Journal of Agriculture, Environmental Resource and Management
ISSN2245-1800(paper) ISSN 2245-2943(online)
4(2)607-613; Dec.2021; pp621-627

www.saerem.com

ECONOMIC ANALYSIS OF VALUE CHAIN ADAPTATION AMONG COCOYAM FARMERS IN NSUKKA LOCAL GOVERNMENT AREA, ENUGU STATE, NIGERIA

Nwangwu Kelvin Nnaemeka. [1*], Onah Ogochukwu Gabriella[1], Onah Linda Tochukwu[1], Orazulike Ozioma Faith[1] and Asogwu Benson Uwakwe[1]
Department of Agricultural Economics, University of Nigeria Nsukka[1]
*Correspondence Email: nnaemeka.nwangwu@unn.edu.ng

Abstract

The study investigated the economic analysis of value chain adaptation among cocoyam farmers in Nsukka Local Government Area, Enugu State, Nigeria. The objectives of the study were to describe the socio-economic characteristics of cocoyam farmers, describes different value chain adaptation among cocoyam farmers, determine factors influencing choice of value chain adaptation, identify constraints faced by cocoyam farmers in adapting to value chain and estimate the cost and return from investing on the value chain adaptation among cocoyam farmers. Primary data emanated from 60 respondents were collected through multistage sampling technique. Descriptive statistics, multinomial logit regression and gross-margin analysis were used to analyze the data. About 70% of the respondents were female and 77% of them adapted value chain of processing cocoyam into chips (Achicha). The study showed that household size, farm size, level of education, cost of input and cost of processing procedure significantly influenced the decision for adapting to the value chain of processing cocoyam into chip (Achicha) at 1%, 5%, 1%, 5% and 1% probability level respectively as against cooking raw cocoyam. The study also revealed that problem of diseases (phytopythora leaf blight), high cost of labour and shortage of planting materials were the major constraining factors faced by cocoyam farmers in adapting to value chain. The study recommends the following, the need for mechanized dryer for drying cocoyam chip (Achicha) as this would reduce cost of labour. There is also need for the provision of fungicides (Ridomil), use of improved and high yield resistant cocoyam varieties.

Keywords: cocoyam, value chain, adaptation and Enugu State

INTRODUCTION

Cocoyam is of two species (*Colocasia spp* and *Xanthosoma spp*) and belongs to *Aracease* family which grows throughout the humid tropic. It has edible corns, cormels, leaves and other traditional uses which add up to its economic important for production purpose (Onwueme and Charlses, 1994). Cocoyam is considered to be less important when compared with other tropical root tubers such as cassava, yam and sweet potatoes Opara (2002). However, it is an important source of carbohydrate as its corms or cornels provides starch among consumers in the developing countries. Its starch is more digestible when compare with other root tubers because of the small size of the starch granules. Cocoyam contains more crude protein as well as calcium, phosphorus, vitamin A and B. Cocoyam flour is highly digestible and is used for invalids and as an ingredient in body foods Sanful and Darko (2010). In Nigeria, the importance of cocoyam cannot be over emphasized, based on the vital role it plays in human nutrition, income generation and source of employment especially among the rural dwellers. Despite the economic importance of

cocoyam as a food material in most parts of the tropics and sub tropic, there is limited information on their cultivation which perhaps contributes to the scarcity of cocoyam in the market (Ojinnaka, Akobundu and Iwu, 2009). According to Sanful and Darko (2010), calcium oxalate 780mg per 100g in some species of cocoyam are considered to be irritating and can be reduced during peeling, grating, soaking and fermentation processes. It is not considered as important as yam even though it is essentially used as yam. However, rural household are rapidly abandoning cocoyam which is an indigenous staple root and tuber crop for other root and tuber crop like yam and cassava. This is as a result of challenges (high cost of farm inputs, poor access to information, poor government support, low soil fertility and poor value attached to cocoyam, etc) faced by cocoyam farmers in adapting to climate change (Ifeanyi-Obia, Togunb, Lambollc, Adesopea, and Arokoyu, 2017). Farmers that are into cocoyam enterprise find it difficult to process cocoyam into different forms i.e. in terms of value chain addition. Therefore, food utilization and nutritional wellbeing among household farmers in Nigerian is affected by high inflation, low purchasing power, unequal distribution of food supplies and income (Opata and Nweze, 2009), need to analyze value chain of agricultural produce such as cocoyam become an essential aspect to boost food availability and consumption.

Value chain analysis has to do with the effective utilization of resources to create competitive advantage in other to provide lower cost, attract quality market and improve profit margins (Apata, Ekeocha, Jaiyeoba, Igbalajobi, Oni, Bamigboye and Bamisaye 2021). The value addition plays vital role in production, processing and marketing stages of cocoyam enterprise, as this improves welfare of farmers. The value chain addition can be done in so many ways, the corms may be cut up and boiled in curries or tired to make crispy chips, levels and leaf stalks can also be cooked and eaten like spinach (Ademiluyi, 2013; Nwachukwu, 2009), cocoyam can also be processed into cocoyam flour and chips (Opata and Nweze, 2009).

Reviewed study such as Apata et al (2021) analyzed value chain of cocoyam enterprise in southwest region, Nigeria using logit regression model to identify those respondent that participated in value chain activities. Another reviewed work by Abdulrahman (2015) enumerated cocoyam as one of the major roots and tuber crops in Nigeria.

Therefore, this work does not only dwell on the production of cocoyam but on the different forms in which it can be converted after production to enhance food security, those determining factors and constraints influencing choice of adapting to those various forms of cocoyam value chain. Hence very few studies have been done on this regard as far as current literature is concern. Specifically the study describes the socio-economic characteristics of cocoyam farmers, describes different value chain adaptation among cocoyam farmers, determine factors influencing choice of value chain adaptation, estimate the cost and return from investing on the value chain adaptation among cocoyam farmers and constraints faced by cocoyam farmers in adapting to value chain.

MATERIALS AND METHOD

The Study Area

The study was carried out in Nsukka Local Government Area of Enugu state Nigeria. Nsukka lies between latitudes $6^0$51N and longitudes $7^0$23E. It has a temperature range of 20^0C-30^{o}C,the total annual rainfall is about 1579mmHg per annum. There are two seasons; wet and dry season. The wet season is relatively long, lasting between six and seven months of the year, from the months of March to August. The dry season begins in early September and extends to February or early March, a period of approximately five to six months (ENADEP, 2012).

Nsukka has a land area of about 1,700km and an estimated population of about 755,886 as at 2006 census (NPC, 2006). Nsukka local government is made up 16 towns namely; Nsukka, Eha-alumona, Edem, Alor-uno, Opi,

Ede-Oballa, Obukpa, Obimo, Okpuje, Lejja, Ibagwa-ani, Okpaligbo, Okutu, Anuka, Ibagwa-Aka, Eha-Ndiagu.

Sampling Procedure and Sample Size

In this study a multi-stage sampling technique was used in drawing the sample for this study. Firstly, six rural farming communities namely Obukpa, Obimo, Okpuje, Ede-oballa, Okutu and Lejja were purposively selected in Nsukka local government area where majority of the farmers are predominantly cocoyam farmers. Secondly, ten (10) major cocoyam farmers in each community were purposively selected so as to capture respondents that produces cocoyam at large quantity when compare to other farm crops, making it a total of sixty (60) respondents.

Data Collection and Analytical Techniques

The data for the study were collected from the primary sources. It was obtained through the use of structured questionnaires administered to the respondents. Descriptive statistics such as frequency and percentage was used to analyze the socioeconomic characteristics of the respondents, different value chain adaptation and constraints faced by cocoyam farmers in adapting to value chain. Multinomial logit model (MNL) was used to determine factors influencing choice of value chain adaptation in the study area. Gross-margin analysis was used to estimate the cost and return from investing on the value chain adaptation among cocoyam farmers. In multinomial logit regression, variable in one is chosen as the comparison variable (Adeosun, Amaechina and Nnaji (2017). Therefore, cooking raw cocoyam which is one of the choices of value chain of cocoyam was chosen as the comparison group and Processing into chip (achicha) and Processing into (flour) were compared with the comparison outcome. The equation for multinomial logit model is given as:

$$Pr(yi = j) = \frac{\exp(Xi\beta j)}{1+\sum_{j=1}^{J}\exp(Xi\beta j)} \quad (1)$$

And

$$Pr(yi = 0) = \frac{1}{1+\sum_{j=1}^{J}\exp(Xi\beta j)} \quad (2)$$

Where ith represents a single value chain adaptation, yi is the comparison outcome (cooking raw cocoyam), while Xi represents a vector of independent variables. The independent variables for the study included: gender, age, farming experience, level of education, household size, farm size, cost of farm inputs and cost of processing procedures.

The model for gross margin is specified thus;

GM = TR-TVC,

NR = TR-TC

Where
GM = gross margin, TR = total revenue, TVC = total variable cost, NR = Net revenue, TFC = Total fixed cost.

RESULTS AND DISCUSSIONS

Table 1 shows the socio-economic characteristics of the cocoyam farmer in the study area. The result showed that (70%) of the respondents were female while (30%) were male. Majority of the respondents are within the age range of 41-50 years. This showed that female farmers are more active in value chain adaptation of cocoyam when compared with the male counterpart. This is in line with the finding of (Apara et al 2021). Majority of respondents (73%) have 11 years and above farming experience and (47%) of the respondents also attended primary school. Majority (67%) of the respondents have household size that falls within 9-11 number of individual. Majority (53%) of the respondents have farm size that ranges from 3 and above hectares of land whose cost of farm inputs are with 200,000 to 399,000 per season.

Table 1 Distribution of Respondents by Socioeconomic Characteristics.

Socio-economic Characteristics of rural households	Frequency	Percentage (%)
Gender		
Female	42	70
Male	18	30
Total	**60**	**100**
Age (years)		
40 and below	15	25
41-50	30	50
51-60	10	17
61 and above	5	8
Total	**60**	**100**
Farming Experience		
1-10	16	27
11 and above	44	73
Total	**60**	**100**
Level of education		
No formal education	22	37
Primary school	28	47
Secondary school	7	12
High institution	3	5
Total	**60**	**100**
Household size		
1-5	8	13
6-8	12	20
9-11	40	67
Total	**60**	**100**
Farm size		
1-2	28	47
3 and above	32	53
Total	**60**	**100**
Cost of farm inputs		
Less than 200,000	15	25
20,000 to 399,000	30	50
400,000 to 599,000	10	17
600,000 and above	5	8
Total	**60**	**100**

Table 2 showed adaptation of value chain base on cocoyam farmers in the study area. The distribution showed that (77%) of the farmers adapt processing of cocoyam into chip (Achicha). This is an indication that cooked tuber is part of processed cocoyam in the study area. This finding is in line with that of Adeosun et al, (2017) who categorized cooked tuber as one of the processed cocoyam. The result on the distribution table also showed that (67%) and (53%) of the respondents prefers cooking of raw cocoyam as their own value chain and processing into flour respectively. This finding is in line with (Opata and Nweze, 2009; Adeosun et al, 2017) whose finding identified cocoyam chip (Achicha) and cocoyam flour as some of the value chain addition through the processing of raw cocoyam.

Table 2 Distribution of respondents by adaptation of value chain

Variables	Frequency	Percentages (%)
Cooking raw cocoyam	40	**67**
Processing into chip (achicha)	46	**77**
Processing into flour	32	53

Source: field survey, 2017

Table 3 showed the socio-economic factors influencing value chain adaptation of cocoyam in the study area. Value chain adaptions of cocoyam were categorized into three forms; cooking raw cocoyam, processing into chip (Achicha) and processing into flour. Cooking raw cocoyam was used as the based category. The result showed that some of the variables significantly influenced value chain adaptation of cocoyam production with the $\chi 2$ value of 62% at 0.05 level of probability.

By estimating the category of value chain adaptation of cocoyam in relation to the base group adaptation for processing into chip (Achicha), the result showed that household size and farm size were positive and significantly influenced the decision for adapting the value chain of processing cocoyam into chip (Achicha) as against cooking raw cocoyam. Household size was significant at 1% probability level; this is an indication that farmers with large number of individuals are more likely to adapt for the processing of cocoyam into chip (Achicha) than cooking raw cocoyam. This could be that they are more likely to practice division of labour as there are more hands in the process which helps in reducing the vigorous process involve in processing into chip (Achicha). Farm size was significant at 5% probability level. This shows that farmer with more farm size are more likely to adapt to processing of cocoyam into chip (Achicha) than cooking raw cocoyam. This could be that as farm size increases, the quantity of cocoyam output also increases, thereby demanding for the adaptation of processing of cocoyam into chip (Achicha) so as to reduce output spoilage. According to Adeosun *et al*, (2017), Achicha has been seen as a very local delicacy strongly attached to Igbo culture and that may be the reason for the adaptation process.

On the other hand level of education, cost of input and cost of processing procedure were negative and significantly influenced the decision to adapting the value chain of processing cocoyam into chip (Achicha) as against cooking raw cocoyam. Level of education was significant at 1% probability level. This shows that farmers with low level of education are more likely to adapt for processing of cocoyam into chip (Achacha). This could be that this adaptation practice is more of traditional method. Cost of input and cost of processing procedures were significant at 5% and 1% probability level respectively. This shows that the lesser the cost of input and cost of processing procedures for cocoyam the more farmers adapt for processing of cocoyam into chip (Achicha) than cooking raw cocoyam. This could be that since the overall cost incurred (that is the cost of input and cost of processing procedures) are reduced, farmers are more likely to adapt for processing of cocoyam into chip (Achacha) than cooking raw cocoyam.

In the decision of categorizing value chain adaptation of cocoyam in relation to the base group adaptation for processing into flour, the result showed that level of education was positive and significantly influenced the decision for adapting the value chain of processing cocoyam into flour as against cooking raw cocoyam. This shows that farmers with higher level of education are more likely to adapt for processing of cocoyam into flour. This could be that this adaptation practice requires modern technologies in which more educated farmers can adapt. Cost of processing procedures was negative and significantly influenced the decision for adapting the value chain of

processing cocoyam into flour as against cooking raw cocoyam. This shows that the lesser the cost of processing procedure the more the adaptation of processing cocoyam into flour.

Table 3 Socio-economic factors influencingvalue chain adaptation

Variables	Coefficients	
	Processing into chip (achicha) (2) (dy/dx)	**Processing into (flour) (3)** (dy/dx)
Gender (male 1, female 0)	-0.04527 (-0.55)	2.94364 (5.74)
Age (in years)	0.78225 (4.31)	0.02910 (4.62
Farming Experience (in years)	-0.09256 (-1.35)	0.05381 (0.62)
Level of Education (in years)	-0.14727 (-0.34) ***	2.64364 (4.94)***
Household Size (in number)	0.02798 (2.17)***	1.31007 (2.15)
Farm Size (in hectare)	0.14794 (0.76) **	7.31007 (3.64)
Cost of farm inputs (in naira)	-0.62548 (-3.11) **	-0.61558 (-1.74)
Cost of processing procedures (in naira**)**	-0.5076 (-1.70)***	-0.5321 (-2.75) ***
CONSTANTS	3.23475 (2.38)**	-5.42296 (-3.32)***

Source: Field survey data 2017; Comparison cooking raw cocoyam; LR $\chi 2$ (24) = 62%; ***, **, * show significance levels at 1, 5 and 10%, respectively.

Table 4 showed the cost and return for investing on cocoyam value chain adaptation. It was seen that the total variable cost was ₦ 2,107,550 and that of total revenue was given as ₦ 5,976,350, therefore, the Gross margin being the different between total revenue and total variable cost is given as ₦ 3,868,800. Therefore, investing on value chain adaptation of cocoyam is profitable.

Table 4 Gross Margin Analysis of Cocoyam Enterprise in the Study Area

Item	Amount (₦)
Input cost	1,954,525
Adaptation cost	153,025
Total variable cost	**2,107,550**
Fixed cost	220,050

Total cost	**2,327,600**
Total revenue	**5,976,350**
Gross margin (GM = TR-TVC)	**3,868,800**

Source: field survey, 2017.

The results in table 5 show the constraints faced by cocoyam farmers in adapting to value chain. It results revealed that problem of diseases (phytopythora leaf blight) (87%) appear to be the major constraints followed by high cost of labour (75%) and shortage of planting materials (65%). This could be as a result of inefficient use of fungicides, improve and resistance crop varieties.

Table 5 Constraints faced by cocoyam farmers in adapting to value chain

Constraints faced by cocoyam farmers in adapting to value chain	Frequency	Percentages (%)
Problem of disease (phytophthora leaf blight)	52	**87**
High cost of farm inputs	20	33
Shortage of planting materials	40	**67**
High cost of transportation	25	42
High cost of labour	45	**75**
Lack of information on improved farm Production method	26	43

CONCLUSION AND RECOMMENDATION

The study revealed that female farmers in the study area where more into this value chain adaptation practices. Among the three identified value chain adaptation practices of cocoyam, it was discovered that processing cocoyam into chips (Achicha) was the most practiced aspect when compared to others. The study showed that household size, farm size, level of education, cost of input and cost of processing procedure significantly influenced the decision for adapting to the value chain of processing cocoyam into chip (Achicha) as against cooking raw cocoyam. The study also revealed that problem of diseases (phytopythora leaf blight), high cost of labour and shortage of planting materials were the major constraining factors faced by cocoyam farmers in adapting to value chain. The study recommends the following, the need for mechanized dryer for drying cocoyam chip (Achicha) as this would reduce cost of labour. There is also need for the provision of

fungicides (Ridomil), use of improved and high yield resistant cocoyam varieties.

REFERENCES

Abdulrahman S. (2015). Profitability and Production Efficiency of Cocoyam (*Colocasiaesculenta)*among Small Holder Farmers in Kaduna State, Nigeria.

Ademiluyi, B.O. (2013). Evaluation of weed management Strategies in cocoyam (Colocosia esculentus L.) production in Ado-Ekiti, Nigeria. *International Journal of Agriculture and Soil Sciences***3(2),** 38-42.

Adeosun K. P., Amaechina E. C. and Nnaji A. P. (2017).Determinants of household's consumption preference for processed cocoyam in Enugu State, Nigeria. *Journal of Development and Agricultural Economics*. Vol. 9(6), pp.137-144. DOI:10.5897/JDAE2016.0782.

Apata, T.G., Ekeocha, T.H., Jaiyeoba, C., Igbalajobi, O., Oni, K., Bamigboye, O. and Bamisaye, S., (2021). Value Chain Analysis of Cocoyam Enterprise in Southwest Region, Nigeria.*Journal of the Austrian Society of Agricultural Economic*.pg 1-20.

ENADEP.(2012). *Enugu State Agricultural Development Programme*.

Ifeanyi-Obia, C.C., Togunb, A.O., Lambollc, R. Adesopea, O.M. and Arokoyu, S.B. (2017). Challenges faced by cocoyam farmers in adapting to climate change in Southeast Nigeria. *Climate Risk Management*. Pg 155-164.

NPC.(2006). Nigeria Population Commission.

Nwachukwu I. (2009) Composition and Nutritive value of corms, cornels and leaves of colocasia esculentus (L) Schott. *Journal of Science, Food and Agriculture***35,** 1112-1119.

Ojinnaka, M.C., Akobundu, E.N.T. and Iwe, M.O. (2009) Cocoyam starch modification effects on functional, sensory and cookies qualities, *Pakistan Journal of Nutrition***8 (5):** 558-567.

Onwueme, I.C. and Charles, W.B. (1994).Cultivation of Cocoyam. In: FAO (ed). Tropical root and tuber crops.Production, perspectives and future prospect.*FAO Plant Production and Protection*, **26:** 139-161.

Opata P. I. and Nweze, N.J. (2009). Indigenous Tehnologies in cocoyam processing: Implications for food security in Nigeria. African Crop Science Conference Proceedings, Vol. 9.pp. 325 – 32.

Opera, L.U. (2002). Edible aroids: Post harvest operation. In AGST/FAO: Danilo, M. (ed). Massey University, New Zealand.

Sanful, R.E and Darko, S., (2010). Production of cocoyam, cassava and wheat flour composite rock cake.*Pakistan Journal of Nutrition*, **9 (8):** 810-814http://www.pjbs.org/pjnonline/fin1773.pdf