Current Research Journal of Economic Theory 5(3): 38-43, 2013
DOI:10.19026/crjet.5.5523
ISSN: 2042-4841, e-ISSN: 2042-485X

Submitted: Dec 08, 2010 Accepted: May 18, 2011 Published: September 20, 2013

Research Article

Technical and Economic Efficiency of Palm Oil Marketing in the Niger Delta Region of Southern Nigeria

Nkasiobi Silas Oguzor
Department of Agricultural Education, Federal College of Education (Technical),
Omoku-Rivers State, Nigeria

Abstract: This study examined the structural performance and productive efficiency of palm oil marketing in some selected States in Southern Nigeria. Eighty districts were selected in the Niger Delta Area and data were collected from 1000 palm oil sellers randomly selected in these towns. The tools of analysis were marketing margin, Lorenz curve and Gini coefficient to measure the structural performance while the productive efficiency was measured with the use of the production function analysis using the OLS multiple regression analysis to estimate the parameters of the production function equations. All these phenomena portend a high poor structural performance in the system. The productive efficiency measurement showed that palm oil marketing was in stage one of the production surface in the area and this implies inefficient allocation and utilization of resources. Therefore palm oil marketing in the study is though profitable was grossly inefficient from the view point of market structure and productive efficiency analysis.

Keywords: Efficiency, marketing, Nigeria, palm oil

INTRODUCTION

Nigeria, as a developing country, has expanding production both in the urban and rural areas. The population growth rate is 3.5% per annum, while the food production rate is 2.5% per annum. The significant imbalance between food production and the expanding population has resulted in an ever-increasing demand for agricultural products. It has also placed a serious stress on the marketing and production systems, especially the marketing of foodstuffs.

One of the major problems facing developing countries in the tropics is the production of sufficient food, fuel, fibre and shelter for their population. The problem of eliminating hunger is now a big challenge especially in third world countries and sub-Saharan Africa in particular.

One of the prerequisites of economic progress is increased agricultural productivity. This is particularly true of Nigeria, a developing country, where a large proportion of the population lives in the rural areas and depends on primary production. One of the widely suggested strategies for increasing agricultural productivity is a combination of measures designed to increase the level of farm resources as well as make efficient use of the resources already committed to farm sector.

The diffusion of managerial skills has not been observed, while the expected increase in productivity has not commensurate with the level of incentives and other financial support given to them. It should be noted that productivity enhancement can be achieved through the use of improved technology and improvement in efficiency of resource use (Omotayo *et al*., 2001). Given the low rate of adoption of yam technologies by farmers, improvement in efficiency remains the most cost effective way in enhancing productivity in the short run. Improving efficiency of resource use in food production by farmers will require knowledge of their current efficiency levels as well as identification of some policy variables that can be tinkered with bringing improvement. Even though Nigeria has the potential resources to produce more food than the current population requires, factors like biological, economical, socio-cultural and climatic which is beyond the control of the farmer have continue to tamper production. Low crop yield, high cost of labour, late or inadequate inputs to farmers, use of indigenous or unimproved crop varieties and breeds of livestock, poor marketing system, low technology and limited ratio of extension workers to farmers are some of the associated problems with agriculture since the Colonial period.

Prior to the advent of the oil boom in the early 1970's, agriculture was the backbone of Nigeria's economy and the country was self-sufficient in food production. However, with the advent of the 'oil boom', agriculture became relegated both in attention and in contribution. Consequently, ever-growing demand for

food has remained a major challenge. In 1994, food consumption accounted for approximately 50% of a household's total expenditure, but the proportion increased to 72% in 1995. A rapidly growing population exerts pressure on the increased demand for food. Yields are low as a result of inefficient production techniques manifested in technical and allocative inefficiencies, over-reliance on household resources, labour-intensive agricultural technology and rapidly declining soil productivity. The need to improve the efficiency in food crop production so that output could be raised to meet the growing demand has become imperative.

Most studies show that aggregate food production in Nigeria has been growing at about 2.5% per annum while the annual rate of population growth has been as high as 2.9% (Olayemi, 1998). The reality of the circumstance is that, food supply has not kept pace with demand even though Nigeria, with a population of over 100 million people and about 93 million hectares of land has about 70% of this population engaged in agriculture (National Population Commission (NPC), 1992). Consequently, greater emphasis is inevitable upon making efficient utilization of the existing resources and combining the enterprises in an optimal manner.

An attempt aimed at increasing the efficiency in food crop production could lead to the resolution of the food crisis, improvement of farm income earned by farmers, reduction in their poverty level and meeting their usually multiple goals of production. This study investigates the technical efficiency of Palm Oil marketers in the Niger Delta region of Nigeria.

CONCEPTUAL FRAMEWORK

Agricultural marketing is the performance of all business activities involved in the flow of food products and services from the point of initial production until they are in the hands of consumers (Kohls and Joseph, 1985). It is the process of satisfying consumers' needs, by transforming, storing and transporting agricultural products from the point of initial production to the consumers in the proper form, time and place. In other words, marketing creates time, form, place and possession utilities. The basic physical processes or services required to produce these utilities are called marketing functions. These functions are exchange, physical and facilitating functions (Adekanye, 1988) and they are carried out by middlemen who constitute the marketing channels. These middlemen are categorized as, on the farm collectors or country buyers, wholesalers and retailers (Adegeye and Dittoh, 1985). The activities of these middlemen in the agricultural marketing of rural economies are exploitative and harmful.

Agricultural marketing is efficient when the market price is close to the equilibrium price, the market is near purely perfect competitive market and there is efficient and economical services and ownership transfer in the movement of commodities from sellers to buyers.

Previous studies on efficiency of farm can be classified broadly into the following three categories; namely, deterministic parametric estimation, non-parametric mathematical programming and the stochastic parametric estimation (Udo and Akintola, 2001). The use of non-parametric techniques are limited in efficiency measurement in agriculture despite the fact that non-parametric methodologies can be used in situation where data is more limited and where production technologies are less well understood (Llewelyn and Williams, 1996).

Econometric modeling of stochastic frontier methodology of Aigner *et al*. (1977) associated with the estimation of efficiency has been an important area of research in recent years. Basically, the studies are mostly based on Cobb-Douglas function and transcendental logarithmic (translog) functions that could be specified either as production function or cost functions. The first application of stochastic frontier model to farm level agricultural data was by Battesse and Corra (1977). But technical efficiency of farms was not directly addressed in the study. Kalirajan (1981) estimated a stochastic frontier Cobb-Douglas production function using cross-sectional data and found the variance of farm effects to be a highly significant component in describing the variability of rice yield. Bagi (1984) used the stochastic frontier Cobb-Douglas production function model to investigate whether there were any significant differences in the mean technical efficiencies of part-time and full-time farmers. Results showed no apparent significance, irrespective of whether the part-time and full-time farmers were engaged in mixed farming or crops-in only.

Bagi and Huang (1983) estimated a translogarithmic stochastic frontier production function and found technical efficiencies to vary from 0.35 to 0.92 for mixed farms and 0.52 to 0.91 for crop farms. Kalirajan and Flin (1983) assumed a translogarithmic stochastic frontier production and by maximum likelihood estimation, the parameters were estimated and individual technical efficiencies ranged from 0.38 to 0.91. They went further to regress the predicted technical efficiencies on several farm-level variables and farm-specific characteristics. In most of the studies, it was found that the Cobb-Douglas stochastic frontier does not provide an adequate representation for describing the data given the specification of a translog model.

The analysis of efficiency is generally associated with the possibility of farms producing a certain

optimal level of output from a given bundle of resources at least-cost. Farrel (1952) distinguishes between three types of efficiency:

Technical efficiency: Which is the physical ratio of product output to the factor input. The greater the ratio, the greater the magnitude of technical efficiency.

Allocative or price efficiency: A firm is allocatively efficient when production occurs at a point where the marginal value product is equal to the marginal factor cost.

Economic efficiency: Obtains where both technical and allocative efficiencies have been attained.

The achievement of either technical or allocative efficiency is a necessary but not a sufficient condition to ensuring economic efficiency. He suggested a method of measuring technical efficiency of a firm in an industry by estimating the production function of firms which are 'fully efficient' (i.e., a frontier production function).

The marketing of foodstuffs in Nigeria is faced with a lot of problems, which include:

- Lack of efficient pricing of the foodstuffs which reduces producers and consumers to just mere price takes while the middlemen become the centre price in the distributive business.
- Inadequacy of transport facilities, such as, insufficient vehicles to carry products from the farms to the various markets, bad roads and inadequacy of feeder roads between farms and rural markets. Inefficient transport facilities have caused perishable products to be left to waste away or attract low prices at points of production.
- Inadequate storage and credit facilities.
- Other problems are lack of uniform weights and measures, adulteration of produce, inadequate research on marketing and lack of information about production and marketing.

These problems are crucial to the performance of marketing of agricultural food production in Nigeria especially palm oil.

Palm oil is the most valuable natural oil in the diet of Nigerians (FDA, 1985) and it is also an important raw material in the soap and related products industry. Its production is mostly in the hands of small scale resource poor farmers (Seyoum *et al*., 1998) and its distribution is in the hands of large number of exploitative middlemen who pay producers prices for below what the consumers pay for the product. This dampens the producers' incentive to raise output through adopting improved techniques and practices.

This study examined the performance of the palm oil marketing in some selected areas of the Niger Delta region of Nigeria, with a view to empirically measuring its productive efficiency and determining the degree of palm oil sellers' concentration as a measure of market structural performance.

METHODOLOGY

The data used in this study cam from sample survey of palm oil sellers in some selected local Government areas of the Niger Delta States of Nigeria. The Niger Delta region is the oil producing and treasure base of Nigeria. The local government areas are basically rural since the entire population's major occupations are centered on production of primary products.

The study focused on palm oil sellers in eight towns and villages in the area. The areas are Omoku, Egbema, Etche, Emohua, Eleme, Ahoada and Omuma.

Primary data were collected using structured questionnaire administered on 1000 palm oil sellers that were randomly selected from the eight towns. Data were collected on sales earnings from palm oil offered for sale in naira and inputs involved. These inputs are, experience in years (X_1), cost of purchase (X_2), cost of transportation (X_3), credit facilities in naira (X_4), storage facilities as dummy variable (X_5),

The analytical tools used in measuring the palm oil market structure are the marketing margin analysis, Lorenz curve and its adaptation of Gini coefficient analysis.

The productive efficiency of the inputs involved in palm oil business is measured using the production function analysis with the use of ordinary least squares multiple regression analysis under the assumption that data collected fulfilled the assumptions of multiple regression model. These assumptions include absence of multi collinerarity among independent variables, normally distributed error term N (O, o_2) and non-auto regression disturbance (Aderinola, 1997).

The Lorenz curve is obtained by plotting the cumulative proportion of the palm oil seller from the smallest number to the largest against the cumulative proportion of their sales earnings, (Dillon and Hardaker, 1993). If the distribution is totally equitable the curve will fall on the 45° line. The greater the inequality.

Mathematically, the Gini coefficient:

$$G.C-1-\sum TZ$$

where, $\sum TZ$ is the summation of the production of the cumulative proportion of the palm oil sellers (T) and the cumulative proportion of their earnings (Z). Gini coefficient greater than 0.35 are high and indicating inequitable distribution (Dillon and Hardaker, 1993). In other words, higher Gini coefficient means higher level of concentration and consequently high inefficiency in the market structure.

The production function is a bio-physical concept which indicates the physical quantities of output and the set of inputs used to produce the output. In its explicit from the Cobb-Douglas functional model used for this study is of the form:

$$Y_i = b_0 X^{b1}{}_{1i} X^{b2}{}_{2i} X^{b3}{}_{3i} X^{b4}{}_{4i} X^{b5}{}_{5i} Ui$$

where,

Y_i = The sales earnings from the sale of palm oil by the ith seller in naira
X_1 = Experience of palm oil sellers in years
X_2 = Cost of purchase of palm oil in naira
X_3 = Total cost of transporting palm oil to the market
X_4 = Credit facility taken in naira
X_5 = Effect of storage on sales earning (Dummy variable 11 for storage and 10 otherwise)
U_i = Error term which was assumed to be normally distributed with zero mean and constant variance.
b's = Parameters to be estimated.

For ease of estimation, the Cobb-Douglas equation was linearised to a double log form. The estimated parameters were statistically evaluated on the basis of R-squared (R^2), adjusted R^2 (R^2), t-ratio, signs and magnitude of the regression coefficients before subjecting the estimates to further economic analysis.

RESULTS AND DISCUSSION

The summary of the values of the variables used in the analysis is presented in Table 1.

Margin analysis: The gross and marketing margins analysis are presented in Table 2. A gross margin of 37.21% of sales receipts or 59.26% of total variables cost shows that palm oil marketing is a profitable business in the study area.

The marketing margin represents the price paid for a collection of marketing services and its size reflects the structural efficiency of the marketing system (Ahmed and Rustagi, 1987). A high marketing margin indicates inefficiency because a high cost is incurred in the provision of the marketing services. For this study, a marketing margin of 40.45% of sales receipts or 64.42% of total variable cost is very high and therefore implies that palm oil market is structurally inefficient in the area.

Distributed of palm oil sellers: Table 3 gives the distribution of the palm oil sellers by yearly sales and number of sellers in each category.

A high Gini coefficient of 0.7 implies that there is a significant inequality in the distribution of income among the sellers and hence a high of concentration, which is a reflection of inefficiency of the palm oil, markets structure.

Economic analysis and results: The regression coefficients and related statistics are summarized in Table 4. The estimated regression coefficients carry positive signs, which imply they all have direct relationship with the dependent variable. That is, increasing their use would still lead to increase in sales earnings.

Table 1: Summary statistics of the variables for palm oil sellers

Variables	Mean	S.D.	Min. value	Max. value
Sales earning Y	112765.05	183793.42	1650	1687500
Experience in years (X1)	14.30	11.90	1	50
Cost of purchase (X2)	67441.06	114537.30	980	1062500
Cost of transportation (X3)	4653.85	6850.47	45	30000
Credit facilities (X4)	6885	13551.22	0	80000
Storage facilities (X5)	10.77	0.42	10	11

Computed from survey data 2008

Table 2: Gross and marketing margins of palm oil sellers

Function	Charge/Cost (N)	% of scale receipt	% of total variable
Acquisition price	6800126	59.58	97.84
Transportation cost	340185	2.98	0.05
Interest on loan	29805	0.26	0.004
Total variable cost	7170116	62.79	100.00
Sales receipts	11414181	100.00	159.20
Marketing margin	4619055	40.45	64.42
Gross margin	4249065	37.21	59.26

Computed from survey data, 2008

Table 3: Distribution of palm oil sellers by yearly sales

Sales (N)	No. of sellers	Proportion	Cumulative sellers (T) proportion
1-50, 000	42	0.42	0.42
50,001-100,000	22	0.22	0.64
100, 001-150, 000	14	0.14	0.78
150, 001-200, 000	9	0.09	0.87
200, 001-250, 000	6	0.06	0.93
250, 001-300,000	2	0.02	0.95
350, 001-400,000	2	0.02	0.97
400, 001-450, 000	2	0.02	0.99
450, 001 and above	1	0.01	1.00
Total	1000	1.00	1.00

The R^2 value shows that 81.3% of the variability in the dependent variable is explained by the independent variables. While the other unexplained variations are due to non-inclusion of other relatively important variables in the equation.

Table 5 illustrates the computation of the partial influence of the inputs on the output, the elasticities of production (CP) and the Returns to Scale (RTS).

The values of the MP show that if each of the inputs is increased while keeping others constant the total output would increase by the value of each of the MP.

Also, the elasticity of production of each of the inputs implies that each obeys the law of Diminishing Marginal Returns (DMR). The RTS of 1.0978 indicates that production is in the increasing returns region or stage one of the production surface. The sellers could still improve on their earnings by the more efficient utilization of the inputs involved except input X^2 (cost of purchase). This further confirms that

Table 4: Coefficients and related statistics

Function	Intercept	X_1	X_2	X_3	X_4	X_5	F	R^2	R^2	S.E
Double	1.4576	0.0417	*0.5973	*0.2446	0.1169	0.0973	81.799	0.8131	0.8032	0.471
Log		(0.68)	(8.545)	(4.37)	(0.869)	0.078				

Figures in parentheses are t-ratios; *: Statistically significant at 1% level; +: F-value significant as 5% level; Computed from survey data 2008

Table 5: Marginal product, elasticities and Returns to Scale (RTS)

Variable	Elasticities (ep)	MP
X_1	0.04170	328.83
X_2	0.5973	1.00
X_3	0.2446	5.93
X_4	0.1169	1.915
X_5	0.0973	1018.76
RTS	1.0978	

Competed from survey data 2008

the palm oil market is inefficient technically in the study area.

CONCLUSION

The study looked at performance of palm oil marketing in some selected areas of the Niger Delta region of Nigeria. It measured the degree of sellers' concentration as a measure of market structural efficiency and also measured the productive efficiency of the inputs involved in the business. The market structure was measured mainly using the marketing margin analysis and sellers' concentration using the Lorenz curve and Gini concentration.

The study revealed a high proportion of marketing margin of 40.45% of sales receipt or 64.42% of total variable cost. The seller's concentration showed a high Gini coefficient value of 0.70. The high marketing margin, high Gini coefficient and high-income inequality of sellers, are all associated with poor market performance.

The technical and productive efficiency as measured by the production function analysis showed that palm oil marketing in the area was in the stage one of the production surface and thus there was inefficient allocation and utilization of the production inputs. Hence, palm oil marketing in the study area though profitable is however grossly inefficient from the viewpoint of market structure and productive efficiency analysis.

REFERENCES

Adegeye, A.J. and J.S. Dittoh, 1985. Essentials of Agric. Econs Published by CARD, University of Ibadan, Nigeria.

Adekanye, T.O., 1988. A Rice Grading Scheme for Nigeria. In: Adekanye, T.O. (Ed.), Readings in Agric Marketing Lagos, Longman, Nigeria.

Aderinola, E.A., 1997. Economics of upland rice production in Ondo State of Nigeria. Appl. Trop. Agric., 2(2): 152-159.

Ahmed, R. and N. Rustagi, 1987. Marketing and Price Incentives in African and Asian Countries: A Comparison. In: Elz, D. (Ed.), Agricultural Marketing Strategy and Pricing Policy. The World Bank, Washington, DC, pp: 104-118.

Aigner, D.J., C.A.K. Lovell and P. Schmidt, 1977. Formulation and estimation of stochastic frontier production function model. J. Econ., 6: 21-37.

Bagi, F.S., 1984. Stochastic frontier production function and farm level technical efficiency of full-time and part-time farms in West Tennessee, N Cent. J. Agric. Econ., 6: 48-55.

Bagi, F.S. and C.I. Huang, 1983. Estimating production technical efficiency for individual farms in Tennessee. Can. J. Agric. Econ., 31: 249-256.

Battesse, G.E. and G.S. Corra, 1977. Estimation of a production frontier model: With application to the pastoral zone of Eastern Australia. Aust. J. Agric. Econ., 21: 169-179.

Dillon, J.L. and J.B. Hardaker, 1993. Farm Management Research for Small Farmer Development. FAO, Rome.

Farrel, M.J., 1952. The measurement of productive efficiency. J. Roy. Stat. Soc. A Sta., 120: 253-281.

FDA (Federal Department of Agriculture), 1985. 11th Annual Reports of Monitoring and Evaluation Unit of FDA. Retrieved from: books.google.com.pk/ books?id = XxS3AAAAIAAJ.

Kalirajan, K., 1981. An econometric analysis of yield variability in paddy production. Can. J. Agric. Econ., 29: 283-294.

Kalirajan, K.P. and J.C. Flin, 1983. The measurement of farm-specific technical efficiency. Pak. J. Appl. Econ., 2: 167-180.

Kohls, R.L. and N.U. Joseph, 1985. The Marketing of Agricultural Products. Macmillan, New York.

Llewelyn, R.V. and J.R. Williams, 1996. Non-parametric analysis of technical and scale efficiencies for food production in east Java. Indonesian J. Agric. Econ., 15: 113-126.

National Population Commission (NPC), 1992. National Population Census 1991. Abuja. Nigeria, pp: 12.

Olayemi, J.K., 1998. Food security in Nigeria. Research Report No. 2, Development Policy Centre, Ibadan, Nigeria.

Omotayo, A., O.D. Chikwendu and K. Adebayo, 2001. Two decades of world bank assisted extension services in Nigeria: Lessons and challenges for the future. J. Agric. Educ. Extension, 7(3): 143-152.

Seyoum, E.T., G.E. Battese and E.M. Fleming, 1998. Technical efficiency and productivity of maize farmers in Eastern Ethiopia: A study of farmers within and outside the Sasakawa-global 2000 project. Agric. Econ., 19: 341-8.

Udoh, E.J and J.O. Akintola, 2001. Land Management and Resource Use Efficiency among Farmers in South Eastern Nigeria. Award Winning Paper Presented to the African Real Estate Society and the Rics Foundation: Elshadai Global Ventures Ltd., pp: 20-32.