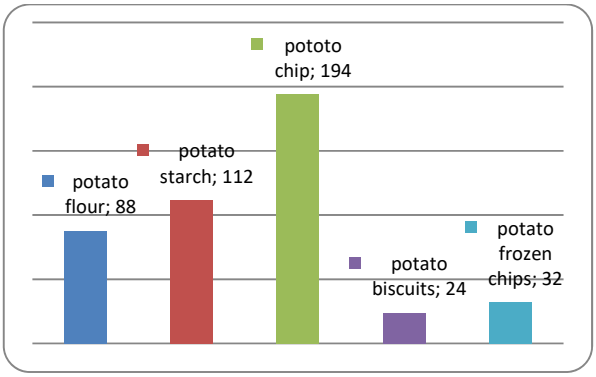


Fig. 7 Distribution of potato products in the study area

Fig. 7 shows the distribution of the potato products in the

study area by the enterprises. From the result, it was seen that potato chips is the highest potato product that was produced by the enterprises which was subtly followed by potato starch and potato flour. Potato biscuits have the lowest rate of product production by the enterprises, although potato frozen chips were a bit higher in the production.

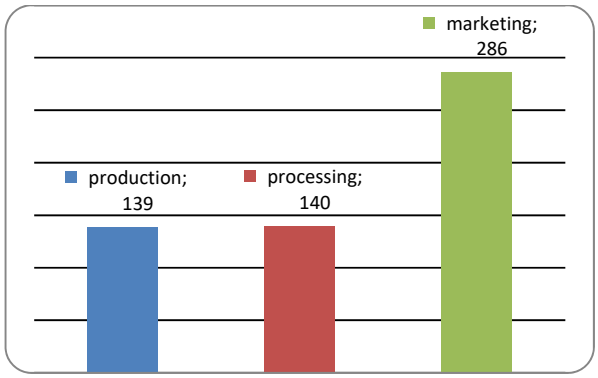


Fig. 8 Distribution of the production level adopted

Fig. 8 shows the distribution of the production level adopted by the individuals in the potato value chain process. A greater population of the individuals/enterprises engages effectively in the marketing of the potato products, while equivalent number of the population engaged in the production and processing of potato.

TABLE III
DETERMINANTS OF YOUTH PARTICIPATION IN POTATO VALUE CHAIN

Variables	Coefficients (t-values)
level of education	0.0537(4.467)*
income	2.4020(4.321)***
awareness of technology	0.7341(2.832)*
access to credit	6.342(3.412)**
Labour Size	-4.0142(-2.121)
production capacity	1.3153(0.2031)
access to machines and equipment	4.3051(2.890)*
Gender	6.556(7.332)***
R^2	0.774
R^{-2}	0.667
F –statistics	45.678***

Note that *, **, *** indicate that the values are statistically significant at 10%, 5% , 1% respectively.

Table III shows the regression result of the determinants of youth's participations in potato value addition chain. The F-value was significant at 1% level of significance with a value of 45.678 which indicates the equation has a line of best of fit. The R^2 of 0.774 signifies that 77.4% variations in the dependent variables were explained by the independent variables. Level of education, awareness of technology and access to machines and equipment were positively significant at 10% level of significance, positive significance attributes implies that an increase in those variables will lead to a corresponding increase in the youth's participation in the potato value chain process. This is in line with [10] which reported that increase in education of farmers positively influenced access, participation and adoption of improved agricultural practices.

Table IV shows the result of the Likert scale distribution of the sustainability factors influencing potato enterprises in the study. The result revealed that ownership of the value addition equipment ($\overline{x}$ = 4.95), has a severe influence on sustainability of the enterprise in the potato value addition process. This was followed by the value addition products with a means of 4.87. Accessible marketing channels, courteousness of staff, room size/facilities, awareness of value addition techniques, awareness of best practices and packaging of products in small efficient packs were significant factors that influence the sustainability of potato enterprises. Ninth and tenth on the rank where identification and communication ($\overline{x}$ = 4.22), and use of renewable energy ($\overline{x}$ = 4.15). These results as indicated above if present in the potato value chain can influence the sustainability and continuity of the value chain process. From indication it is seen that environmental factors played a significant role in sustainability; this is why [1], [11], made strong suggestions that there exists a positive correlation between environmental performance and economic performance.

Table V shows the distribution of the costs and returns on potato production levels. The marketing aspect of the potato value chain has the highest return on investment per naira; the return on investment of 0.913909 signifies that for every 1 naira invested marketing potato, there is a 91.3909% income returned. Processing aspect of potato value addition has a 0.8945621 return per naira invested, while the production aspect has a return per naira invested of 0.890225%. Although the production aspect has a higher gross and net profit than the processing and marketing aspect, when compared to its costs the return per its investment was lower than that of processing and marketing aspect.

IV. CONCLUSION

The study looked at the scaling up of potato economic opportunities, with focus on evaluation of youth participation in potato value chain in Nigeria. The result of the age distribution of participants revealed that a greater percentage of youth (55.97%) was involved in the potato value chain process, while 16.053% of the respondents were above the age 50 years. It was also found that a greater proportion (248) of the workers were between the ages of 26 to 30 years. Manual methods were adopted in the washing, peeling, slicing, grating and drying (sun drying) of the potatoes during the production process. The study affirmed that potato chips was the common value added potato product produced by the enterprises while potato biscuits is the least. In the production level adopted, it was found that the individuals engaged mainly in marketing of potato products than in the production and processing. Level of education, awareness of technology and access to machines and equipment were seen to be factors that significantly determine youth participation in potato value chain process. The result for sustainability factors revealed that ownership of the value addition equipment; value addition products and availability of accessible marketing channels were the major

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sustainability factors affecting the value addition enterprises. The marketing aspect of the potato value chain has the highest return on investment per naira with a return of 91.3909%. Processing aspect of potato value addition has a 0.8945621 return per naira invested, while the production aspect has a return per naira invested of 0.890225%.

TABLE IV
DISTRIBUTION OF SUSTAINABILITY FACTORS INFLUENCING POTATO ENTERPRISES

	Strongly Agreed	Agree	Undecided	Disagree	Strongly Disagree	total	Mean score	Rank
awareness of best practices	45	32	0	0	3	80	16	
	(225)	(128)	(0)	(0)	(3)	(356)	(4.45)	7th
training for best practices	40	24	5	6	5	80	16	
	(200)	(96)	(15)	(12)	(5)	(328)	(4.1)	11th
desire to maintain best practice	55	21	0	3	1	80	16	
	(275)	(84)	(0)	(6)	(1)	(366)	(4.58)	5th
continuous training, research and development	19	35	10	4	12	80	16	
	(95)	(140)	(30)	(8)	(12)	(285)	(3.56)	14th
use of renewable energy	33	32	10	4	1	80	16	
	(165)	(128)	(30)	(8)	(1)	(332)	(4.15)	10th
controlled use of chemicals	35	25	51	72	11	194	38.8	
	(175)	(100)	(153)	(144)	(11)	(583)	(3.01)	15th
availability and usage of safety materials by workers	22	24	34	0	0	80	16	
	(110)	(96)	(102)	(0)	(0)	(308)	(3.85)	13th
clear safety instruction for workers	56	10	11	0	0	77	15.4	
	(280)	(40)	(33)	(0)	(0)	(353)	(4.58)	5th
identification and communication of risk	72	94	29	0	0	195	39	
	(360)	(376)	(87)	(0)	(0)	(823)	(4.22)	9th
adherence to necessary legal requirement	25	43	6	6	0	80	16	
	(125)	(172)	(18)	(12)	(0)	(327)	(4.09)	12th
clear risk evaluation process	7	8	50	6	9	80	16	
	(35)	(32)	(150)	(12)	(9)	(238)	(2.98)	16th
clear risk mitigation decision	63	11	6	0	0	80	16	
	(315)	(44)	(18)	(0)	(0)	(377)	(4.71)	3rd
awareness of value addition techniques	56	17	0	3	3	79	15.8	
	(280)	(68)	(0)	(6)	(3)	(357)	(4.52)	6th
room size/facilities	62	10	0	8	0	80	16	
	(310)	(40)	(0)	(16)	(0)	(366)	(4.58)	5th
courteousness of Staff	52	23	5	0	0	80	16	
	(260)	(92)	(15)	(0)	(0)	(367)	(4.59)	4th
value addition to products	69	10	0	0	0	79	15.8	
	(345)	(40)	(0)	(0)	(0)	(385)	(4.87)	2nd
Availability of accessible marketing channels	57	23	0	0	0	80	16	
	(285)	(92)	(0)	(0)	(0)	(377)	(4.71)	3rd
Vertical integration of value addition process	10	11	21	22	16	80	16	
	(50)	(44)	(63)	(44)	(16)	(217)	(2.71)	17th
ownership of value addition equipment	76	4	0	0	0	80	16	
	(380)	(16)	(0)	(0)	(0)	(396)	(4.95)	1st
Packaging of products in small efficient packs	61	9	0	0	10	80	16	
	(305)	(36)	(0)	(0)	(10)	(351)	(4.39)	8th

Values in parenthesis are Likert values.

TABLE V
DISTRIBUTION OF THE COSTS AND RETURNS ON POTATO PRODUCTION LEVELS

Item	Production aspect of potato value addition, Amount(N)	Processing aspect of potato value addition, Amount(N)	Marketing aspect of potato value addition Amount(N)
Total revenue	28,057,200	17,058,200	18,058,200
Total variable cost	1,055,966	752,661	729,949
Total fixed cost	2,024,020	1,045,920	824,700
Total cost	3,079,986	1,798,581	1,554,649
Gross profit	45,732,033	16,305,539	17,328,251
Net profit	24,977,214	15,259,619	16,503,551
return per naira invested	0.89022476	0.894562087	0.913909

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V. Recommendation

From the result of the study it is recommended that awareness should be created by government and corporate organization to influence the youth participation in potato production value addition activities as a means of livelihood. Government at all levels are advised to increase people's access to grant and subsidized loans to enable more farmers harness the potato production and processing sector of agriculture. There is also a need to educate and train youths on the various production technique and use of machines/equipment in the production and processing of potatoes and also to maintain best practices.

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