



ECONOMIC ANALYSIS OF YAM PRODUCTION IN SHIRORO LOCAL
GOVERNMENT AREA OF NIGER STATE

Diye, M. and Yisa, E. S.

Department of Agricultural Economics and Farm Management, Federal University of Technology, Minna, Nigeria
Correspondence Email: musadiye26@gmail.com GSM: +2349168053515

ABSTRACT

The study was designed to examine the economic analysis of yam production in Shiroro local government area of Niger state. A multi-stage sampling technique was used to select total of ninety (90) farmers. Data were collected using well structure questionnaire and analyzed using both the descriptive and inferential statistic. The result shows that quantity of fertilizer increased by 1% and holding other variables constant output will increase by 3765.0. The result shows that resources were efficiently utilized because it has shown that labour was over utilized since the value is less than 1, fertilizer (3.92), farm size (305.85), capital (103.8) and other inputs (40.95) respectively, were underutilized since allocative efficiency ratio is greater 1. Therefore, the farmer should allocate resource efficiency so as to increase the output of yam. The result has also shown that yam production is encouraging in the study area but the matter concerned here is that farmers underutilized their capital resources and this might due to extension gap in the study area. However, labour was over utilized possibly due to absence of alternative to channel the excess labour. Thus, the study calls on the need for adequate extension services delivery in order to address poor utilization of resources in yam production.

Keywords: Analysis, Economic, Examine, Production and Yam

INTRODUCTION

The country's population has rapidly expanded from roughly 80 million to over 130 million people, and this, together with a widespread desire for a higher quality of life and other socioeconomic and political considerations have significantly increased the need for food. However, root and tuber crops have become more clearly known to most farmers and citizens in recent years (Nanbol and Namo, 2019). Root and tuber crops contribute a highly significant proportion of the country's diet. The production of root tuber crops in Nigeria is handled by a reasonable number of poor and illiterate farmers who are subsistence farmers by nature, growing largely on small and scattered farm holdings. One of the main staples in Nigeria, yam is produced second in importance in the production of basic foods after cassava (Otegbayo *et al.*, 2019). Approximately 98% of cassava, 99% of yam, and 85% of cocoyam were produced by farmers in Nigeria. Low production, however, is a major issue for the growers.

Yam is deeply ingrained in Nigerian culture as a component of many tribes' sacred traditions (Schram, 2018). Nowadays, yam is a significant component of religious and ceremonial rituals. One such ritual is the new yam festival, which is celebrated globally in Nigeria's farming regions to mark the start of the harvest season (Jeremiah, 2021). Southeast Asia is where several food yams were first cultivated. It is thought to be cultivated in central and southern America, and it is also native to West Africa. The yam *Dioscorea* spp is of different varieties but the first three in order of importance namely *Dioscorea rotundata*, *Dioscorea alata* and *Dioscorea cayenensis* and it family *Diodcoreaceae* are mostly cultivated in Nigeria (Epping and Laibach, 2020).

The role of agriculture in any economy cannot be over emphasized, since no country can survive without food (Matemilola, 2017). For a nation to developed at all she must be able to feed



herself from the goods and services produced within the country and most of these goods normally comes from agricultural sector of the economy. At present the problem of high cost of production is a general problem in the economy, mainly because of the adverse effect on small farm holders who's economic are been eroded by the high cost of agricultural inputs used for production which transmitted into high cost of products beyond the purchasing power of the consumers. Therefore, the efficient use of resources in the production of agricultural products would have a tremendous effect on the output productivity and economy of the farmers in the study area making food available to the households and raw materials to industries. To be able to suggest any meaningful solution to the problems involved and to the extent of aiding good contributions to the problem as a constraint to effective yam production process, therefore, the factors hindering the efficient production of yam in particular needs an insight investigation.

The economic analysis in yam production is not a subject for agricultural economists alone but the entire agriculturist who will prefer adequate production and increased availability of food. It is therefore, important and urgent to determine the most appropriate production systems in yam production that will guarantee incentives to farmers to be able to continue production. The choice of the topic emanated from the fact that more efficient resources is required in production to make the products available to every home at affordable prices and save them from wastage by staying longer in storage. The general objective of the study is to determine the Economic Analysis of Yam Production in Shiroro Local Government Area of Niger State. The specific objectives were to describe the socio-economic characteristics of yam farmers and determine resources use efficiency in yam production.

MATERIALS AND METHODS

The study Area

The study area is Shiroro Local Government of Niger State was created in May' 1989. It is located in guinea savannah region of the middle belt between 25⁰ and 20⁰ N of the equator, latitude 45⁰ and 10⁰ E of the Green witch meridian with an average rainfall ranging between 1100-1600 mm per annum with temperature of 13.88⁰C and with dry season of six months period (Information Department Bulletin of Shiroro local government Kuta, 2021). The local government boarders in the North with Kaduna state, in the East with Munya local government while in the West with Rafi local government and in the South with Bosso local government. Shiroro Local Government Area (LGA) inhabitants are predominantly peasant farmers, 80% of who grows yam (NSNALDA) Extension Unit, 2020). The area is blessed with arable land and soil type of well drained sandy loamy soil. The provisional 2022 census figure put the population of the LGA at 404, 202.

Sampling Techniques

Using a multi-stage sampling technique, a total of ninety (90) farmers were randomly selected. Firstly, all the fifteen wards were purposively selected given that yam production cut across the study local government area. Secondly, from each of the selected wards, two (2) villages were randomly selected, thus given a total of thirty (30) selected villages. Lastly, from each of the selected wards, three (3) active farmers were randomly selected, thus given a total of ninety (90) selected farmers.

Method of data Analysis

A well-structured questionnaire coupled with interview schedule was used for data elicitation and the collected data were analyzed using both descriptive and inferential statistics.

Objective I and II were achieved using descriptive statistics and linear regression method estimated by ordinary least square (OLS).

Specification of model

$$Q = f(X_1, X_2, X_3, X_4, X_5, D, e) \quad \dots(1)$$

Where

Q = Output of yam (kg/ha)

X_1 = Labour input (man-days) X_2 = Fertilizers input (kg/ha)

X_3 = Farm size (unit/ha) X_4 = Capital (Represents the depreciation on farm tools and implements, rent, interest on capital) X_5 = other cost (These include cost of planting materials (seeds), herbicides and transportation) E = Error term or stochastic disturbance term.

Four functional forms will be tried and the model with best fit will be chosen for analytical criteria. The four functional forms include:

i. Linear:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e \quad \dots(2)$$

ii. Exponential:

$$\ln y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e \quad \dots(3)$$

iii. Cobb-Douglas:

$$\ln y = \ln b_0 + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + e \quad \dots(4)$$

iv. Semi-Logarithm:

$$Y = \ln b_0 + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + e \quad \dots(5)$$

B_0 = constant term

B_1 - b_5 = regression parameters to be estimated.

Of the four tried functional forms, the lead equation was chosen based on:

- Relative magnitude of the explanatory power of the model (R^2 value).
- Significance of the estimated coefficients.
- Magnitude of the estimated coefficients.
- Conformity of signs of estimated coefficient with a priori expectation.
- F – statistic.

Resource-use Efficiency

In calculating the efficiency of resource use, the allocative efficiency index was calculated as following (Henderson, 2015; Kumar *et al.*, 2020) as:

A resource is said to be allocatively efficient at the where marginal product (MVP) equates the marginal factor cost (MFC) acquisition cost of an input/cost of an additional unit of out.

$$MVP = MFC (PX) \quad \dots(6)$$

$$MVP = b. py \quad \dots(7)$$

Where,

MVP is as defined above

B = elasticity of production = dy/dx

Dy/dx = first partial derivative with respect to an input.

P_y = price of unit of output.

In a perfectly competitive market $MFC = PX$

Where,

PX = price of unit of output

$$\text{Therefore, } MVP = PX \quad \dots(8)$$

$$b. Py = Px; \quad Dy/dx, Px; \quad Dy/DX = Px/Py \quad \dots(9)$$



It implies that resource allocation obtained at the point where the marginal physical product of an output equates the ratio of the input and output prices.

If $MVP = MFC$ it implies that the ratio $MVP/MFC = 1$.

This is the point of efficient resource allocation

If $MVP > MFC$ it implies that the ratio $MVP > 1$.

MFC this indicated that the farmer is operating in stage 1 of the classical production function, which suggest underutilization.

If $MVP = MFC$ it implies that MFC is greater than MVP which is the ratio $MVP/MFC < 1$.

It indicated over utilization of the implicit. The farmer is operating in stage (iii) and should therefore reduce utilization of the said implicit.

RESULTS AND DISCUSSION

Age distribution of respondents

Table 1 shows that 13.3 of respondents were between the ages of 15-20 years, 16.7% were between the ages of 21-30 years, 35.6% were between the ages of 31-40 years, 20% were between the ages of 41-50 years while 14.4% were between the ages of above 50 years. The indicate that the average of farmers fall within the ages of 31-40 years representing 35.6%. From the result it can be said that 35.6% of respondents are in their productive age in which the majority are youths hence, there is tendency for expansion in the nearest future. This also agree with the findings of Aba *et al.* (2015) who asserted that these categories of farmers are the economically active population as the age could affect the type of farming he or she could positively engage as reported by Food and Agricultural Organization (FAO, 2014). The ability to meet up with demand and procurement of yam to meet consumers demand is energy demanding and therefore requires energetic and young farmers. The implication of this result is that there is likelihood of high productivity among farmers since majority of the farmers are less than 50 years of age which shows that they are strong, active and flexible to farming activities.

Table 1: Age distribution of respondent

Age distribution	Frequency	Percentage
15-20 years	12	13.3
21-30 years	15	16.7
31-40 years	32	35.6
41-50 years	18	20.0
Above 50 years	13	14.4
Total	90	100

Source: Field survey (2021)

Gender distribution of respondents

Table 2 shows that 93.3%are males which indicate that yam farmers in the study area is mostly done by males while 6.7% were females, thus it shows that female were not left out in yam production. This corroborated with Okene *et al.* (2013) who reported that male dominance in seed yam cultivation in Oyi Local Government Area of Anambra State, Nigeria.

Table 2 Gender distribution of respondents

Gender	Frequency	Percentage
Male	64	93.3
Female	6	6.7
Total	90	100

Source: Field survey (2021)

Family size distribution of respondents

Table 3 revealed that farmers having family size between 1-10 constitute 47.8%, 11-20 have the family between 35.9% while the family size above 20 have 13.3%. This indicate here that the large family size of the farmer is between 11-20 and above 20 might be due to the fact that majority of farmers use traditional and crude method of faming which is tedious and that may be why most of them have more than one wife for more children. Therefore, this might explain for the large size of their households who may provide labour at various stages of farm operations. This was in line with the report of Marcus (2019) who stipulated that there is a positive and significant relationship between the household size and the efficiency of farmers in crop production. The reported further reveals that large household size which could serve as a source of cheap labour in farming activities.

Table 3: Family size distribution of respondents

Family size	No. of farmers	percentage
1-10	43	47.8
11-20	35	38.9
Above 20	12	13.3
Total	90	100

Source: Field survey (2021)

Farm size distribution of respondents

Table 4 shows that 35.5% of respondents farm size falls between 0.1-1.0, 31.1% are within 1.1-2.0, 20% were within 2.1-3.0 while 13.3% are within 3.1-4.0 of farm size. The variation observed on the table of the farm size might be due to the financial status of the farmer. It is true that the financial status of an individual farmer can be used as an indicator to determine his or her investment potential. Therefore, an individual with higher financial status has greater ability of investment in the farm than those with lower financial status. This is line with Adamu *et al.* (2021) they opined that most of the farmers were small-scale farmers who may likely improve their standard of living through increase acreage of farming activities with available production inputs.

Table 4: Farm size distributions of the farmers

Farm size	Frequency	Percentage
0.1-1.1.1	32	35.6
1-2.0	28	31.1
2.1-3.0	18	20.0
3.1-4.0	12	13.3
Total	90	100

Source: Field survey (2021)

Educational distribution of the respondents

Table 6 shows that 23.3% of have primary education, 27.8% have secondary education, 13.3 have post-secondary education, 8.9% have Quranic education, 12.2% have adult education and 24.4% have not acquire any education. Therefore, the table shows that the educational level among farmers is still very low in the study area. This may serve as a barrier for their speeding adoption of new farming techniques.

Table 6: Educational levels of respondents

Education level	Frequency	Percentage
Primary	21	23.3
Secondary	16	27.8
Post-secondary	12	13.3
Quranic education	8	8.9
Adult education	11	12.2
None	22	24.4
Total	90	100

Source: Field survey (2021)

Major occupation of respondents

Table shows that 75.6% of the respondents are farming, 10% engaged in fishing, 8.9% are hunters, while 5.6% are civil servants. This result indicated that the majority of the respondents engaged in farming as their occupation which means farming is their main source of employment in the area.

Table 7: Occupational distributions of respondents

Type of occupation	Frequency	Percentage
Farming	68	75.6
Fishing	9	10.0
Hunting	8	8.9
Others	5	5.6
Total	90	100

Source: Field survey (2021)

Level of Experience in Production

The Table 8 revealed that 13.3% fall between 10-20 years of experience, 24.4% are between 21-30 years, 38.9% fall between 30-40 years while 23.3% have experience between 41-50 years. This has shown that farming for yam have been their cultural heritage in which yam production has long standing culture and source of employment. More experienced farmers are knowledgeable on the best production systems to adopt to maximize output and reduce cost. In addition, experienced farmers are better able to adopt technologies extended to them to enhance their productivity and efficiency. It is in accordance with the findings of Makarau *et al.* (2013) who stated that farmers within this age bracket and years of experience are more willing to undertake new risk, therefore adopting new methods that will put them in a better economic position.

Table 8: Level of Experience in Production

Year of experience	Frequency	Percentage
10-20 years	12	13.3
21-30 years	22	24.4
31-40 years	35	38.9
41-50 years	21	23.3
Total	90	100

Source: Field survey (2021)

Cropping Pattern

Table 9 has shown that of the respondents practiced sole cropping system in yam production. This might be to avoid competition among crops for light, space, moisture and

nutrients. Hence, avoidance of crops competition allows the main crop as yam for enough space and soil fertility that enhance tuber enlargement and increase the quality and quantity of harvest, thus result in high income for the farmers.

Table 9: Distribution according to cropping pattern of the farmers

Cropping pattern	Frequency	Percentage
Sole cropping	59	65.6
Mixed cropping	31	34.4
Total	90	100

Source: Field survey (2021)

Types of labour used by the respondents

Table 10 shows that 72.2% used family labour, 13.3% used hired labour, while 14.4% used the combination of both family and hired labour in the production. The table indicates that majority of respondents used family labour. This could be due to the practice of subsistence farming in the study area. This is in agreement with Okene *et al.* (2013) who stipulated that male farmers usually engage in early marriage to enable them exploit the benefits of family labour.

Table 10: Labour utilization among the respondents

Labour source	Frequency	Percentage
Family labour	65	72.2
Hired labour	12	13.3
Combination	13	14.4
Total	90	100

Source: Field survey (2021)

Access to Capital

Table 11 shows that 57.8% used their personal savings as capital for farming, 14.4% source their capital from friends and relatives while 27.8% source from cooperative societies in which they belong, none of the respondent obtained loan from the bank. The inability of the farmers to obtain loan from any formal financial institution have led to their smallholding of farm sizes. This is in agreement with findings of Mohammed *et al.* (2015) asserted that farmers in Kwara State, Nigeria rely heavily on personal savings as source of capital for farming.

Table 11: Distribution according to respondents' source of capital

Source of capital	Frequency	Percentage
Personal savings	52	57.8
Friends/relatives	13	14.4
Cooperative societies	25	27.8
Total	90	100

Source: Field survey (2021)

Source of Land Acquisition

Table 12 indicates that land is mostly acquired in the study area by inheritance. This might not be unconnected to the fact that most respondents are indigenes in the sample area. Acquiring land by inheritance reduce the cost of production. This is in line with Adamu *et al.* (2021) who reveals that majority of the farmers in Kaduna state, Nigeria acquired their land through inheritance which could lead to farmland fragmentation.

Table 12: Distribution of respondents to how land is acquired for farming

Land acquisition method	Frequency	Percentage
Purchased	3	3.3
Gift	6	6.7
Inheritance	64	60.0
Rent	10	21.1
Borrowed land	8	8.9
Total	90	100

Source: Field survey (2021)

Factors Influencing Yam Production

The ordinary least square (OLS) multiple regression analysis was used to estimate the economic analysis in yam production in Shiroro Local Government area of Niger State. The result in Table 14 shows that the linear functional form is the lead equation because it gives the best fit with relative high value R^2 of 0.901 and was therefore used for further discussion. This implies that 90.7% of the variation output (Q) yield of yam is caused by the index while the remaining 9.3 is as a result of non-inclusion of some explanatory variables as well as other factors outside the control of the farmer. For the five variables namely labour (X_1), fertilizer (X_2), farm size (X_3), capital (X_4), and other cost (X_5) were statistically significant at 1%, 1%, 1%, 1% and 10% level respectively. The implication is that the factor that significantly led to the increased yields of yams. The increase in the quantity of fertilizer brought about the increased in the quantity of output. Labour has the co-efficient of 1.116 and statistically significant at 1%. This implies that there is positive relationship between labour and output of yam, this confirms to priority expectation of labour that the availability of labour brought about higher outputs. From the result seen if the quantity of fertilizer is increased by 1% and holding other variables constant output will increase by 3.765. 0. The results also corroborated with the findings of Okene *et al.* (2013) who reported that the coefficient of farm size was significant at 1%, hence is an important variable in yam production. The use of chemical input fertilizer was also significant to the output at 1% level. This shows that output of yam is greatly affected by the use of fertilizer.

Table: 14 Regression estimates of economic analysis in yam production.

Variables	Linear	Semi-log	Exponential	Cobb-Douglas
Constant	-2.714(-1.219)	-30.702 (-4.161)***	2.639 (39.613)***	2.245(18.077)***
Labour(X_1)	1.116 (3.550)***	10.890 (2.386)**	4.459E-03 (0.474)	0.177(2.319)**
Fertilizer(X_2)	3.765(5.273)***	9.141 (4.375)	0.118 (5.542)***	0.297(2.659)***
Farm size(X_3)	6.117 (3.287)***	2.235 (1.102)	0.223 (4.006)***	8.863E-02(2.596)**
Capital(X_4)	2.076 (3.109)***	26.843 (3.797)***	1.421E-02 (0.711)	0.446 (3.744)***
Other cost(X_5)	0.807 (1.829)*	6.201 (2.194)**	-1.097E-02 (-0.831)	3.298E-02 (0.693)
R² =	0.901	0.821	0.651	0.588
F= statistic	163.875***	101.2*	45.11*	22.22

Source: Field survey (2021) Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%

Allocative Efficiency Ratio

The result shows that the resources were efficiently utilized because it has shown that labour was over utilized since the value is less than 1, fertilizer (3.92), farm size (305.85), capital (103.8) and other inputs (40.45) respectively, were underutilized since the allocative efficiency ratio is greater than 1. Therefore, the farmer should allocate and manage resource efficiency so as to increase the output of yam. This further agreed Giroh, *et al.* (2013) who affirmed that farmers are fairly efficient in producing cassava at a given level of output using the cost minimizing input.



Table: 15 Allocative efficiency ratio in yam production

Variables	Coefficient (b)	Py	Mup b.Py	MFC	MUP/MFC
Labour in Man-days	1.116	50	55.8	600	0.093
Fertilizer (kg)	3.765	50	188.25	48	3.92
Farm size (ha)	6.117	50	303.85	1	305.85
Capital (N)	2.076	50	103.8	1	103.8
Other cost	0.087	50	40.35	1	40.35

Source: Field survey (2021)

CONCLUSION AND RECOMMENDATION

The result has also shown that yam production is encouraging in the study area but the matter of concerned here is that the farmers under-utilized their capital resources and this might be due to extension gap in the study area. However, labour was over-utilized possibly due to absence of alternative to channel the excess labour. Thus, the study calls on the need for adequate extension services delivery in order to address poor utilization of resources in yam production.

REFERENCES

- Aba, D. A., Mbanasor, J. A. and Agwu, M. N. (2015). Socioeconomic analysis of ginger value chain in Kaduna State. *Nigeria American Journal of Marketing Research*, 4(3):54-67.
- Adamu, B. D., Tanko, F., Barnabas, T. M. and Adejoh, E. U. Determinants of Household's poverty among crop farmers in Kaduna State, Nigeria. *FUDMA Journal of sciences*, 1(5):529-538.
- Epping, J. and Laibach, N. (2020). An underutilized orphan tuber crop—Chinese yam: A review. *Planta*, 252, 1-19.
- Food & Agricultural Organization, (2014). Production quantity of ginger in the world total 1961-2009. www.fao.Mongabay.com/g/5000-World, 08/5/2015.
- Giroh, D. Y. and Tashikalma, A. K. (2013). Evaluation of technical, allocative and economic Efficiencies of rubber-cassava based farming system In Edo State, Nigeria. *Global Journal of Agricultural Sciences*, 12(2), 125-134.
- Henderson, H. (2015). Considering technical and allocative efficiency in the inverse farm size–productivity relationship. *Journal of Agricultural Economics*, 66(2):442-469.
- Jeremiah, M. (2021). Egelege Cultural Festival amongst the Aluu People of South-South Nigeria: An Instrument of Social Cohesion and Intergroup Relations. *South-South Journal of Humanities and international Studies*, 4(4):.
- Kumar, S., Meena, R. S., & Jhariya, M. K. (Eds.). (2020). *Resources use efficiency in agriculture* (p. 760). Singapore: Springer.
- Makarau, B. S., Rabi, M. S., Mohammed, I. D., Anna, O. G., Yakubu, D. and Gadzama, I. U. (2013). Effect of socio-economic factors on the adoption of ginger (*Zingiber officinale*) production technologies in Southern Kaduna State, Nigeria. *World Journal of Agricultural Sciences*, 1(6):203-208.
- Marcus, P. L. (2019). Analysis of supply response and trend of ginger production in Benue and Kaduna States, Nigeria (Doctoral dissertation).
- Matemilola, S. (2017). The challenges of food security in Nigeria. *Open Access Library Journal*, 4(12), 1
- Nanbol, K. K. and Namo, O. (2019). The contribution of root and tuber crops to food security: A review. *J. Agric. Sci. Technol. B*, 9, 221-233.
- Okene, D. C., Okeke, C. C. and Udeora, S. N. (2013). Socio-economic determinants of seed yam production in Oyi Local Government Area of Anambra State. *Asian Journal of Agriculture and Rural Development*, 3(393-2016-23864), 148-153.
- Otegbayo, B. O., Samuel, F. O., Kehinde, A. L., Sangoyomi, T. E. and Okonkwo, C. C. (2010). Perception of food quality in yams among some Nigerian farmers.