ANALYSIS OF SWEET POTATO PRODUCTION AMONG MEMBERS OF COOPERATIVE THRIFT AND CREDIT FACILITIES IN ANAMBRA STATE, NIGERIA

[1]Okonkwo; I E, [2]Mazza, Mary -Ann and [3]Nwakodo, F O
[1]Agricultural Extension and Management Federal College of Agriculture, Ishiagu, Ebonyi State.Nigeria
[2]National Root Crop Research Institute, Umudike, Abia State
[3]Abia State University, Uturu, Umuahia Campus

Corresponding Author, okonkwoei@gmail.com

ABSTRACT
An analysis of sweet potato production among members of cooperative thrift and credit facilities in Anambra State, Nigeria, was conducted. Purposive and multi-stage sampling methods were adopted in selecting a total of 120 respondents for the study from twelve (12) villages. Both primary data were collected through a structured questionnaire and oral interviews. Data collected were analyzed using percentage responses, budgetary analysis and Logit model analysis were used to address the objectives. The results of the socioeconomic characteristics showed that most of the respondents were females, married, aged, educated, with high farming experience, and moderate household size. The sweet potato production in the study area was viable, with a high Rate of Return on Investment (RRI) of 1.62. Also, the determinants of sweet potato farm output for cooperative members in the study area were starting capital, extension services, educational level, and asset ownership. Additionally, the following determinants of cooperative members' access to loans were positively associated: age of the farmer, educational level, assets, start-up capital, and farming experience. The need to enhance farmers' access to educational programs and encourage experienced farmers to remain in business was recommended.
Keywords: Effect, Loan, Cooperative Thrift, Credit Facilities, Members, Sweet potato, Farm output

INTRODUCTION
Globally, Asia is the largest sweet potato-producing region, with figures showing over 90 million tons produced annually. China is the world's biggest producer(70,963,630 metric tons) and highest consumer of the same (Food Agriculture Organization(FAO, 2021; IPC, 2012). Nigeria is the largest producer of sweet potato in West Africa and third in the World with 4 million hectares of farm size of about 1.7 million hectares (Ha) and yield of 2.3t/ha (NRCRI, 2019). In Nigeria and most countries in sub-Saharan Africa, sweet potato production is carried out by smallholder farmers, predominantly women, who maintain small farm operations manually with traditional farm tools such as hoes and machetes (Tewe, Ojeniyi, and Abu, 2012; Okeke, Mba, Madukwe and Nwalieji, 2019). Despite the potential of the sweet potato, its production per unit area is low. For instance, FAO (2020) stated that farmers in Nigeria recorded one of the world's lowest average potato yields of less than 3.1 tonnes per hectare compared to the United States of America and Japan's yields of 22.8 and 21.7 tonnes per hectare, respectively. The low yield is traceable to poor access to credit The significance of credit in furthering farm productivity and farmers' well-being is well documented.

For instance, credit tends to enhance farmers' investments in their enterprises, farming, and other income-generating activities, increase income and consumption levels of households, reduce income inequality, and enhance welfare, building all kinds of assets and lead to the diversification of sources of income for the participants (Adekunle, 2018, Nwandu, 2017, Ume, *et al;* 2015).

Studies revealed that cooperative societies such as thrift and credit facilities could aid farmers or entrepreneurs in gaining access to credit at low interest (Njuba, 2017, Falusi, 2018, Okeke, et al, 2019). Thrift society serves as banks in rural communities since it assist members to keep their savings which they only collect at the end of the year (Ogbonna et al; 2016, E, Arthur, 2016; ze, 2015).

It is against this background that this study seeks to investigate the effects of cooperative thrift and credit facilities on members' sweet potato farm performance in terms of production and productivity. This is imperative, as the researcher's knowledge, to the best of the researcher's knowledge, no work on the subject matter has been published in the study area. This study would serve as a source of research information for scholars for further studies in related subjects, and also provides useful information for agricultural cooperative extension agents for effective dissemination of information to farmers.

The specific objectives of the study are to:

ii. describe the socioeconomic characteristics of the respondents.
iii. estimate cost - return structure of respondents' sweet potato farms.
iv. access the determinants of sweet potato output of the cooperative members,
v. determine the factors affecting credit access for the respondents in the study area.

METHODOLOGY

Anambra State is the study area and is bounded in the North by Kogi State, in the west by the River Niger and Delta State, in the south by Imo State and on the east by Enugu State. It has twenty-one (21) Local Government Areas with Awka as the State capital. It was created in 1991 with a population figure of 3.467 million people (NPC, 2006) and land mass of 4415.54Km^2. The State is divided into four agricultural zones of Aguata, Anambra, Awka and Onitsha. The zones are further delineated into 24 extension blocks and 120 circles. Farming is the predominant occupation, with the majority being smallholders. The major crops available in the study area are sweet potato, yams, cassava, rice, maize, cocoyams, cowpea, tomatoes, and vegetables. At the same time, the livestock produced in the state include poultry, sheep, goats and to some extent pigs. The people also engage into other economic activities apart from farming, included trading, saloon, automobile, vulcanizing, bricklaying, tailoring and among others.

One hundred respondents were selected using a multi-stage random sampling technique. In stage 1, three out of the four agricultural zones were purposively selected. This is based on the number of cooperatives existing in the area. The selected zones were Anambra, Aguata and Awka. In the second stage, two LGAs were purposively selected from each agricultural zone. They were Orumba North and Orumba south from Aguata zone, Awka North and Awka South from Awka zone as well as Anambra West and Anambra East from Anambra zone. This brought to a total of six LGAs. In stage Stage 3, twenty farmers were randomly selected from each of the LGAs and this brought to a total of 120 farmers for the study.

A structured questionnaire and an oral interview were used to collect primary data. Percentages responses was used to address the objectives I, Cost and Return was used to address objective ii. Multiple regression and Logit regression models were used to address the objectives iii and iv respectively

Model Specification

Gross Margin Analysis

The gross margin of an enterprise is the difference between the total value of production and variable costs.

Gross Margin can be expressed mathematically as; GMI = ΣTR ΣTVC…….(1)

TR = Py .Yi……..(2)

TVC = Px. X…… (3)

TC = TVC + TFC……(4)

NFI = GM –TFC…….(5)

Where:

GMI = Gross Margin Income (₦); TR = Total Revenue (₦); TVC = Total Variable Cost (₦); TC = Total Cost (N); NFI = Net Income (N); Py = Unit Price of Output Produced (N)

Y = Quantity of Output (Kg); Pxi = Unit Price of Variable Inputs Used (N)

Xi = Quantity of Variable Inputs (Kg)

Rate of return on Investment (RRI) = NI/TC X 100……..(6)

Rate of Return on Variable Cost (RRVC) = (TR-TFC)/TVC X100……(7)

Operating Ratio (OR) =TVC/TR…….(8)

Multiple Regression

It has four functional forms;

Linear function; Y = b0 + b1 x1 b2 x2 + b3 x 3 + b4 x4 + b5 x5 + ei ……. (1)

Double log function: ln(y) = lnb0 + b1lnx1 + b2lnx2 + b3lnx3 + b4lnx4 + b5lnx5 + ei…… (2)

Semi Log: Y =lnb0 + b1lnx1 + b2lnx2 + b3lnx3 + b4lnx4 + b5lnx5 + ei…… (3)

Exponential function: lnY = b0 + b1x1 + b2x2 + b3x3 + b4x4 + b5x5 + ei …… (4)

The choice of the best functional form was based on the magnitude of the R2 value, the high number of significance, size and signs of the regression coefficients as they conform to *a priori expectation*.

Where;

X_1 = Age in years, X_2= Educational Level in years, X_3 = Household size (ha), X_4 = Farming experience(Years).

The Logit Regression Model

It is simply stated :

$$P(Y = 1|X) = \frac{1}{1 + e\lambda(-z)} where\ z = \beta_0 + \beta_1 X_1 + \cdots \beta_n X_n$$

Where:

Y= Dependent variable(Access to credit; yes, 1 and otherwise, 0)

β0 = Constant

β = Coefficient of independent variables

Y = Access to credit; yes, 1 and otherwise, 0)

X1= Educational level (years of formal schooling), X2= Start-up Capital (N), X3= Labor (mandays), X4= Age of SMEs owner (years), X5= Farming experience (years), X6= Household size (number), U = Error term

RESULTS AND DISCUSSION

The results of the following socioeconomic characteristics of the farmers, such as age of the farmers, level of education, farming experience, and household size, were presented and discussed therein.

Table 1: Distribution of Respondents According to Socioeconomic Characteristics

Variable	Frequency	Frequency
Age		
<29	18	15.1
30-39	52	43.3
40-49	40	33.3
>50	10	8.3
Level of Education		
No formal education	13	10.8
Primary education	47	39.2
Secondary education	52	43.3
Tertiary education	8	6.7
Farming Experience		
1-10	13	10.8
11 – 20	36	30
21 – 30	60	50
31 – 40	11	9.2
Household Size		
1 – 5	15	12.5
6 - 10	72	60
11 – 15	28	23.33
15 and above	5	4.17

Source. Field Survey, 2025

Table 1 revealed that 57.5% of the cooperative members were below 40 years of age, while 42.5% were above 40 years of age. Implying that majority of the sweet potato cooperative farmers were youthful, thus could have formal education than the aged to have access to information boost their livelihood through enhanced output and productivity (Midamba, et al; 20220, Okeke, et al, 2019). The finding of Sugri et al (2017) concurred with the above assertion. They reported that youths are able to surmount the drudgery associated with farming to increase production and enhance their welfare. As well, 93.3% of the total respondents had formal education, while at least 6.7 had no formal education. Education and training, as asserted by Ume *et al* (2015), are important factors that could enhance farmers' ability to understand, accept and evaluate innovations or interventions for high output to accrue and consequently enhance livelihood. Besides, 59.2% of the cooperative members had farming experience of more than 20 years, while those with less than 21 years had farming experience of 40.8 years. Farmers with long years of farming experience are often endowed with experiences needed in overcoming intricacies involved farming leading to high farm outputs. The knowledge gained by respondents is measured by the numbers of years the cooperative members have been into business and this could be translated into his \ her efficiency in resources use and overall management of their business activities for high farm outputs to accrue (FAO, 2020). Moreover, majority (60%) of the farmers had household size of 6 – 10 people, while the least (4.17%); 15 years and above. Large household size could imply more proxy to family labour to diversify against risk and make way for increased farm performance and high farm output (Tewe, et al; 2012).

2.0 Costs and Return of Sweet Potato Production

The cost and returns of sweet potato farmers is presented in Table 2.

Table 2: Estimation of the Costs and Return of Sweet Potato Production

Sn.	Item Description	Quantity	Unit price	Amount (₦)
	Revenue:			
	Output/kg			
A		6747.17	80.97	**546,295.91**
	Operational Cost:			
	Vine	15984.1	3.09	49,417.56
	Fertilizer (kg)	79.93	240.83	19,250.61
	Agrochemical (litre)	2.88	3,425.00	9,875.42
	Labour (Man-day):			
	Land preparation	6	4100.00	28,200
	Planting	3	2200.00	6,930.00
	Heaping	4	2900.00	11,600
	Fertilizer application	3	2500.00	7,833.33
	Agrochemical application	3	2500.00	8,187.50
	1st weeding	5	4200.00	19,320.00
	2nd weeding	4	4200.00	16,800
	Harvesting	5	3800.00	17,100.00
B	Totalal operational cost			**168,342.76**
	Fixed Cost			

	Hoe	3	435.17	1,309.13
	Cutlass	7	676.00	4,585.53
	Wheelbarrow	3	1,438.33	4,914.31
C	Total Fixed cost			**10,808.97**
D	Total cost (TC)			**179,151.72**
	E Gross Margin (A – B)			351,781.49
I	Net Returns : TR(A) – TC(D)			340,972.52
	Return on investment NR/TC			1.62

Source; Field Survey, 2025

The total sweet potato output of 6747.17kg was sold at an average unit price of ₦80.97, generating a revenue of ₦546,295.91. The average total operational expenses amounted to ₦168,342.76, and the depreciated value of fixed assets was ₦10,808.97, resulting in a total production cost of ₦179,151.72.

The net returns from sweet potato production was ₦367,144.17 . This represents the actual profit that can be reinvested or distributed after deducting all costs, including operational expenses and depreciation. The positive net returns indicate that there is a surplus after covering all costs. This surplus can be used for expansion, adopting new technologies, improving infrastructure, or other strategic initiatives to enhance productivity. The profitability index is calculated at 0.553 (55.3%,) indicating that sweet potato production is generating a positive return and is considered profitable. This percentage represents the proportion of revenue that contributes to profit after covering all costs. The Return on Investment (ROI) is 1.62, suggesting that for every unit of currency invested, there is a return of 1.62 units. In this case, it implies a positive return on the initial investment. This agrees with Ume, *et al*;(201), who recorded a return on investment (ROI) of 1.50 to conclude that there is profit in sweet potato production.

3.0 Determinants of Sweet Potato Output of the Cooperative Members

The determinants of sweet potato output of the cooperative members are shown in Table 3

Table 3; Determinants of Sweet Potato Output of the Cooperative Members

Variable	Linear	Exponential	+Double Log	Semi Log
Constant	9.864(4.744)***	7.5064(3.629)***	5.001(3.881)***	8.109(3.888)***
Age	0.370(0.017)	0.023(0.341)	0.901(4.001)***	7.311(-0.109)
Education	0.253(-1.066)	0.437(2.607)**	0.476(3.009)***	-2.194(2.514)**
Household size	1.002(3.399)***	0.1518(4.236)***	0.456(0.654)	-0.315(0.143)
Farm. Exp.	0.343(0.707)	3.095(2.0913)**	1.100(2.114)***	3.030(3.518)***
R^2	0.6543	0.6614	0.8877	0.5784
F Value	5.086***	7.641***	96.64***	4.091***

Source: Field Survey, 2025

*****, **, *** significant at 1.0%, 5.0% and 10.0% levels of probability respectively

The figure in parenthesis is the t-ratio

Cobb - Douglas was chosen as lead equation based on having high statistical and econometric criteria. The coefficient of multiple determination, R^2 was 0.8877 implying that 88.77% of the variation in the dependent variable were accounted by the variables included in the model, while the remaining 11. 23% were due to errors. The coefficient of the age of the sweet potato farmers was positive and significantly influenced the output of the farmers at 1.0 % probability level. The finding of Ndukwu, et al (2010) agreed with above statement. Aged farmers according to them often has vast knowledge in farming and this obtained through years of observations and years of farming experience, consequently high farm output ensued (FAOSTAT, 2020). The finding of Jote, et al; (2018) contradicted the aforesaid assertion. They reported that the innovativeness of farmers usually decreases with age, hence affecting their production and productivity

Also, the level of education coefficient was significant and positively influenced sweet potato production. This implies that literate farmers are more likely to source for agricultural related information for higher agricultural production and productivity than the illiterate farmers (Egwu, et al,2020). This agrees with Kpaka, et al; (2019), who opined that education plays an important role in creating awareness in farming communities, since educated people are capable of sourcing information on agricultural innovations. As well, the coefficient of farming experience had positive impact on sweet potato production at 5% alpha level. Farming experience enhances productivity, as it is capable of encouraging for rapid adoption of farming innovation. The finding of Ume, *et al;* (2015) is in consonance with aforesaid attestation. They opined that the more experienced a farmer is, the more efficient his decision-making process and the more he would be willing to take risk associated with the adoption of innovations for high output to ensue

Determinants to Credit Access by the Respondents

Factors affecting credit access to the thrift cooperative society by the respondents in the study area is shown in Table 4.

Table 4 Determinants to Credit Access by the Respondents

Variable	Coefficient	Standard Err.	t-value	P>|t|
Age of the farmer	1.08730	2.00980	0.54328	0.002
Starting up capital	- 0.0252306	0.009676	- 2.64*	0.030
Educational level	0.864364	0.334136	3.62***	1.131
Ownership of Assets	0.44241	0.14673	3.16***	0.001
Farming Experience	0.24917	0.12316	0.37215	0.014
Constant	8.097321	2.009821	4.03***	0.011
Sigma	1.487747		0.292626	
Number of Observation		120		
Log Likelihood		-655071		
LR Chi2 (12)		189.56***		
Pseudo R2		0.27.52		

Source, Field Survey; 2021

The Logit regression model was used to examine factors that determine cooperative members' access to loan. The chi-square^2 value was 189.56*** and log likelihood function -633071. Hence, sigma square was statistically significant, thus indicating that the model displays a good fit. The models also met the parallelism assumption that requires that parameters in the subsequent equations are the same. The link test also revealed that the model was correctly specified.

The variable that had significant co-efficient is education, since the positive sign, signifies that higher values of the variables could incline to increase the chances of credit accessibility and impact on sweet potato farm output. The cooperative society in question may perhaps favour giving access to loan to their clients that having formal education to ensure less defaulting risk, The finding of Tewe, et al(2012) concurred to above assertion. They reported that educated people is often prudent in resource use and proficient in accessing information aimed at boosting their production and productivity and loan repayment ability Moreover, the coefficient of asset had a positive identity and significant at 5 % probability level. Ownership of asset could serve as collateral in seeking loans from credit cooperative. Several studies (Ume, et al, 2018, Okorie, 2017; Nwandu, 2017) harmonize with the above claim, as it (collateral) aids in reducing defaulting rate. Further, the coefficient of Start-up Capital had negative coefficient, implying curtailed prospect of credit accessibility. Credit cooperative could be deterred in lending credit to people to start business for fear of defaulting in repayment. The finding of Okorie, (2017), who hypothesized that cooperatives favour experienced entrepreneurs to beginners in order to curb marginally the risks of evasion.

CONCLUSION AND RECOMMENDATIONS

It can be concluded that sweet potato production in the study area was profitable with high Rate of Returns on Investment (RRI). The determinants of sweet potato farm output of the cooperative members were starting capital, educational level and ownership of asserts. Besides, the following determinants to cooperative members' access to loan were positive; age of the farmer, educational level, assets, starting up capital and farming experience.
Based on the conclusions, the following recommendations were made;
(i). There is need to make policy options aimed at exposing farmers to educational programs such as adult education, workshop, and seminars to enhance their farm output.

(ii)Aged farmers should be encouraged to remain in farming by providing them with farm inputs at subsided prices

(iii)Government should provide viable means of assisting cooperative societies to improve their management activities.

(iv) There is need for policies options be enacted by government agencies concerned to encourage experienced farmer to remain in sweet potato farming through provisions of improved farm inputs at subsidized price.

REFERENCE

Adekunle, B. (2018). How thrift and credit societies can help Africa promote entrepreneurship. Retrieved from (http//www.theconversation.co,.html) 15/07/18

Arthur, E. (2016). Problems and prospects of cooperative societies on Nigeria. Retrieved from (http//www.infoguidenigeria.com.html) 20/07/18

Egwu P. N., Nnabu B. E., Mbam B. N. and S. U. Nwibo (2020). Credit rationing by deposit money banks and implication on agricultural output in Nigeria, G*lobal Journal of Agricultural sciences* 19(1):59-69.

Eze, C. (2015). The role of cooperative society in rural development. Retrieved from (http//www.project.ng.com.html) 25/07/18

Falusi, C.O. (2018). Commercial banks and thrift and credit cooperative societies in Lagos. Retrieved from (http//www.jster.org.html) 15/07/18

FAO (2021). Food and Agricultural Organization production year book. Rome

FAOSTAT (2020); Sweet potato production; World Region/ productionquantity from pick list*. Statistics Division (FAOSTAT). Food and Agriculture Organization of the United Nations. 2020. Retrieved* 24 March *2021.*

Harpen, H. (2015). Function of thrift and credit cooperative societies. Retrieved from (http//www.projectsprings.com.html) 15/07/18

Igbokwe, J. (2017). An examination of the role cooperative thrift and credit societies play in the development of the rural area. Retrieved from (http//www.Project champion.com.ng.html) 20/07/18

International Potato Centre (CIP)(2012). Nutritional benefits of orange fleshed sweet potato, pamphlet developed by CIP,Donata and Kari;Available:www.sweetpotatoknowlege.org

Jote A, Feleke S, Tufa A, Manyong V and Lemma T (2018). Assessing the efficiency of sweet potato producers in the southern region of Ethiopia. *Experimental Agriculture* 54(4):491-506.

Kpaka C, Gugerty MK and Anderson CL (2019). Sweet Potato Value Chain: Uganda. *Gates Open Research* 3(652):652.9-84.

Midamba D C, Alela B, Atukunda B O, Kwesiga, M and Ogei K (2020) Measuring technical efficiency and its determinants among sweet potatoes farmers in Western Uganda. *African Journal of Agricultural Research.* Vol. 18(2), pp. 117-126, February, 2022