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Resource Use Efficiency among Cocoyam Farmers in Anambra State of Nigeria

Ume Smiles Ifeanyichukwu[1*], Ezeano Caleb Ike[2], Agu Leonard Uchechukwu[3] and I. Emma-Ajah Josphine[3]

[1]Department of Agricultural Extension and Management, Federal College of Agriculture Ishiagu, Ebonyi State, Nigeria.
[2]Department of Agricultural Economics and Extension, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
[3]Federal College of Agriculture Ishiagu, Ebonyi State, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author USI designed the study, wrote the protocol, and wrote the first draft of the manuscript. Author ECI managed the literature searches, analyses of the study performed the spectroscopy analysis and author ALU managed the experimental process. All authors read and approved the final manuscript.

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ABSTRACT

The study was on economics of cocoyam production in Anambra State. Data used were generated through structured questionnaire and interview schedules administered on 120 cocoyam farmers selected randomly from the study area. Net farm income analysis was used to capture the profitability of cocoyam production in the study area. Furthermore, ordinary least squares regression method was used to analyse the resource use efficiency data, subsequently the allocative indices of the farmers were derived and explained. Result shows that cocoyam production in the study area is profitable with average total revenue of N840,000, total cost of N408,608 and net farm income of N431,392. Result of the resource efficiency showed that farmers did not achieve optimum allocative efficiency in the use of the any of the resources. In general, the elasticity of production show that they were operating at increasing returns to scale.

**Corresponding author: Email: umesmilesi@gmail.com;*

The main problems to cocoyam production were poor access to credit, inadequate extension contact, high cost of inorganic fertilizer and high cost of labour. Among the recommendations made including; need for policy options that would enable farmers to employ more of the resources that were under utilized, while for over utilized resources, farmers should use less of the resource in their productions in order to achieve higher productivity. Furthermore, the need to enhance farmers' access to; improved production inputs, credit through micro finance banks and adequate motivation of extension agent and among others were proffered.

Keywords: Allocative; production; cocoyam; efficiency.

1. INTRODUCTION

The term cocoyam refers to the member of aroid family, *aracease* which is widely cultivated in developing countries in Africa, Asia and the Pacific [1]. The two common genera of cocoyam are *Colocasia* and *Xanthosoma* of which the most extensively cultivated species are *Colocasia esculenta* (L) *Schott and Xanthosoma sagittifolium* (L) Schott [2]. The classification of cocoyam into these two species as noted by [3] depends on the colour of the tuber, flesh, leaf morphology and floral organization. *Colocasia esculenta* is believed to have originated from South East Asia while *Xanthosoma sagittifolium* is indigenous to tropical America and West Indies [3]. [4] reported that cocoyam was introduced into West Africa in the 16 – 17th century by Indian mercenaries.

Nigeria is the largest producer of cocoyam in the world in terms of volume of production with the annual output of 5,068,000 metric tons/annum, (which represents 37% of the world output of cocoyam) as against the potential of 160 million metric tons/annum [5,6]. This production figure according to [7] indicated that the potentialities of cocoyam for food security, income generation and nutritional enhancement in the country are grossly under-utilized. However, [4,8,9] a noted that the global average yield of cocoyam is only about 600 kg/ha. Cocoyam is ranked third in Nigeria, second and first in Cameroon and Ghana respectively in terms of food supplies and area of land under cultivation [9,10]. In Nigeria, cocoyam production are in South-East, South-West, South-South and Middle belt Agro-Ecological Zones by small holder farmers mostly women who rely essentially on simple and crude tools like hoe, cutlasses which are empowered by human efforts [1]. Cocoyam cultivation is usually solely, especially where other crops may not thrive well or inter-planted with plantation crops, such as oil palm, coconut and intercropped with arable crops, like yam, maize, cassava, and others.

In comparism to the roots and tubers, cocoyam has high food energy yield per unit area [11]. More so, cocoyam has potentials to thrive in marginal soil, tolerates erratic rainfall and survives many years through small dormant tubers [2,12]. The crop according to [7] is a low maintenance crop that will maintain a good ground cover in the field to reduce weeds and soil erosion, has low production costs and can be stored in the farm, hence making them very useful to rural families. [1] emphasized that cocoyam has potentials of not having vines to stake as in yam (*Discorea* sp), no strong obstructing stem as in cassava (*Manihot* spp) and no entangling vines like in sweet potato (*Ipomeabatata*) which may obstruct its production. Cocoyam has rare attributes which are not peculiar in other roots and tubers such as yielding 30 – 60 metric tons/ha and very low in starch gains [7]. Cocoyam production is proned to mechanization using machinery, equipment and selection of clones, to reduce labour costs of production from 49% to 25% [13].

Cocoyam provides employment for about 12% of the Nigeria working population. [13] and supply more than 18% of the carbohydrate needs of the Nigeria (Okwuowulu 2000). It provides income for jobless youths and returns who could otherwise be viewed as unproductive by the society [14].

Nevertheless, cocoyam production in the country failed substantially in attaining the potential output level because of the following constraints which include; cocoyam production is labour intensive with most of the operations carried out manually at the production level [15,13]. Lack of improved varieties and cultural practices, long period of maturation, tuber irritants among certain cultivars and possession of dangerous calcium oxalate which is suspected to affect the liver [4,16]. Furthermore, [17] identified socioeconomic constraints to sustainable cocoyam production in Lake Victoria Crescent, Tanzania to include: Storage problems, increasing input costs, labour scarcity, land scarcity, inadequate technical know-how among cocoyam growing farmers, lack of extension services, poor road network, perishability of planting material, unavailability and ignorance in the use of agrochemicals (Fertilizer, pesticides etc).

Adepogu [18] attributed the problems of migrant cattle rearers who graze over farm land and stealing of farm produce affect considerably cocoyam production in Ekiti local government area of Ondo State. The dwindling attention given to cocoyam production according to [7] could be because of its unacceptability by the high income countries for consumption and other purposes. Other problems are poor marketability system, relatively poor producer prices, lowly yield [9] poor cultural practices, late planting and pest and diseases control [2,19]. For instance, the *Pythium myriotylum* viral disease has caused considerable damage to corms and cormel up to 90% in Cameroon [20,11].

The reasons for under-exploitation of the values of cocoyams in Nigeria as enumerated by [7] include: Unattractive mucilage which could discourage consumption, technical difficulties involved in managing cocoyam especially the post-harvest losses have made cocoyam to be less attractive, the introduction and popularization of cassava, maize, rice and other new crops into the farming and food system of Nigerians led to a rapid decline in relevance of cocoyam as food for even the peasant farmers.

However, the prospects of cocoyam in Nigeria remain bright, despite myriads of problems; cocoyam production and marketing enhanced many rural and urban households, particularly women with low income to better their livelihoods; its starch can be converted or used in the manufacturing of perfumes, fire extinguisher, soap and deodorant. The starch can be used as composite in the manufacturing of infant and invalid meals [7]. [20] reported that cocoyam is a source of foreign exchange for Cameroon and Nicaragua farmers. The broad leaves of cocoyam are used for wrapping purposes of kola and bitter kola during storage [12,21].

Cocoyam can be prepared, processed and consumed in various forms, especially where it is cultivated. For instance the corms and cormels can be peeled, boiled and eaten with palm oil or vegetable source. The cormels can be boiled or roasted. The boiled cormel pounded to prepare paste, the cormels are dried and pounded to fufu, a popular dish in West Africa [3,12]. Cocoyam can be processed into cornflakes, confectionaries and flour for soup thickening [22]. It can also be processed into “Achicha” used as food to fill up the hunger period gap especially during peak farming season when hunger is on increase. The leaves of cocoyam especially *Colocasia esculenta* is an excellent source of folic acid, riboflavin, thiamine particularly value to anemic. Thiamine is necessary in our modern day diet where lot of refined carbohydrate is eaten [12,23].

Taro and Tannia cormels and corms composed of 77-86% edible material and 14-23% scaly peels. They (corms and cormels) contain calcium phosphate and vitamin A, B and C, and contain small sized starch which is easily digestible and used by diabetics [7]. Cocoyam does not only provide carbohydrate but as well dietary-fibre (non-starchy polysaccharides e.g. cellulose and petins) which medically reduces the incidences of coronary heart disease, colon cancer and digestible disorder [6]. Cocoyam according to Parkinsons (1984) supersedes cassava and yam in terms of its high protein, mineral and vitamins.

Several studies have shown that the production and productivity of cocoyam in Nigeria is dwindling in recent year as yield less than 18 metric tones per hectare, thus limiting the ability of the crop to perform its’ traditional role in economic development [17,24]. The productivity of Cocoyam can be increased through application or adoption of new technologies or efficient utilization of existing resource. Nevertheless, reports on adoption of technology by farmers in developing countries are not impressive, hence improving their productivities entail efficiency in resource use [25,26]. Allocative efficiency is the manipulation of available scarce resources and technical know how to achieve the highest possible economic benefits within given resources where its marginal value product is equated to its unit price [27,28]. It is allocative efficiency of cocoyam farmers and the profitability of cocoyam production in the study area that this study incline to explore as such information is deficient in the study area.

2. METHODOLOGY

Anambra State of Nigeria was the study area. The state is located between latitude 5°38'N and 6°47'E of the equator and longitude 6°36'N and 7°21'E of the Greenwich Meridian. The state is bounded in the east by Enugu State, in the West by Delta State, in the South by Imo State and in the North by Kogi State. Anambra State has Awka as capital with population figure of 4.184 million people [29]. It has four agricultural zones; Anambra, Awka, Onitsha and Aguata. The state has mean temperature of 28–38°C and rainfall of 1500–2500 mm.

Multistage random sampling technique was used for the study. Three zones were selected out of four agricultural zones for stage 1. In stage 2, four blocks were selected from each of the zones. Stage 3 involved selection of five circles from each of the sampled block. This brought to a total of sixty circles. In the final stage, sixty farmers were selected from each circle and making a total of one hundred and twenty farmers for detail study. Structured questionnaire was administered to each of the respondents to collect information on input and output quantities used and their unit prices, farmers' socioeconomic characteristics and other essential information as related to the study. Secondary data were obtained from journals, internets, seminar and other periodicals. Ordinary least square regression method was used to determine the bi coefficient of cocoyam farmers and stated as;

$$Y = f(x_1x_2x_3x_4x_5x_6 + e) \quad (1)$$

Where Y = output of cocoyam (~~kg~~)
x_1 = farm size (ha); x_2 =planting material (~~kg~~); x3 = fertilizer (kg)x_4 = labour (manday); x_5 = capital input (₦); $b_1 - b_5$ = coefficient of the parameter; b_0 = intercepts, e = error term.

Four functional forms were fitted. These include: linear, semi-log, double log and exponential functions. The model were stated as follow:

Linear function

$$Y = b_0 + b_1 x_1 b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + e \quad (2)$$

Semi log

$$Y = \ln b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + e \quad (3)$$

Double log function:-

$$\ln Y = \ln b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + e \quad (4)$$

Exponential function

$$\ln Y = b_0 x b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + e \quad (5)$$

The choice of the best functional form was based on the magnitude of the R^2, the significance, size and the signs of regression coefficient. The allocative efficiency was determined by computing the marginal analysis of the inputs used by farmers in the study area. Moreso, the required adjustment in marginal value product (in percentages) for optimal allocation of the variable inputs used was also computed. The models were specified as follows:

$$r = MVP/MFC \quad (6)$$

$$MVP = mpp_{x1} py \quad (7)$$

(double log as lead equation)

$$Mppy_1 = {}^{dy}/_{dx} = {}^{b1y}/_{x} \quad (8)$$

Semi log form the lead equation

$$Mpp_i = {}^{dy}/_{dx} = b_i \quad (9)$$

(linear form is the lead equation)

$$D_1 = (1 - {}^{1}/r_1)\, 100 \quad (10)$$

(Simonyan and Balogun, 2010)

r = efficiency ratio notation, MVP = marginal value product, MFC = marginal factor cost (cost of unit price of a particular input), MPP = marginal physical product and are arithmetic means of the yield, Py = unit price of output, x_1 = various input 1 to n = absolute value of % change in MVP of 1^{th} resource, r_1 = ratio of MVP to MFC for i^{th} resource, 100 = factor (percentage) If r = 1, it implies that resources are efficiently used i.e. MVP = MFC = 1.

r > 1, implies that resources are under-utilized.
r < 1, implies that resources are over-utilized.

The net farm income can be calculated by gross margin less fixed input. The net farm income can be expressed as thus:

Gross Margin (GM) = $\sum_{1-1}^{n} F_1 Q_1 - \sum_{1-1}^{m} r_1 x_1$ (11)

Net farm income (NFI) = $\sum_{1-i}^{n} P_1 Q_1 \left[\sum_{1-1}^{n} r_1 x_1 + K \right]$ (12)

Where GM = Gross margin; NFI = Net farm income; P_1 = Market (unit) price of output Y (₦); Q = quantity of output Y (kg); r_1 = unit price of the variable input (₦); x_1 = quantity of variable input (kg); x_1 = quantity of variable input (kg); Kn = Annual fixed cost (depreciation) (₦); i = 1 2 3 …………….n; j = 1 2 3 ……………. M

The objective iii was determined using percent response and frequency distribution.

3. RESULTS AND DISCUSSION

The result of the estimated Cobb Douglas production function (lead eqation) as shown in Table 1 was used to compute the allocative efficiency indices b_1 coefficient which is the ratio of the marginal value product (MVP) of each input to their respective acquisition cost. These were computed to obtain the relative efficiency of cocoyam farmers in south east Nigeria.

From Table 1, the double log analysis revealed that the coefficients of farm size, planting material, labour and fertilizer were significant at various risk levels. As expressed the coefficient of fertilizer (0.076) was positive and statistically significant at 1.0% alpha level. This conformed to the findings of [14], who asserted that fertilizer is an important input factor that greatly influences farmers' output. The coefficient of planting material (0.968) was positive and statistically at 5.0% risk level. This was in agreement to *apriori* expectation that increase in planting material would result in increase in the cocoyam output of the farmer. The coefficient of labour (0.677) and farm size (0.165) were positive in line with *apriori* expectation and significant at 10% risk levels respectively. These implied that any increase in individual or collectively would increase the farmers' output. Farm size, according to [25] affects adoption costs, human capital, and risk perception.

The result in Table 2 indicated that none of the variables considered had efficiency ratio that was equal to 1 (one), which implied efficient utilization of resources. The ratio of marginal value product to marginal factor cost of farm size (0.020) and planting material (0.766) were greater than 1, signified under utilization of resources. These indicated that more than profit maximization levels of there sources were used. [30,31] findings concurred to these assertions. The low resource endowment of most of most farmers in the developing countries could be because of poor financial base, hence, resulting to under-utilization of resources. The effects of under-utilization of resources as observed by [32] are that farming remains in rudimentary and traditional levels.

Table 1. Estimated multiple regression production function for cocoyam

Variable	Linear	Exponential	Double log (Cobb douglas)	Semi log
Constant	9.664 (4.766)***	6.6464 (3.229)***	6.074 (3.741)***	3.181 (3.177)***
Farm size	1.404 (2.007)**	0.061 (0.022)	0.165 (1.201)*	0.732 (0.007)
Planting material	0.61 (0.787)	0.667 (0.571)	0.958 (2.021)**	1.061 (-0.441)
Fertilizer	0.413 (-1.266)	0.087 (2.177)**	0.076 (3.661)***	-2.104 (2.314)**
Labour	0.922 (3.024)***	0.488 (4.056)***	0.677 (1.272)*	-0.475 (0.303)
Capital	-0.511 (-2.763)	-0.599 (-1.046)	-0.433 (0.016)	0.014 (0.029)
R^2	0.688	0.551	0.874	0.647
F Value	4.486***	6.641***	92.64***	4.771***

Source: Field Survey, 2012
****, **, * significant at 1.0%, 5.0% and 10.0% levels of probability respectively*
The figure in parenthesis is the t-ratio

Table 2. Distribution of allocative efficiency indices of cocoyam farmers

Variable	$\overline{Y}$	$\overline{X}$	Bi	MPP	MVP	MFC	R	(D)%
Farm size	3,420.28	0.877	0.165	643,490	772.188	1000	77218.8	99.9
Planting material	3,420.28	540	0.958	6.067	728.04	150	4.85	-20.4
Fertilizer	3,420.28	420	0.076	0.619	74.28	120	0.619	-61.6
Labour	3,420.28	500	0.677	4.631	555.72	1000	0.556	-79
Capital	3,420.28	-217	0.345	5437.33	-65247	1000	-6.524	99.9

Source: Field Survey, 2014

The over-utilization of resource implied that less of the profit maximization of the resource was used. The possible reasons for the over utilization of the resources of fertilizer, labour cost and capital as shown in Table 2, were variously discussed. The limitless use of animal manure, particularly from sheep and goat in crop production as fertilizer by farmers from their farms which has no significant cost implication could be the reason for over-utilization of the resources. [6] reported that the employment of large number of family labour that is often neglected in costing total cost of production among peasant farmers in most developing countries in small sized farm could result to over-utilization. The finding of [33] agreed to this work. Therefore, for profit to be optimized in cocoyam production in Anambra state of Nigeria, farm size and planting materials should be reduced from their current level by 99.9% and 20.4%, while fertilizer, labour and capital should be increased from their current levels by 16.6%, 79% and 99.9% respectively.

The value of the return to scale of the cocoyam farmers in south east Nigeria as shown in Table 3 was 1.441, which indicated that the farmers were operating at irrational stage of production which is the region of maximum technical efficiency. This finding concurred with the assertion of 35, 15, who posited that the actual cases of increasing returns occurred in relatively low levels of output that characterized small scale farming. [31] remarked that our local farmers can improve on their productivity by employing more of improved inputs.

Costs and return on cocoyam production per hectare is revealed in Table 4. In the study area, mixed cropping was the predominant cropping pattern although sole cropping could be cultivated especially where other crops can not survive. This is particularly under fairly high shade. The food crops usually planted in mixture with yam, cassava, maize and stands of okra. In Nigeria, the practice of mixed cropping is adopted as a risk aversion strategy designed to insure against possibilities of crop failure and heavy loses of capital and labour inputs [34]. Furthermore, mixed cropping is known to be more profitable than sole cropping and consistent with farmers' food security objectives [35]. In this study, the emphasis was on cocoyam as major crop.

Table 3. Elasticity of production and return to scale of cocoyam

Variable	Elasticity of production
Farm size	0.165
Planting materials	0.958
Fertilizer	0.076
Labour	0.677
Capital	-0.433
Return to Scale	1.441

Source: Field Survey, 2013

The average quantity of cocoyam sett planted per hectare was 400kg. as shown in Table 4. Given a cost of ₦300 per kilogram (kg), expenditure on cocoyam setts for planting was ₦120,000, constituted about 39.6% of the total physical input. The high cost of planting material (corms and cormels) (₦120,000) could be attributed to the fact that the same edible part also served as planting material, in effect resulting in high cost of the input. [2,36] finding on yam minisett technique by farmers in Southeast Nigeria concured to this assertion. About 350 kg of inorganic fertilizer costing ₦42000, 400 kg of organic manure costing ₦12,000 was applied per hectare of cocoyam enterprise. The total cost of physical input came to ₦255, 000.

Labour input (family and hired) for various farm operations was shown in Table 4 and included; land preparation (bush clearing, stumping and mounding/ridging), planting, fertilizer application, weeding and harvesting. However, while bush clearing and land preparation were predominantly male activities, planting, fertilizer application, weeding and harvesting were mostly undertaken by women and children. Labour input was measured in man-days. The hours worked by men, women and children were converted to regular man-days using the follow conversion factors: 1 man-day for all activities carried out by male adult, 0.50 man-days for all operations carried out by children (7-14 years) and 0.75 man-day for planting, land preparation and fertilizer application by women. A conversion factor of 1.00 was used for weeding and harvesting operation by women [37].

On the average, the total amount of labour employed per hectare was 440 man-days. A total of 60 percent came from family labour, while 40 percent from hired labour. Hired labour was used for most tedious operations such as land preparation and bush clearing. Nevertheless, family labour constituted a significant proportion of total labour input. This could be because most farmers used family labour since they were financially constrained to hire labour in their farm works [12]. The high cost and scarcity of hired labour could be related to recent unprecedented urban drift of youths witnessed in the study areas [7].

About 10.9% of man-days were employed in planting, fertilizer and harvesting respectively, while 36.4% and 27.3% of man-days were engaged in land preparation and hand weeding respectively. [38] finding agreed with this assertion. Nevertheless, only very insignificant number of cocoyam farmers used herbicides. Weeding was therefore, mostly done manually thus raising the labour input for weeding. [27] invoked scarcity, high cost, ignorant of existence and method of use of relevant herbicide to explain the possible reasons for limited use of herbicides among small holder farmers in most developing counties. Limited number of the farmers used insecticides. The same reasons for limited use of herbicides apply to the limited use

Table 4. Costs and return on cocoyam production per hectare

Item	Unit	Quantity		Price/ Cost/Unit (₦)	Cost/Value (₦)
Gross revenue					
Yield	Kg	2800		300	840,000
Physical input cost					
Cocoyam sett	Kg	400		400	160,000
Fertilizer (NPK)	Kg	400		6,000	48,000
Organic manure	Kg	400		1,500	12,000
Transportation and other miscellaneous					35,000
Total					**255,000**
Labour		**Hired**	**Family**		
Land preparation (clearing and ridging)	Man-day	20	-	2,500	50,000
Planting	Man-day	2	4	800	4,800
Fertilizer application	Man-day	-	6	800	4,800
Hand weeding	Man-day	-	15	1,000	15,000
Harvesting	Man-day	-	6	1000	6000
Total labour cost					**80,600**
Opportunity cost of capital at bank lending rate of 23%					75,808
Total variable cost					**411,408**
Gross margin (GM) (TR-TVC)					429,592
Depreciation of fixed assets excluding land					3,200
Total cost (TVC+TFC)					414,608
Net Farm income (TR-TC)					425,392
Benefit cost ratio					1:2.06

Source: Field Survey, 2014

of insecticides as well as the fact that limited diseases and insect attacked cocoyam farms in the survey year. These may have reduced the need for insecticide.

Wage rate varied with the nature of the farm operations. Land preparation (mounding and ridge making) attracted ₦2, 500 per day, planting: ₦800, weeding; ₦1000, fertilizer application; ₦800 and harvesting; ₦1000. The total cost of labour was ₦80600, which was about 19.8 percent of total cost of production.

The depreciated value of farm implements (machete, hoe, digger, shovel and basket) amounted to ₦3, 200 per hectare. The total cost of production was ₦408, 608.

Table 5. Distribution of respondents according to constraints to cocoyam production

Problems	Frequency	Percentage
Poor access to credit	99	82.5
High labour cost	98	81.7
High cost of fertilizer	97	80.8
Inadequate extension contact	94	78.3
High cost of planting Material	58	51.7
Long distance from farm	14	11.7
Inadequate storage facilities	10	8.3

** Multiple responses*
Source: Field Survey, 2012

A total of 2800kg of cocoyam were harvested per hectare. At ₦300/kg of cocoyam; this yielded a market value of ₦840, 000. Taking away the total variable cost of ₦411,408. The gross margin for cocoyam was ₦429, 592. The NFI =total revenue/total cost =425392. This indicated that cocoyam production was profitable in the study area. This collaborates with the finding of [38], who obtained a similar finding in Owerri West Local Government Area of Imo State. The benefit cost ratio = 1:2.06 This indicated that for every one naira spent on cocoyam production, about ₦2.06 will be realized.

Cocoyam farmers in the study area were confronted by challenges in their quest to increase their productions and were summarized and presented in Table 4.

Poor access to credit was the most prominent problem that confronted cocoyam farmers and was represented by 81.7 percent of the total respondent. The finding of 34 attested to the finding. Credit is a very important production resource which helps in transforming agriculture from subsistence to commercial type [39]. Unfortunately, this resource eluded most farmers because of lack of collateral, lack of knowledge and experience on how to complete loan application forms, rigorous process involved in obtaining loan and high interest rate. Other problems included delay in loan approval and release of fund to farmers during planting season and short repayment period [40,14]. Moreso, a high proportion of sample farmers (81.7%) encountered the problem of high labour cost. Labour cost constituted about 35-40% of the total cost of production. This could be because most of traditional farm level operations are nearly zero mechanized [7]. [37,38] remarked that with increase in population, rural-urban migration, the ageing of the rural farming population and feminization of agriculture, labour would likely to be inelastic and expensive. The effect is high cost of production and consequently low returns.

Table 4 revealed that 80.8 percent of the respondents complained of high cost of chemical fertilizer as hindrance in achieving their production objective of self-sufficiency in cocoyam production. Fertilizer was among major factors limiting productivity growth of agriculture in Sub-Saharan Africa. Its' effect on crop yield is positive and immediate; hence, the most readily adopted technology. Nevertheless, this important resource-input is prohibitive and scarce at the most farm levels of the developing countries as reported by [29]. Fifty one dot seven percent (51.7%) of the sampled farmers complained of high cost of planting material. Studies on cocoyam [2,38,17] opined that cocoyam corms and cormels (planting materials) constitute more than 33% of the total cost of cocoyam production and this could be attributed to the fact that the same planting material is the edible portion.. In addition, inadequate extension contact (78.3%) was reported by the respondents. Several authors [41,30,42] reported a wide gap of extension services and the farmers in the developing countries. This limits the interpersonal contacts which plays decisive role to eventual adoption of technology. In effect, technologies that are found to be technically and financially feasible and socially acceptable and compatible with the farmers' resources base could not be adopted. This scenario does not augur well for agricultural development.

4. CONCLUSION AND RECOMMENDATIONS

The major conclusions drawn from this study are that; Cocoyam farmers were not allocatively efficient in the use of their farm resources. Most of the farmers' resources considered were under utilized with exception of fertilizer and labour that were over utilized, which implies that the farmers operates in region 1 of production process.

Cocoyam farming was profitable in the study area with average revenue of N840,000,total cost of production of N408,608 per hectare and Net farm income of N431,392.

The main problems to cocoyam production as reported by the respondents were; poor access to credit, inadequate extension contact, high cost of inorganic fertilizer and high cost of labour. Based on the results, the following recommendations are made;

(i) There is need for policy options to increase farmers' access to improved production inputs such as fertilizer, seed, credit and pesticides at lower cost and at right time for the farmers to achieve high production.
(ii) To achieve optimum allocative efficiency and hence maximum profit in ocoyam production in the study area, farmers should be encouraged to maximise the use of underutilized resource and minimize the use of over utilized resource in order to improve the farmers' productivity and income of the farmers in the study area. This can be achieved through appropriate policy options that would encourage the reallocation and redistribution of these inputs.
(iii) The need to improve extension agents frequency of contact with farmers through either reducing the extension-farmer's ratio or providing the extension agents with mobility and other incentives to enhance farmers productivity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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