Journal of Sustainable Development in Africa (Volume 14, No.5, 2012)
ISSN: 1520-5509
Clarion University of Pennsylvania, Clarion, Pennsylvania

ECONOMICS OF SMALL-SCALE AGRO-ENTERPRISES IN NIGERIA: A CASE STUDY OF GROUNDNUT PROCESSING AMONG RURAL WOMEN IN KWARA-STATE

Abdulazeez Muhammad-Lawal, Jubril Olayinka Animashaun and Ademola Solomon Towoju
Department of Agricultural Economics and Farm Management,University of Ilorin, Ilorin, Nigeria

ABSTRACT

This study was designed to carry out an analysis of the profitability and technical efficiency of groundnut processing among rural women in Kwara State, Nigeria. A three-stage sampling technique was adopted in collecting the data used for the study from a sample of 120 women groundnut processors. Descriptive statistics, Gross Margin Analysis and Stochastic Frontier Model were used to analyze the data. The study revealed that 44.2% of the processors did not have formal education and relied mostly on traditional tools and equipment for processing groundnut. The net return to groundnut processing was estimated at N4, 643.28 (US$ 31) per 50kg of raw groundnuts. The mean technical efficiency of groundnut processing was estimated at 88.26%. The major factors affecting the efficiency of groundnut processing were farming experience and household size. Based on the findings, and given the relative economic sustainability of the enterprise, this study recommends the need for the policy makers to organize entrepreneurial training programs especially the new entrants among the processors in order to update their skills and improve their efficiency. The processors should also be assisted with easier access to processing equipment that would enable them to carry out the activities with smaller labour personnel requirements thereby enhancing its sustainability.

Keywords: Value Chain, Profitability, Technical Efficiency, Groundnut oil, Kwara State

INTRODUCTION

Groundnut, or peanut, commonly called the poor man's nut is an important oilseed and food crop for millions of people in the semi-arid tropics. It generates employment on the farm during cultivation and in agro-processing (CGIAR, 2005). It is the 13th most important food crop of the world and the 4th most important source of edible oil. Its seeds contain high quality edible oil (50%), easily digestible protein (25%) and carbohydrates (20%) (FAO, 1994). As such, it is an essential food product that enjoys good patronage in both the domestic and international market as a veritable source of edible oil, animal feed and also consumed as snacks (Nnamdi, 2010). Nigeria is the fourth largest producer of groundnut with a proportion of 4.5% of the total world production (FAO, 1994). It follows China, India, and USA with 41.5%, 18.2% and 6.8% respectively of total world groundnut production (Trade Invest Nigeria, 2010; USDA 2008/2009). In West-Africa, Nigeria produces 41% of the total groundnut production (Echekwu and Emeka, 2005).

Groundnut processing is basically the transformation of the primary agricultural products (raw groundnut) into other finished commodities like groundnut oil, cake and animal feed among others. Processing of groundnut perhaps the best area an investor can engage in with maximum utilization of the product. The milling of the product would yield edible oil which can be refined to get vegetable oil and groundnut cake which is a valuable input in the preparation of animal feed

and as such can be sold to animal feed millers. Therefore, groundnut processing can lead to reduction in food wastage, enhanced food security, improvement in livelihood of low income groups and empowerment of women especially in Nigeria where processing of groundnuts into various products is mostly done by women either for home or commercial consumption (Ibrahim *et.al.*, 2005, Practical Action, 2010).

The prospect of Nigeria's development particularly in relation to the attainment of the core goals of the Millennium Development Goals (MDGs) rests on sustainable agriculture. This is because sustainable agriculture encompasses the inter connectedness of environmental health, economic profitability, social and economic equity goals. International Labour Organization ILO (1990) estimated that food processing activities form the basis of nearly 30% of industrial output and 20% of employment under manufacturing in developing countries within the formal sector of the economy. In the context of agriculture-led development strategies for Nigeria, the development of a sustainable and vibrant food and allied manufacturing industries to conserve and convert enhanced agricultural output into maximized value-added products for global markets occupy a critical tactical niche.

Besides, increasing globalization, technological advances and changing consumers' socio-demographics have brought about expansion of urban areas leading to higher incomes, higher opportunity cost of time and therefore greater demand for agricultural food commodities. This might result into more competitive use of resources which may have dire consequence for sustainability, particularly for rural-based unsophisticated agro-enterprises. In view of the relevance of groundnut processing to small-scale agro-allied industry and economic development, this study examined the technical efficiency and profitability of small scale processing of groundnut in Kwara State, Nigeria. Specifically, the study estimated the costs and returns to groundnut processing; determined the technical efficiency of groundnut processors; and examined the determinants of technical efficiency of groundnut processors. Apart from serving as an indicator of the sustainability of the agro-allied enterprise, this study may also prompt the bringing back to life, the once vibrant groundnut era in Nigeria which would lead to an increased income and employment opportunities, generation of foreign exchange earnings, enhanced food sufficiency and improved standard of living for the teeming Nigerian population (Nnamdi 2010).

LITERATURE REVIEW

Conceptual Framework

Sustainable development can be defined as the growth that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nation Summit, 1987). Accordingly, providing the essential needs of the world poor and the need for the environment to be able to meet both present and future needs could be identified as the two major concepts emphasized in this definition. The international community has therefore endorsed these concepts as the guiding compass while countries undertook to add modifications to the definition. For instance, the Brazilian Government, recognized sustainable agriculture as a productive system for food and fibre that guarantees among other things, long-term maintenance of natural resources and agricultural productivity, the minimum of adverse impacts on the environment, adequate returns to producers; optimization of production with a minimum use of external inputs, satisfaction of human needs for subsistence and income, and attendance to the social needs of rural families and communities (Ministry of Environment, 1997). This integrated approach and modification proposed to the concept of sustainable development provides the basis for this study.

Analytical Framework for Technical Efficiency

As established in the literature, productivity growth can be segregated into technical efficiency change (TEC), technological change (TC) and scale or size efficiency change (SEC) (Coelli et al. 2005). This decomposition is important because TEC can be interpreted as a relative measure of managerial ability given technology, while TC leads to increases in productivity that arise from the adoption of new production practices and SEC relates to changes in unit costs associated with the growth in the size of the firm. Consequently, gains in TEC are derived from improvements in managerial ability, which in turn are related to a host of variables of which experience and education are included. By contrast, the driving force behind TC is investments in research and technology whereas SEC is determined by the ability of the firm to invest and procure new resources in order to expand its size (Moreira and Bravo-Ureta, 2009).

Two methods were developed from this conceptually based approach to efficiency measurement: Data Envelopment Analysis (DEA) (Charnes et al., 1978), which is non-parametric and based on a series of linear programming models, and Stochastic Frontier Analysis (SFA), which is a parametric approach applying econometric techniques to estimate efficiencies (Aigner et al, 1977; Meeusen and van der Broeck, 1977). The two aforementioned methods differ in handling of 'noise' (i.e., random shocks that are not associated to changes in farm level efficiency) within the observations and the method used to draw the frontier.

DEA uses actual data to draw a 'piecewise linear frontier' whereas SFA applies a particular functional form from the data to provide the shape of the frontier to envelope the data. However, DEA tends to be inadequate when applied to agriculture because it fails to remove the impact of stochastic events, e.g. weather, disease outbreaks etc., from the measure of technical efficiency. The stochastic frontier approach has found wide acceptance within the agricultural economics literature (Battese and Coelli,1992; Coelli and Battese,1995), because of its consistency with theory, versatility and relative ease of estimation. To derive the frontier, a production function can be estimated using a set of observations adopting a particular functional form for the production function (in the case of technical efficiency), such as the Cobb-Douglas or Translog Function. In this study, Battese and Coelli (1995) formulation for the stochastic production frontier was be employed. This encompasses the estimation of technical efficiency and allows the inclusion of explanatory variables within a one-stage estimation procedure.

METHODOLOGY

Study Area

The study was carried out in Kwara state. The location of Kwara State is as shown in Fig. 1.

Source: http://en.wikipedia.org/wiki/File:Nigeria_Kwara_State_map.png

Figure 1: Map of Nigeria showing the location of Kwara State

The state experience both dry and wet seasons, with an intervening cold and dry harmattan from December to January. The annual rainfall ranges between 1000mm to 1500mm, while average temperature ranges between a maximum of 30^0c to 35^0c and a minimum of 21.1^0c to 25^0c minimally. The vegetation is rainforest in some parts of the state and wooded in others. The climate and vegetable pattern coupled with sizeable expense of arable land make the state well suited for the production of wide varieties of crops with groundnut inclusive.

Sampling Technique

Two Local Government Areas (LGAs) noted for groundnut production and processing were purposively selected. The LGAs are Edu and Patigi. Data were collected through the use of structured questionnaire. A two-stage sampling technique was adopted for the selection of a total of 120 respondents used for the study. The first stage was a purposive selection of two LGAs namely Edu and Patigi noted for high level of groundnut processing in Kwara State. The second stage was random selection of 20 respondents in each of three districts that make up each of the two LGAs.

Methods of Data Analysis

Gross Margin Analysis:

Gross Margin (GM) analysis was used to analyse the costs and returns of groundnut processing in the study area. This was to allow for the determination of the profitability of the production.

GM was estimated as follows:

ATR – ATVC..... (1)

Where ATR = Average Total Revenue and ATVC = Average Total Variable Cost

Total Revenue includes the returns from groundnut oil and all other bi-products. ATVC includes cost of raw groundnuts, salts, water, pepper, firewood, and cost of other variable inputs.

Stochastic Frontier Model

The explicit empirical model specified for the study is follows:

$Y=\beta_o + \beta_1 \ln X_1+\beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \delta_o + \delta_1 \ln Z_1 + \delta_2 \ln Z_2$.....(2)

Where, Y = Output of the groundnut muffin (*Donkwa*) in Kg,

βo and δo are the constants,

X_1= Labour,

X_2= Fuel Consumption,

X_3= Membership of cooperation,

X_4=quantity of groundnut,

Z_1= Farming experience, and

Z_2= Household size.

RESULT AND DISCUSSION

Socio-Economic Characteristics of Respondents

This section presents the socio-economic characteristics of the respondents including education, marital status, sex, household size. The distribution of the respondents according to their socioeconomic characteristics is as presented in Table 1.

As shown in Table 1, 41.2% of the respondents had no formal education. While the majority had one form of formal education or the other, this study reveals that only one-tenth of he respondents had secondary education. This distribution indicated that majority of them were non-literate processors who could neither read nor write. This could affect their productivity as they may find it difficult to adopt new techniques in the processing activity.

Marital status of the respondents shows that the majority of the respondents were married. Only 5.6 percent of them were either widow and separated. The large population of married women in groundnut processing could lead to high family responsibility on the women and as such need to work extra hard to meet up with home and business challenges. Furthermore, most of the women processors (45%) had household size ranging from six to ten. Analysis of the distribution of household size of the respondents revealed that less than one-third (29.2%) of the respondents have household size that is not more than five people. This therefore implies that the women processors would have access to family labour especially for the tedious operations. However, lack of education on modern family planning may be responsible for such huge family size especially when the huge financial burden of such large household size were to be given any serious consideration. The distribution of the respondents according to their years of experience shows that majority (63.30%) of the women processor have been engaged in the enterprise for more than ten years. This implies that the processor are highly experienced in the enterprise and that introduction of any change in technology may be difficult to adopt.

Table 1: Distribution of the Respondents According to their Socioeconomic Characteristics

VARIABLES	FREQUENCY	PERCENTAGE
i. EDUCATIONAL STATUS		
No formal education	53	44.2
Quranic Education	24	20
Adult Education	9	7.5
Primary Education	22	18.3
Secondary Education	12	10
Total	120	100
ii. MARITAL STATUS		
Single	7	5.6
Married	92	76.7
Divorced	6	5
Widowed	9	7.5
Separated	6	5
Total	120	100
iii. HOUSEHOLD SIZE		
1 – 5	35	29.2
6 – 10	55	45.8
> 10	30	25
Total	120	100
iv. YEARS OF EXPERIENCE		
Less than 10	44	36.5
11 – 20	51	42.5
21 – 30	25	20.8
Total	120	100

Source: Field Survey, 2011

Occupational Characteristics of the Respondents

This section is based on the analysis of the respondents' occupational features including the role of groundnut processing as a source of their income, sources of their groundnut supply, membership of cooperative and access to credit. The distribution of the respondents according to their occupational features is as presented in Table 2.

Table 2 reveals the occupation of the respondents, credit and capital source and their use in groundnut processing. As shown in Table 2, about 59.2 percent of the processors are engaged in groundnut processing as a major source of income. Analysis of the reasons for groundnut processing revealed that 73.3 percent of the respondents are engaged in the activity as a business venture while about 26.7 percent were in groundnut processing for both sale and family consumption. About 40.8 percent of the respondents source their raw groundnut from the market while the remaining 59.2 percent sourced their raw groundnut from farms. About 11.7 percent sourced their groundnut from community farms while about

4.2 percent from cooperative farms. Equal percentage of 21.7 percent of rural women under study sourced their groundnut from personal as well as family farms.

Table 2: Distribution of Respondents According to their Occupation and Credit Source

VARIABLES	FREQUENCY	PERCENTAGE
i. GROUNDNUT AS MAJOR OCCUPATION		
Yes	71	59.2
No	49	40.8
Total	120	100
ii. OTHER OCCUPATION		
Farming	49	40.8
None	71	59.2
Total	120	100
iii. REASON IN BUSINESS		
For sale	88	73.3
Family consumption and sale	32	26.7
Total	120	100
iv. SOURCE OF GROUNDNUT		
Personal farm	26	21.7
Family farm	26	21.9
Cooperative farm	5	4.2
Community farm	14	11.7
Market	49	40.8
Total	120	100
v. COOPERATIVE MEMBERSHIP		
Yes	60	50
No	60	50
Total	120	100
vi. BENEFITS FROM COOPERATIVE		
Government grant	1	0.8
Loan	59	49.2
Others	60	50
Total	120	100
vii. SOURCES OF CAPITAL		
Personal savings	42	36
Friends and relatives	22	18.3
Cooperative	37	30.8
Money-lenders	9	7.5
Bank loan	10	8.3
Total	120	100
viii. FORMS OF CAPITAL		
Cash	110	91.7
Kind	10	8.3
Total	120	100
ix. CREDIT USE		
Yes	76	60
No	44	40
Total	120	100

Source: Field Survey, 2011

Though groundnut processing does not require huge amount of take-off capital, the processors still sourced for their investment. As shown in Table 2, about 36.0 percent used personal savings as capital source while 30.8 percent relied on cooperative societies for their capital sources. Others estimated at 18.3 and 7.5 percent got their capital from friends and relatives, and money lenders respectively. The remaining 8.3 percent source their capital through bank loans. The implication of this distribution of source of capital among the respondents is that there is very limited opportunity for economic development for as long as the banks are not seen to promote economic activities of the small scale agro-allied processors.

Cooperatives are often considered a major source of capital used for business activities in the rural areas. Women groundnut processors in Kwara State were not left out of the scheme. In spite of its role, only 50 percent of the rural women in groundnut processing were into one form cooperative society or the other. Almost all of the processors who belong to cooperative society derived loan as benefits of their membership. The capital sourced could be given in monetary terms as cash or in kind as material inputs used in groundnut processing. About 91.7 percent of the rural women groundnut processors in Kwara State got their capital in cash while the remaining 8.3 percent got their capital in kind. The credit gotten was either put into groundnut processing or into any other activities including farming. About 60 percent of the respondents used the credit for groundnut processing activities while the remaining 40 percent used the capital in other activities like trading.

Results of Costs and Returns Analysis

Costs and returns to groundnut processing per 50kg of raw groundnut per cycle is presented in Table 3.

Table 3: Cost and Return Analysis

ITEMS	QUANTITY	AMOUNT (₦)
Revenue items		
Groundnut oil	59.79 litres	14,947.10
Groundnut cake	13.17 kg	2,100.71
Donkwa	4.17 kg	856.69
Average Total Revenue (ATR)		17,904.48
Variables items		
Raw groundnut	50 kg	8, 687.2
Maize	5.2 kg	2,234.00
Water	6 litres	50
Salt	0.5 kg	30
Pepper	0.2 kg	40
Firewood	35 bundles	350
Fuel	1.8 litres	1,800.00
Hired labour	1 man day	70
Average Total Variable cost (ATVC)		13,261.20
GROSS MARGIN		4,643.28

Source: Field Survey, 2011

From the analysis in Table 3, average total variable cost was estimated at ₦13, 161.21. Items included were the cost of raw groundnut, maize, pepper, salt, firewood, fuel, water, and hired labour. The average total revenue of ₦17, 904.48 was realised from production of 59.79litres of groundnut oil, 13.17kg of groundnut cake and 4.17kg of *donkwa* per 50kg of raw groundnut per cycle. Net returns to groundnut processing based on gross margin estimate of ₦4, 643.28 per cycle was therefore realised in the study area. In a month, which on the average involved 7 cycles, a net profit of ₦32,502.96 were realised. This therefore implies that groundnut processing was profitable enterprise in the study area.

Determinants of Technical Efficiency of Groundnut Processing

This section presents the results of the stochastic production frontier used to examine the determinants of groundnut processing in the study area. As presented in Table 4, the results are based on Maximum Likelihood Estimates of Parameters of Cobb-Douglas function.

Table 4: Maximum Likelihood Estimates of Parameters of Cobb-Douglas Function for Groundnut Processors in Kwara State

VARIABLE	COEFFICIENTS	T-RATIO
General Model		
Constants	6.316	3.069 *
Labour (Man-day)	0.738	2.012 *
Quantity of Groundnut (kg)	0.762	2.026 *
Fuel Consumption (litre)		
Membership of Association	-0.25	2.061 *
	0.442	3.270 *
Inefficiency Function		
Constants	2.669	0.9577
Farming Experience	-0.834	-2.040*
Household size	-0.973	2.0750*
Diagnosis Statistics		
Sigma-square	0.432	4.842
Gamma	0.9591	4.632

* = significant at 5% level

Source: Field Survey, 2011

As shown in Table 4, the coefficients of labour, quantity of groundnut used and membership of association had positive signs which indicated that an increase in these variables will lead to a corresponding increase in revenue made from the groundnut processing activities. The variables were statistically significant at 5% level. The coefficient of fuel used was negative. This showed that an increase in fuel consumption will bring about a corresponding decrease in revenue made from groundnut activities.

For the inefficiency function of the model, a positive sign of an estimated parameter implies that the associated variable has a negative effect on efficiency and a negative sign indicates the reverse. The negative coefficients for years of experience and household size imply that technical inefficiency reduces with increase in years of experience and

household size. As such, processors with higher the years of experience and household size would be more technical efficient than those with lower years of experience and household size.

Sigma square is 0.4316 and statistically significant at 1 percent. This indicates a good fit and the correctness of the specified distributed assumption of the composite error term. The gamma (y) ratio 0.9591 which is significant at 1 percent level imply that about 95.91 percent variation in the output of groundnut processors was due to differences in their technical efficiencies.

CONCLUSION AND RECOMMENDATIONS

The main objective of this study was to examine the economic sustainability of small-scale groundnut processing in the study area. The study shows that groundnut processing is a relatively profitable business. The production is affected majorly by quantity of groundnut processed, labour, maize, and other inputs. Being a major source of employment and income among rural women in the study area, efforts at attaining sustainable economic development need to be directed at improving the livelihood and economic activities of the small scale entrepreneurs. Besides, this is needed to ensure that the existing inequality in income distribution particularly in relation to agricultural and non agricultural sectors which has continued to worsen the level of underdevelopment in agriculture is reduced.

This study therefore shows that there is ample room for improvement in the output of the processing activities of the groundnut processors. This is because of the existence of technical inefficiency among the processors. In view of the need to minimise wastage in the use of available resources and attain sustainable development in economic situation of the processors, this study makes the following recommendations:

1. Government should provide extension services for the people in the study area in order to educate the groundnut processors about innovation and adoption of improved production techniques;
2. The research institutes the area especially the Nigerian Store Products Research Institute (NSPRI) should develop higher yielding varieties which will be made available to groundnut processors at affordable price;
3. The public and the private sectors could collaborate and invest in groundnut processing; and
4. Efforts should be made for the groundnut processors should come together and form cooperative societies in order to acquire improved tools, finances and equipments for groundnut processing so as to enhance the ease of production.

REFERENCES

Aigner, D.J., C.A.K. Lovell, and P. Schmidt (1977). Formulation and Estimation of Stochastic Frontier Models, *Journal of Econometrics* 6, 21-37.

Battese GE, Coelli TJ (1992). Frontier production functions, technical efficiency and panel data: with application to paddy farmers in India. *Journal of Prod Anal* 3:153–169.

Battese, G.E. and Coelli, T.J. (1995). A model for technical efficiency effects in a stochastic production for panel data. *Empirical Economics*, 20, 325-332.

Charnes, A., Cooper, W.W. and Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operation Research,* 2, 429-444

Coelli T.J and Rao, DSP (2005). Total factor productivity growth in agriculture: A Malmquist Index Analysis of 93 countries, 1980– 2000. *Agric Econ* 32:115–134.

Consultative Group on International Agricultural Research(2005). Research and impact retrieved on 18/1/11 from www.cgiar.org/impact/research/groundnut.html

Echekwu, C.A and Emeka, I. (2005). Groundnut, endowing, the groundnut /rediscovery programme in Nigeria. *Opah mission* Abuja pp 18

FAO, 1994. Expert's recommendations on fats and oils in human nutrition. The article is adapted from the first chapter of fats and oils in human nutrition: report of joint expert consultation, FAO Food and Nutrition Paper No. 57

Ibrahim, H., Y., Saingbe, N., D., and Ibrahim, H., I. (2010): An Evaluation of Groundnut Processing by Women in a Rural Area of North Central Nigeria. *Journal of Agricultural Sciences (2)1*International Labour Organization (ILO) **(**1990). Small Scale oil extraction from groundnut and copra. Prepared under the joint auspices of the International Labour Office and United Nations Industrial Development Organization, *Oxford and IBH Publication Co.* Pvt. Ltd. New Delhi.

Ministry of the Environment (1997). *Agricultura sustentável*. Agenda 21 Brasileira, Brasília.

Moreira, V.H., and B.E. Bravo-Ureta. 2010. Technical Efficiency and Metatechnology Ratios for Dairy Farms in Three Southern Cone Countries: A Stochastic Meta-Frontier Model *Journal of Productivity Analysis* 33(1): 33-45.

Nnamdi, A.E (2010) "Groundnut processing and trading in Nigeria" retrieved on 18/1/11from http://www.articlebase.com/business-opportunities-articles/groundnut-processing-and-trading-in-nigeria-3923801.html
Practical Action (2010). Sustainable livelihood through agro processing" retrieved on 18/1/11 from http://practicalaction.org/food-production/agroprocessing

Trade Investment Nigeria (2010). "Invest in the processing of groundnuts". *Investment opportunities in Nigeria*. Retrieved on 18/1/11 from www.tradeinvestnigeria.com/investment_opportunities/944416.html USDA, (2008) *Oilseeds: World Markets and Trade*. http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1490

United Nations. (1987). *Report of the World Commission on Environment and Development. General Assembly Resolution* 42/187, 11 December. Retrieved: 2012-11-18 from http://www.un.org/documents/ga/res/42/ares42-187.htm

ABOUT THE AUTHORS

Abdulazeez Muhammad-Lawal is affiliated with the Department of Agricultural Economics and Farm Management, Faculty of Agriculture, University of Ilorin, Ilorin, Nigeria.

Jubril Olayinka Animashaun is affiliated with the Department of Agricultural Economics and Farm Management, Faculty of Agriculture, University of Ilorin, Ilorin, Nigeria.

Ademola Solomon Towoju is affiliated with the Department of Agricultural Economics and Farm Management, Faculty of Agriculture University of Ilorin, Ilorin, Nigeria.