Journal of Agriculture and Food Science
Volume 3, Number 1, April. 2005. pp 75-84

ISSN 1597 - 1074

COMPARATIVE ANALYSIS OF LARGE AND SMALL SCALE FARMERS RESOURCE USE EFFICIENCY IN FOOD CROP PRODUCTION IN AKWA-IBOM STATE, NIGERIA

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ABSTRACT

The study attempted to compare efficiency in resource use and utilization between large and small farm sizes in cassava / yam and maize production in Akwa-Ibom State. Pre- tested and well-structured questionnaire were administered on a sample of one hundred and eighty (180) farmers. A multi-stage sampling technique was used to delineate farm size (large / small). The linear regression model was chosen as a lead equation. Coefficients for returns to scale for large farm size is 1.222 indicating increasing returns to scale and 0.285 for small farm size which indicates decreasing returns to scale in production. With respect to allocative efficiency (AE) for large scale farm size, capital and other inputs were underutilized while land and labour resources were over utilized. For small farm size, labour resource was underutilized while land and capital resources were grossly inefficient. Other inputs were underutilized for small farm size. The study however found out that both group of farmers were inefficient in resource use and utilization but more severe for small scale farmers. This was mainly as a result of high cost of farm inputs. If resource inputs are used efficiently by both groups of farmers to produce these staple crops, hunger and unemployment could be drastically reduced in our environment.

INTRODUCTION

It is important to stress that farm production, which is an organization of resources to produce output, involves different operations with varying technical and managerial requirements. Farm structures invariably could be large or small and the scale of production influence the amount of farm input required. Moreso efficiency of production varies with the managerial ability of the entrepreneur and the conditions under which the operations are carried out. Bhasin (2001) emphasized that farm efficiency however vary across farms and other socio-economic environment thereby opening up opportunities to enhance its efficiency and productivity as well as through re-allocation of current resources and introducing new technologies that target farmers.

In Akwa-Ibom State, small-scale farmers predominates most of our farming activities especially with regards to food crop production. Ijere (1992) however stressed that large-scale farmers seem to be more efficient in resource use and utilization than small-scale farmers. It is common to agree on this fact because small scale farmers having small farm size are regarded as inferior and they are mostly excluded from extension programme services, credit and training schemes, farm supplies and services of new technologies. To cushion these problems, government has embarked on several agricultural policies and programmes and the level of success as of now cannot be accurately determined because of

incessant policy somersaults, government swabbing or inconsistent policy. Willem (1995) emphasized that some of these policies and programmes seem to favour large scale farmers more than small scale farmers because of the belief of being less efficient than the former. Desai (1995) stressed that it is ideal to lay emphasis on their scale of enterprises in terms of allocating and distributing resource, investment in research and eliminating the bottleneck to efficient resource use at the farm level. Ali and Byerlee (1996) has opined that the decline is due to inefficient use of resources, labour shortage and poor capital base.

In essence, the small-holder farmers appear to be poor – resource managers because of their limitations in many respects. Onyenweaku (2000) however identified these limitations to include labour constraints arising from the increasing scarcity and high cost of labour, technical constraints including inadequate infrastructure, dependence on unimproved inputs and rudimentary technologies. Nwaru (2001) stressed that rural resource users must come to a dynamic and innovative level where they can establish and nurse or imbibe economic activities with greater success through mobilizing and allocating available rural resources more efficiently. This will help to cushion the pressing constraints as to reduce low output, poor income, unimproved inputs and technology.

This study however is aimed at analyzing the relative efficiency in resource use with respect to large and small scale farms in selected food crop products in Akwa Ibom State with a view of formulating relevant facilitative and structural policies that will contribute to enhance the growth of the state economy and the nation's agricultural sector as a whole. More so, the study also aimed at identifying the constraints to efficient resource use in the study area as well.

Empirical Literature / Theoretical Framework

Small farms require relatively more capital and labour to produce a naira worth of output than large farms and restricting farm size to the declining portion of the Long Run Average cost curve (LRAC) will increase the amount of resources used to produce food and fibre (Ali and Byerlee (1996). These extra resources are misallocated in that they have a higher opportunity cost in other activities and as such restricting farm size will reduce overall economic efficiency. This is efficiency cost in this respect. Duraisamy (1990) however considered some of the conceptual and practical problems affecting the measurement and comparison of efficiency across farm management survey data in yielding the accurate relationship between size and efficiency.

Studies however relating to the structure of agriculture, the survival of the family farm and also the desirability of recasting farm policies to better suit the needs of the smaller farmers have recently become the source of considerable controversy. It should be emphasized that for smaller farms to survive, they may require more resources to do so which implies that there could be an efficiency costs. However, small farm sizes are still found to be economically viable. Obasi (1991) however stressed that most benefits of technology are achieved by moderate sized farmers depending on total output . Estimating the effect of

farm size on overall economic efficiency requires valuing all inputs so that the cost frontier can be determined.

It is however necessary to assess whether farm size restrictions will engineer higher cost farming techniques in agriculture. It is necessary to examine the sources of the apparent cost advantages of large farms. Economies of size whereby large farms reduce their costs by spreading fixed machinery and labour costs over more land and output are evident. Above all, sources of efficiency in agriculture according to Coelli (1995) especially to large farms have other significant advantages. Firstly large farms probably have greater access to high quality resources, they produce more per hectare because they are better managed. Finally they may be able to sell more of their output because of greater market access and the availability of premium prices for large volume producers. It might be argued that small farms can overcome the disadvantages implied by limited volume sales through cooperative marketing and that farm size restrictions need not imply less efficient marketing and higher farm cost.

It is important to emphasize that the small farm size holders employs over 82 percent of all agricultural work-force and produces about 85 percent of Nigerian food supply. It consists of subsistence oriented low input- low technology family farms (Olamola 1991). It is usually managed by the male- family head who incidentally provides personal or borrowed capital. Basically the farm sizes are on the average of about 0.5 hectare (ha) on a range of 0.1 hectare to 10 hectares. The farm labour is largely provided by the family members. Large scale farm sizes are intensive in structure and has over 50 hectares of land area. It however utilizes hired personnel, mechanized technology and employs about 3-7 percent of agricultural work-force. Its contribution to total Nigerian agricultural products has waned with time and current estimates put its contribution to only about 5 percent. (CBN/NISER 1992).

Materials and method

The sample was drawn from cassava / maize and yam farmers in the study area. Data were from primary source using pre-tested/well-structured questionnaire and complemented with secondary data. The six agricultural zones of the state which reflect the demarcation structure was chosen and from each zone one Local Government Area (LGA) was purposively selected based on high population density, type of agricultural activities and the preponderance of these food crops as applied in the study. A multi-stage sampling technique was used to delineate farm size (large/ small). Three villages in each chosen LGA using simple Random Sampling Technique was chosen. Data were collected from One Hundred and eighty (180) farmers for a detailed study with ten (10) farmers from each village. Village heads, resident agricultural extension agents and other key informants within the area provided the list of farmers, which however form the sampling frame.

Information were sought on the socio-economic features, constraints to efficiency and other quantitative variables of interest. An upper and lower limit (>5ha and <1ha) were

determined and was used to differentiate between large and small scale farms. Enumerators were recruited and trained in each LGA on the objectives of the study.

In essence, the production function approach was utilized with respect to these group of farm size. These can be presented implicitly thus:

Qi = F (X1, X2, X3,X4,ei)

Where

Qi = Value of output measured in naira
X1 = Labour (Mandays)
X2 = Farm Size (hectares)
X3 = Capital inputs i.e depreciation in farm tools and implements etc (N)
X4 = Cost of other farm inputs such as seeds, fertilizers, planting materials, chemicals etc (N)
ei = Error Term

Four functional models were fitted into the production function namely linear, double-log, semi-log and exponential functions and that with the best fit was chosen as the lead equation.

In essence, a particular resource is optimally allocated if MvPx1 = Px1.
Allocative efficiency indices for the various resources were derived and examined using the formula MvPx1/ Px1 = E1 ---------- (eqn. 1)

Where:
MvPx1 is the marginal value product of the ith resource and is given by MvPx1(Py) .
Py is the output price per unit.
MPPx1 is the marginal physical product of the ith resource.
Px1 is the price per unit of the ith resource.
E1 is the allocative efficiency index of the ith resource.

However, in this study where the output is measured in monetary terms, the coefficient have satisfied the condition of MPPx1(Py) and are direct MvPx1.Maximum or absolute allocative efficiency for a particular resource is confirmed if E1 = 1. If E1 > 1, less than the profit maximizing level of the input is confirmed. In these case, efficiency could be increased by an increase use of that resource. However if E1 < 1, more than the profit maximizing level of that particular resource is confirmed. A reduced use of that resource is desirable to increase efficiency.

The elasticity of production shows the change in output relative to a unit change in input. For these linear functional model which is the lead equation, the elasticity of production Ep is given by Ep = ai(x/y)
Where ai is the marginal physical product (MPP) of the ith resource.
xi = the mean of the ith resource
y = the mean of the output.
The summation of the elasticity is the coefficient of returns to scale.

RESULTS AND DISCUSSION

The linear regression functional model was chosen as the lead equation as a result of its satisfactory nature econometrically and statistically more than other models. The coefficients were statistically significant at 5% and had the highest coefficient of multiple Determination (R^2)

Table 1: Estimated production function for large farm size

	Linear	Exponential function	Double-log	Semi-log
Intercept	-10151.4	7.324	1.411	-413137.41
	$(-1.443)^{xx}$	$(44.246)^{xx}$	$(1.423)^{xx}$	$(-3438)^{xx}$
Labour (X1)	241.51	-0.004	0.517	14367.42
	$(2.042)^{x}$	$-(3.011)^{xx}$	$(2.124)^{xx}$	(0.723)
Land (X2)	2042.271	-0.124	0.132	-3564.33
	$2.134)^{x}$	(-0.14)	(-0.143)	(-0.504)
Capital (X3)	2.467	-3214	0.234	14343.07
	(1.412)	(-0.148)	(0.472)	$(4.377)^{X}$
Other Farm inputs (X4)	0.714	8.117	0.284	16123.549
	(1.345)	$(1.435)^{xx}$	(1.147)	(1.743)
R2	0.934	0.873	0.899	0.647
Adjusted R2	0.914	0.865	0.881	0.624
F- Ratio	80.634^{xx}	39.423^{xxx}	84.419^{xxx}	28.874^{xxx}

X = Sig. at 1% xx = Sig. at 5% xxx = Sig at 10%
SOURCE. Computed from Survey data (2003)

Table 2: Estimated production function for small farm size

	Linear	Exponential function	Double-log	Semi-log
Intercept	1774.73	10.747	9.470	-47317.451
	(1.435)	(49.515)	(1.321)	(-1.439)
Labour (X1)	421.352	-0.432	0.107	120371.43
	$(4.511)^{xx}$	(-0.138)	(0.121)	$(4.563)^{xxx}$
Land (X2)	-4371.150	4.337	0.437	-90125.21
	(-0.747)	(3.143)	(0.515)	(-1.251)
Capital (X3)	-0.173	-3.341	-0.214	2147.073
	(0.179)	(-1.120)xxx	(-1.125)	(0.112)
Other Farm inputs (X4)	0.714	8.117	0.284	16123.549
	(1.345)	$(1.435)^{xx}$	(1.147)	(1.743)
R2	0.942	0.745	0.677	0.743
Adjusted R2	0.920	0.731	0.634	0.717
F- Ratio	44.174^{xxx}	29.461^{xxx}	19.374^{xxx}	21.437^{xxx}

Source: Computed from survey data (2003)

In Table 1, the lead equation however indicates that land, labour and other inputs have positive relationship with output and were significant while capital had a positive sign even through not statistically significant for large farm sizes. In table 2 labour resource was significant and positively related to output while land, capital were negatively related. Other inputs were not statistically significant even though, they had a positive relationship. In essence, as the quantities of land, labour and other inputs in large farm increases, the revenue accruing from these crops under study tends to increase. This however conforms to a-priori expectation. In small farm sizes, only labour resource tends to increase in revenue as the quantities employed increases while other resources tends to decrease revenue as the quantity increases.

Table 3: Production elasticity and returns to scale for large farm size

Inputs	Mpp	X	Y	Production elasticity
Labour (X1)	241.510	113	65779	0.414
Land (X2)	2042.271	1.00		0.031
Capital (X3)	2.467	5311		0.199
Other Farm inputs (X4)	0.714	13,521		0.579
Returns to Scale (ER)				1.223

Source: Computed from survey data (2003)

Table 4: Production elasticity and returns to scale for small farm size

Inputs	Mpp	X	Y	Production elasticity
Labour (X1)	421.353	118	54771	0.907
Land (X2)	-4371.150	1		-0.798
Capital (X3)	-0.173	6004		-0.018
Other Farm inputs (X4)	0.714	14,886		0.194
Returns to Scale (ER)				0.285

Source: Computed from survey data (2003)

The production elasticity with respect to table 3(large – farm size) for each of the resources employed is less than unity showing that the relationship between the resources and output it generates is relatively inelastic. But the returns to scale is 1.223 indicating increasing returns to scale. Clark (1990) stressed that increasing returns to scale is quite common where manpower is specialized and larger volume of sales or larger market outlet for its produce are established. It however indicates that farmers operate in stage one (1) of production surface.

In Table 4 (Small – farm size) the production elasticity for each resource is less than unity for labour and other inputs except land and capital resources, which has a negative relationship with output. This however shows that the relationship between resources and output is inelastic. The returns to scale which is the summation of production elasticity is 0.285 indicating decreasing returns to scale which is very prominent where output is relatively small and most common in peasant agriculture. This shows that farmers are operating in region three of the production surface which is an irrational zone of production ''Lesser use of such resource can still be employed to generate that same level of output.

Table 5: Allocative efficiency indices of resources (Large farm size)

Input	Input Price (PX)	MVP (x1)	Allocative efficiency = E1 (MVP/Px)	% Deviation from optimality (1-E1) x 100
Labour (X1	N360/md	241.51	0.670	33.00
Land (X2)	N3590/ ha	2042.271	0.568	432.00
Capital (X3)	N1.15	2.467	2.145	-114.50
Other inputs (X4)	N1.15	2.817	2.449	-144-90

Source: Computed from survey data (2003)

Table 6: Allocative efficiency indices of resources (Small farm size)

Inputs	Input Price (PX)	MVP (x1)	Allocative efficiency = E1 (MVP/Px)	% Deviation from optimality (1-E1) x 100
Labour (X1)	N360.00 / md	421.353	1.170	-17.00
Land (X2)	N3590/ ha	-43711.15	-12.175	1317.50
Capital (X3)	N1.15	-0.173	-0.150	115.00
Other Farm inputs (X4)	N1.15	0.714	0.620	38.00

Source: Computed from survey data (2003)

In Table 5 with respect to Allocative Efficiency indices of resource use by large scale farmers, capital and other inputs were underutilized and to attain optimality in the use of these resources, capital and other inputs should be increased from their present levels by

114.50 and 144.90 percent respectively while labour and land should be reduced by 33 percent and 432 percent from its current level of use because these resources were over utilized. Maximum or absolute allocative efficiency for a particular resource is confirmed if E1 = 1. IF E,> 1, less than the profit maximizing level of the input is confirmed and in such a case efficiency could be increased by an increased use of that resource which is in line with this study. If E1 <1, more than the profit maximizing level of that particular resource is confirmed (labour and land) and a reduced level of usage of these resources is desirable to increase efficiency. With respect to percent deviation from optimality (1-E)x 100 a negative percentage implies an increased employment of that particular resource is needed and vice-verse. If the value is zero then absolute efficiency has been achieved.

For small farm sizes (Table 6), allocative efficiency indices for labour were under utilized. Their use should be increased from their present levels by 17 percent. Other inputs were also over utilized and its current level of usage should be reduced by 38 percent in order to increase efficiency. Land and capital were grossly inefficient in resource use and utilization.

To compare the farm sizes, land, capital and other inputs were underutilized by large farm sizes while labour were under utilized for small farm sizes. Land and labour resources were over utilized by large farm sizes while other inputs were also over utilized by small farm sizes. Land and capital having a ratio of negative sign indicates gross inefficiency in resources utilization on small size farms. The large farm sizes were found to be technically efficient than small farm size because a farm is considered technically efficient than another if given the same quantities of reasonable inputs it consistently produces a larger outputs. This is evident in large farm sizes as they utilized lesser capital and other inputs to produce larger output than the small farm sizes

Constraints to Resource use: The dominance of elderly men and women in agricultural production in our region however influences agricultural output and efficiency especially for small-size farmers in many ways. They are also constrained by low literacy levels outside the age. Clark (1990) has stressed that this can lead to lack of entrepreneurship which triggers low levels of investment and inability to utilize or apply the results of science and technology to agriculture especially to small – size farmers.

The small size food crop farmers interviewed however complained of problems such as lack of fertilizer, improved seeds/seedlings, agro-chemicals especially insecticides which are not within their reach and even when available are sold to them at higher costs. Other constraints envisaged by both group of farmers include pests/disease attack, bad road, high cost of planting materials, poor extension services and high interest rate on agricultural loans, land availability due to land tenure arrangements in our environment, high cost of transportation, poor storage facilities. These elements of constraints could eventually lead to drastic reduction in food crop production hence influences efficiency in resource use and utilization by both group of farmers (large /small) in the study area.

Summary, Conclusion and Recommendations

The study invariably was designed to compare the efficiency of large and small farm sizes in Akwa-Ibom State. The analysis of the resource use efficiency showed that both group of farm sizes were inefficient in their utilization of farm input. This however portrays that farmers in the study area are not efficient managers of resources. It is important to emphasize that their constraint to achieve higher efficiency may be due to high cost of inputs. To reduce these problems, government should subsidize farm inputs especially agro-chemicals and fertilizers. More so, provision of credit facilities to farmers whether small or large should not be discriminatory and the interest rate should be reasonable enough to attract investors. Farmers should be educated and enlighten on how to attain optimal use of farm resources in order to increase efficiency.

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