REPORT

55(286), October, 2019

ISSN 2278–5469 EISSN 2278–5450

DISCOVERY

Resource use efficiency among cooperative cocoyam farmers in Rivers State, Nigeria

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Article History

Received: 24 July 2019

Reviewed: 27/July/2019 *to* 12/September/2019

Accepted: 20 September 2019

Prepared: 25 September 2019

Published: October 2019

Citation

Anyanwu SO, Ajie EN, Queeneth Dick. Resource use efficiency among cooperative cocoyam farmers in Rivers State, Nigeria. *Discovery*, 2019, 55(286), 572-577

ABSTRACT

The study examined resource use efficiency among cooperative cocoyam farmers in Rivers State, Nigeria. Two Local Government Areas (Ahoada East and Ikwerre) were purposively selected. Cross sectional data generated from 80 cooperative smallholder farmers randomly selected from sixteen communities were used. Descriptive statistics and multiple regression analysis were used in analyzing the data. Results showed that value of planting materials and capital inputs were the statistically significant determinants of output of cocoyam in Rivers State, Nigeria. Results of allocative efficiency indices for expenditure on seeds (6.697), and capital inputs (2.015), showed that the MVP> MFC, implying underutilization of expenditures on improved planting materials and capital inputs in Rivers State, Nigeria by the cooperative cocoyam farmers. The allocative efficiency indices were not found to be equal to unity confirming the existence of resource use disequilibria by the cooperative cocoyam farmers in Rivers State, Nigeria. This implies that the cooperative cocoyam farmers in the State operated sub-optimally and hence a scope exists for improvement by re-allocating the resources more efficiently. It was recommended that governmental agencies responsible for the supply of and access to improved planting materials be strengthened. Credit liberalization in favour of cooperatives is also advocated to enable them purchase the requisite planting materials and capital inputs for increased production.

Keywords: Cooperative, cocoyam farmers, Resource use efficiency

1. INTRODUCTION

The search for the appropriate vehicle to deliver a paradigm shift in Nigeria's agricultural development efforts in the recent past has led to the consideration of different options such as interventional programmes, reforms of existing institutions and examination of social organizations such as cooperative societies. Also the peasant nature of Nigeria's agriculture, poor response to technology adoption and access to farm inputs, low capital outlay and investment which eventually culminates into low agricultural productivity are challenges that could be tackled by leveraging on the merits of social organizations and group formations such as cooperative societies. Scholars appear to be unanimous on the need to skew agricultural credit in favour of cooperatives or self- help groups where group pressure can be exerted, than to individuals to ensure a higher rate of loan repayments and lower transaction costs for all parties (CBN, 2003. p209).

World Bank (1989) defined cooperative societies as an association of persons who have voluntarily joined together to achieve a common objective through the formation of a democratically controlled organization, making equitable contribution to the capital required and accepting a share of the risk and benefits of the undertaking. There are different types of cooperatives. Presently in Nigeria the type of agricultural cooperative that could be relied upon for food production, processing and marketing activities include; Farmers multipurpose cooperatives, Fisheries cooperatives, Livestock farmers cooperatives, Agricultural marketing cooperatives, Rural thrift and credit cooperatives (Amalu, 2000). The Farmers multipurpose cooperatives society in Rivers State, are engaged in the cultivation of a wide range of crops ranging from cassava, vegetables, cocoyam etc.

Cooperatives enables farmers to solve agricultural problems such as inadequate capital, inadequate access to loan, and high level of illiteracy which still remain the bane of Nigeria's agricultural development efforts (Kehinde et al., 2009). The determinants of women's access to credit in Abia State Nigeria (Igwe et al., 2009) showed that members of cooperative societies had more access to credit than non-cooperative farmers. An examination of the contribution of farmer cooperative societies to agricultural production in Ikwuano Local Government Area of Abia State, Nigeria by Ibezim et al., (2010) reported a significant difference between the income and output of cooperative and non-cooperative farmers with the mean income and output of the cooperative farmers being higher than that of the non-cooperative farmers. In Enugu State, Nigeria, Agbo (2009) revealed that about 60.5% of the respondents who belonged to cooperative societies got various sums of money as credit through their cooperatives. In that study 14.52% of the respondents bought farm inputs at subsidized prices while 25% were assisted by the cooperatives to sell their farm produce. It was also reported (Adeyemo, 1994) that members of cooperative societies performed better in terms of gross margin than individual farmers. In his study of Milk marketing of small-scale farmers in East African highlands, Holloway et al., (2000) observed that cooperative societies that acted as marketing institutions were potential catalysts for reducing transaction costs, stimulating entry into the market and promoting growth in rural communities. To them producer cooperatives were useful in overcoming access barriers to assets, information, services and markets for high-value products. A lot of documented evidence, in Nigeria (Peter, 2008, Oboh, 2001, Dayo et al., 2009) and beyond (Lyne 1996, Matungul et al., 2001, Spore, 2008) points to access to farm inputs as one of the major constraints expressed by both cooperative and non-cooperative small-scale farmers. Ajah (2015) contended that cooperative societies access to farm inputs seemed to be more on credit facilities than to other inputs like land, labour, herbicide, insecticide, rodenticide, fertilizer, tractor services, storage equipment and processing equipment and therefore focused his study on providing answer to whether cooperative farmers equally had more access to other farm inputs than non cooperative farmers.

These studies both in Nigeria and beyond concentrated a lot of energy on access to farm inputs. The level of resource use or allocative efficiency among these cocoyam cooperative farmers in Rivers State appears to have been neglected or lacking. There is therefore the need to determine among cocoyam cooperative farmers in Rivers State' the efficiency of utilization of their inputs to bridge this gap in knowledge.

2. METHODOLOGY

Two Local Government Areas (Ahoada East and Ikwerre) where Cocoyam farmers Cooperative societies are more predominant were purposively selected for the study. Ahoada East Local Government Area is located northwest of Port Harcourt with the headquarter at Ahoada. It was created in 1996 and has a land mass of 341 km^2 (132 square miles). There are about two major clans Akoh clime 1 and Upata and about 33 communities in Ahoada East. The major occupation of the people in these areas is farming. From the lists of cooperative farmers collected through the assistance of the extension agents, 5 cooperative farmers were randomly selected from

each of the 16 communities randomly selected from Ahoada East and Ikwerre L.G.As. This gave a total sample size of 80 cooperative farmers.

The socioeconomic characteristics of the cooperative farmers were analyzed with descriptive statistical tool such as frequency tables and percentages while production function analysis was used to determine the level of resource use efficiency among the cocoyam cooperative farms. The implicit form of the model specified is given by:

$Y = f(X_1, X_2, X_3, X_4, e)$.....eqn. (1)

Where;
Y = Value of total cocoyam output per farmer (N)
X_1 = Farm size (Ha)
X_2 = labour (man days)
X_3= Value of planting materials (N)
X_4 = Value of capital inputs (N)
e = error term.

Four functional forms were fitted to the data. The Cobb-Douglas or double log model was chosen as the lead equation because of the frequency of its use in production function analysis. Allocative efficiency denotes the ability of farm firms to equate the marginal value product of a factor to its unit price. Mathematically, a farm is allocatively efficient if MVPxi = Pxi or

MVPxi / Pxi = 1 .....eqn. (2)

Where
MVPxi (i= 1, 2 ...5) = marginal value product of the ith factor
Pxi (i= 1, 2 ...5) = the unit price or marginal factor cost (MFC) of the ith factor.

Productivity of Resources

The marginal value product (MVP) of each resource was computed in order to determine the productivity of resources. The MVP is the marginal physical product (MPP) multiplied by the product price. The MPP of a variable factor input is the partial derivative of the production function with respect to that factor. It may also be defined as the slope of the total product curve. The MPP may be positive, zero, or negative.

For the double log function: Log Q = bo + b1logX1 + b2logX2...eqn. (3)

MPP1 = b1 Q / X1, MPP2 = b2 Q / X2

In this study the dependent variable; (the gross farm output) was measured in naira terms. Also the variable factors of production; except land and labour were measured in naira terms (see equation 1). Thus the marginal product (MP) is in monetary terms and the output price (Py) becomes irrelevant (Onyenweaku et al., 1996, Anyanwu, 2003; Ohajianya et al., 2004). Accordingly the marginal value products will be directly equal to the allocative efficiency indices for all factors except land, and labour. This is because the marginal value products are already deflated by the unit factor prices. The price of capital input is taken as one naira plus the relevant interest charge (Anyanwu, 2003). Thus for X_3 and X_4 that are measured in naira terms

Wij = Pyfi = MVPxi .....eqn. (4)

Variables remain as previously defined.
Optimal allocative efficiency is confirmed with respect to a given input if Wij = 1.

If Wij > 1, the resource is under utilized. Efficiency could therefore be increased by an increased use of that particular input. However If Wij < 1, the resource is over utilized hence a reduced use of that input is desirable to increase efficiency.

To show the extent to which a particular factor of production should be increased or withdrawn from current use to achieve the objective of profit maximization, the formulae below were used;

Kij = (1- Wij) 100 .....eqn. (5)

Where Kij is the required percentage change in allocative efficiency and Wij is as defined before.

If equation (5) is evaluated, a negative percentage implies that an increased employment of the factor is required. A positive percentage implies that a withdrawal of some of the factors from current use is required. If Kij equals zero, then optimal allocative efficiency has been achieved for that input.

3. RESULTS AND DISCUSSSION

In the double log model labour input, expenditure on cocoyam seeds and capital inputs possessed the expected positive signs. This implied that increase in man days of labour, expenditure on improved planting materials and capital inputs would lead to increase in the gross income of the cooperative cocoyam farmers in Rivers State, Nigeria. Farm size was inversely related to gross income implying that possibly a reduction of the type of farm land used could increase gross income. Ojimba, Akintola, Anyanwu and Manilla (2014) discussed crude oil pollution effects on crop lands in Rivers State, Nigeria and found out that crude oil spillage on farm lands had detrimental effect on crop production in Rivers State, Nigeria and affirmed that crude oil spillage reduces land productivity (Ekundayo, et al., 2001, Saier 2006, Okonwu, 2010). The usage of such lands should be reduced in order to increase output of cocoyam production in Rivers State.

Expenditure on seeds was statistically significant at 1% level of probability. This implies that increase in expenditure on improved planting materials would significantly increase the gross income of cooperative cocoyam farmers in Rivers State, Nigeria. Value of planting materials and capital inputs were also statistically significant at 5% level of probability with elasticity of response of 0.270 and 0.495 respectively. This implies that among the cooperative farmers, value of planting materials and capital inputs were the statistically significant determinants of output in Rivers State, Nigeria. Reardon et al., (1997) argued that the productivity – enhancing potential of planting materials is dependent not only on the development of appropriate varieties but also on programs that multiply and market the planting materials in such a manner that ensures quality, availability and affordability. This result is consistent with Obasi (2005) that planting materials were among the significant determinants of agricultural productivity in Imo State, Nigeria. The result also agreed with Anyanwu and Iyagba (2009) in Rivers State, Nigeria.

The independent variables jointly explained about 64.4% of the total variations in the gross income of cooperative cocoyam farmers thus attesting to the goodness of fit of the data (table 1).

Table 1 Estimated Production function for Cocoyam Farmers in Rivers State, Nigeria

Explanatory Variable	Linear	Semi log	Double Log	Exponential function
Constant	-25275.6 (-0.996)	-1.867E6 (-4.969)	1.098 (1.861)	-1.867E6 (-4.967)
Farm Size	-8843 (-0.828)	-71869 (-0.413)	-0.095 (-0.348)	-71869.0 (-0.413)
Labour Input	1110.9 (0.996)	24294.1 (0.114)	0.502 (1.495)	24294.1 (0.114)
Expenditure on Seeds	23.3 (12.83)***	266813.2 (3.569)***	0.270 (2.300)***	266813.2 (3.569)***
Capital input (Depreciation etc)	0.825 (2.348)**	240525.6 (3.070)**	0.495 (4.024)***	240525.6 (3.070)***
R2	0.927	0.59	0.644	0.59
F-ratio	111.89	12.589	15.810	12.589

** = Significant at 5%, *** = Significant at 1%, Figures in parenthesis are t-ratios.
Source: Field Survey 2015.

Productivity of Resources

The estimates from the Cobb-Douglas model are direct elasticities. For instance, the estimated coefficient for expenditure on seeds is 0.270. This implies that if uses of cocoyam seeds are increased by one Naira, holding other variables constant, the output of cocoyam will increase by 0.270. Similarly, if the use of capital inputs were increased by one Naira the output of cocoyam will increase by 0.495. The double log estimates were used in the computation of marginal value products (MVP) of resources and in determining the level of optimality in resource utilization. The output was measured in value terms, thus MPP is equal to MVP for all resources except hectares of farm lands and man days of labour. Following Ohajianya et al., (2004) and the information in Table 2, the MVP is calculated as:

MVP = bi (Qij / Xij)

Where
bi = output elasticity or regression coefficient for double log model.
Qij = Geometric mean of output
Xij = Geometric mean of input.

The results of the MVPs are presented in Table 2

Table 2 Allocative Efficiency Indices of Cocoyam Cooperative Farmers in Rivers State, Nigeria

Item	Farm land	Labour input	Expenditure on Seeds	Capital inputs	Output	Returns to Scale
Production elasticities	-0.095	0.502	0.270	0.495		0.765
Geometric mean of inputs and output	2.9575	34.2	3815.4	23243	94638	
Marginal Value product (MVP)	(3039.9)	1389.1	6.697	2.015		
Marginal Factor cost (MFC)	N25000	N4000	N20	N1.22		
Allocative Efficiency indices	(0.1215)	0.3472	6.697	2.015		
Percentage changes in Allocative efficiency index	87.85	65.28	-569.7	-101.5		

Results of allocative efficiency indices for expenditure on seeds (6.697), and capital inputs (2.015), shows that the MVP> MFC, implying underutilization of expenditures on improved planting materials and capital inputs in Rivers State by the cooperative cocoyam farmers.

The allocative efficiency indices were not found to be equal to unity confirming the existence of resource use disequilibria by the cooperative cocoyam farmers in Rivers State, Nigeria. This implies that the cooperative cocoyam farmers in the State operated sub-optimally and hence a scope exists for improvement by re-allocating the resources more efficiently. For optimality, to be achieved, the cooperative cocoyam farmers need to increase expenditure on improved cocoyam seeds by as much as 569.7%. Similarly, capital inputs should be increased by 101.5% in order to achieve optimal allocative efficiency. Results of analysis of returns to scale in Table 2, shows that the total sum of elasticity of production with respect to all significant explanatory variables was 0.765, which implies that production was in the stage two or rational region of the production function, i.e. decreasing but positive marginal benefit for the cooperative cocoyam farmers. The result for the return to scale showed that if all the variables included in the model were simultaneously increased by I unit, output would increase by 0.765.

4. SUMMARY, CONCLUSION AND RECOMMENDATION

The existence of resource use disequilibria was apparent in the study area. Expenditure on planting materials and capital inputs were the statistically significant determinants of the maximized gross income of the cooperative farmers. A wide scope still abounds for improvement in resource allocation to increase output. For instance while optimal resource allocation of planting materials requires further use of about 569.7% of the existing ones, a total of 101.5% of capital inputs is needed for the same purpose. It is therefore recommended that governmental agencies responsible for the provision of and access to improved planting materials be strengthened. Credit liberalization in favour of cooperatives is also advocated to enable them purchase the requisite planting materials and capital inputs.

REFERENCE

1. Adeyemo R. (1994). A comprehensive study of cooperative and non-cooperative farmers in the use of resources in Nigeria. Rural Dev. Admin. 1:52 – 62.
2. Agbo E. U. (2009). Farmers' perception of cooperative societies in Enugu State, Nigeria. *Journal of Tropical Agriculture, Food, Environment and Extension*, 8(3):169 - 174.
3. Amalu (2000) Principles of Agricultural Cooperative .Nigeria Journal of Cooperative Studies Vol (2) No 1 pp 25-30.
4. Anyanwu, S.O. (2003). Window into the pattern of resource allocation in the compound and non compound farms in Imo State. *Journal of Vocational Education and Technology*, 1(1), 57-66.
5. Anyanwu, S.O. and Iyagba, A.G. (2009). Resource productivity and efficiency among cassava farmers in Rivers State, Nigeria. *Journal of Agriculture, Forestry and Social Sciences* (JOAFSS), 7(1), 1-11.
6. Central Bank of Nigeria (2003) *Contemporary Economic Policy Issues inNigeria*. In Nnanna, O.J., Alade, S.O and Odoko, F. O. (eds). Kas Arts Services, Nigeria.
7. Dayo, P., Ephraim N., Omobowale A. O. and John P. (2009). Constraints to Increasing Agricultural Productivity in Nigeria: A Review: Nigeria Strategy Support Program (NSSP) Background Paper No NSSP 006. International Food Policy Research Institute, Abuja, Nigeria. pp. 1-72.
8. Ekundayo, E.O. T.O. Emede, D.I. Osayande (2001) Effects of crude oil spillage on growth and yield of maize (*Zea mays*. L) in soils of mid western Nigeria. Plant Food Hum. Nutrition. (Quantitas Platinum) 56(4):313-324.
9. Holloway, G, Nicholson C. Delgado C. Staal S. and Ehui S. (2000). Agro-industrialization through institutional innovation: Transaction costs, cooperatives and milk-market development in the East-African highlands. *Agricultural Economics* 23(3):279-288.
10. Ibezim, G. M. C.; Okoroigwe L. C. and Ijioma J. C. (2010). The contribution of farmer cooperative societies to agricultural production in Ikwuano Local Government Area of Abia State J. A. Akinlade, A. B.Ogunwale, V. O. Asaolu, O. A. Aderinola, O. O. Ojebiyi, T. A. Rafiu, T B. Olayeni and O. T. Yekinni (eds). Proceedings of the 44th Annual Conference of the Agricultural Society of Nigeria Ladoke Akintola University of Technology, Oyo State Nigeria, 18 – 22 October 2010, pp. 69 -72.
11. Igwe, K. C.; Onyebinama U. A U. and Nwabueze S. C. (2009). Determinants of the level of cooperativeaccess to credit in Umuahia South Local Government Area of Abia State, Nigeria. *Nigerian Journal of Rural Sociology* 9 (1): 33 - 36.
12. Kehinde, A. L.; Ayandiji A, Awoniji O. A and Akiwumi M. T. (2009). Effects of farmers' cooperative on agricultural production in Ejigbo Local Government Area of Osun State: Implications for Agricultural policy. *Nigerian Journal of Rural Sociology, 9(1): 89 - 94.*
13. Matungul, P. M. Lyne M. C. and Ortmann G. F. (2001). Transaction costs and crop marketing in the communal areas of Impendle and Swayimana, KwaZulu-Natal. *Development Southern Africa* 18(3):347-363.
14. Ohajianya, D.O. and D.O.Onu (2004) "Economics of Fertilizer Use in Vegetable Production in Nigeria" *Trop. Agric. (Trinidad)* Vol. 81. No. 4, pp 253-258.
15. Ojimba, T.P., Akintola, J., Anyanwu, S.O., and Manilla, H.A.(2014). An economic analysis of crude oil pollution effects on crop farms in Rivers State, Nigeria. *Journal of Development and Agricultural Economics,* 6 (7), 290 – 298.
16. Okonwu, K.J.O.Amakiri, M.M. Etukudo, S.M. O.sim, and A.A.J.Mofunanya (2010). Performance of maize in crude oil treatment. Glob J. Pure Appl. Sciences 16:173-176.
17. Onyenweaku, C. E., Obasi, P.C., & Anyanwu, S.O. (1996). Production Relationships among Compound and Non Compound Farms in Imo State, Nigeria. *Journal of Applied Science in Southern Africa*. 2(1), 31-36.
18. Reardon, T. V. E. Kelly; T. Crawford, K. Savadogo and D. Clay (1997) *Determinants of Farm Productivity in Africa: A Synthesis of four Case Studies. Technical Paper No. 75, SD Publication Services. Office of Sustainable Development Bureau for Africa. U.S. Agency* for International Development USAID. Pp1-42.
19. Spore, (2008). New Technologies for Maize. Technical Centre for Agriculture and Rural Co-operation (CTA), CTA Publications No. 138, December 2008, The Netherlands. pp. 2-13.
20. World Bank (1989). Principles of cooperative education for developing countries, World Bank Washington, D. C. pp 1-24.