Resource Use Efficiency In Arable Crop Production In Oyi Local Government Area, Anambra State, Nigeria

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ABSTRACT: The study examined the resource use efficiency in arable crop production in Oyi Local Government Area of Anambra State, Nigeria. Specifically, the objectives were to describe the socio-economic characteristics of arable crop farmers in the study area; determine system of land ownership; distribution of farmers according to quantity of fertilizer used; distribution of farmers according to cassava output and constraints to resource allocation to farmers. A multistage random sampling technique was used to select 84 arable crop farmers registered with the Agricultural Development Programme in the study area. Data were collected with structured questionnaire and personal interview. Data were analysed using descriptive statistics such as frequency count and percentages. While inferential statistics wasMaximum Likelihood Estimate of Stochastic Frontier Production Function, using Coelli 4.1 to estimate technical efficiency. The result showed that majority (64.29%) of the arable crop production were women. The farmers were in their active age, literate and small-scale farmers. Majority (69.05%) preferred local varieties of arable crops to improved varieties. Also, majority (72.62%) of the farmers were not visited by extension agents. Most of the land cultivated by the farmers were inherited and various quantities of fertilizer were applied to boost the soil fertility. Outputs of the crops were poor due to lack, inadequate, high cost of inputs among others. The MLE of Stochastic Frontier Production Function using Coelli 4.1 showed that the coefficient of age and sex were negative. The high MVP of farm size showed that there was high return to land which had important effect upon farm output. However, the MFC showed that small-scale cassava farmers could use additional financial capital effectively to produce more output. It was therefore recommended that policies and programmes that would enable farmers to have more access to land should be put in place. Extension services need to be improved in the study area so as to educate the farmers on how to optimally allocate the use of their resources as to have meaningful harvest.

Key words: Resource use, Efficiency, Arable-crop, production

INTRODUCTION

One of the cardinal objectives of government of Nigeria is attainment of self-sufficiency in food production. The government views agricultural production as the main hope for the country's survival, growth and development. Over 70% of the people in Nigeria live in the rural areas relying on agriculture for their income. This informed the desperation with which various governments in Nigeria have enunciated agricultural development programmes and projects focused at the rural sub-sector of the economy to improve their livelihood. Yet the per capita of food production has remained low in Nigeria. This situation has been compounded by grave scarcity and high cost of agricultural production inputs. Ukoha and Nyong reported that there is inadequate food production in the immediate past and lamented that this is a key factor of spiral inflationary trend in Nigeria. They opined that the supply response of the agricultural sector is inelastic. Conversely, Nwaru observed that the acute shortage of agricultural resources has been complicated by gross inefficiency in resource use. According to Scarborough population density has continued to increase in Nigeria and land resources for the expansion of agriculture are becoming increasingly scarce. Moreover, labour constraint; particularly in households headed by women often limit farmers' ability to expand the area they cultivate. Thus sustainable increase in resource productivity especially land and labour are becoming necessary. From the foregoing, therefore, this study focused on the resource use efficiency in arable crop production in Oyi Local Government Area of Anambra State, Nigeria. The specific objectives of the study area were to:

i. describe the socio-economic characteristics of arable crop farmers In the study area
ii. determine the system of land ownership by the farmers
iii. determine the relationship between cassava output and the factors of production
iv. identify constraints of effective resources allocation on farm resources and;
v. estimate the technical efficiency among cassava crop farmers using Coelli Maximum Likelihood Method.

METHODOLOGY

The study was carried out in Oyi Local Government Area of Anambra State, Nigeria. The area was selected for the study because the inhabitants are predominantly arable crop farmers. It is one of the 21 LGAs of Anambra State and it is composed of five (5) autonomous communities. Namely: Awkuzu, Nteje, Umunya, Ogbunike and Nkwelle – Ezunaka. Its location is between Latitude 5^0 and 7^0N and Longitude 6^0 and 7^0E. Oyi LGA is located at the South – West of Awka the capital of Anambra State and at East of River Niger. It occupies a land area of about 500sqKms with predominantly grassland vegetation. The five autonomous communities are known for their vast agricultural farming in both crop and livestock production. Being agrarian in nature, they are essentially agric-based and reputed as one of the food baskets of the State. It has wide arable land and the crops grown include: rice, yam seeds, cassava, cocoyam, maize and vegetables. Domestic animals are goats, sheep and fowl. Due to the system of land ownership in the area, cultivation of crop is relatively on small holdings by individual farmers who practice cropping often with fallow system. The population of the LGA is estimated at about 126, 465. Questionnaire and personal interview were used in data collection. The data so generated were analyzed using descriptive statistics involving percentages and frequency distributions. However, to determine the efficiency level of production, Maximum Likelihood Estimation (MLE) available in Coelli and Bathese was employed. A multi-stage random

sampling technique was used to select 84 arable crop farmers registered with the ADP in Oyi LGA as sample size of the study.

RESULTS AND DISCUSSION

Table 1: Distribution According to Socio-Economic Characteristics of the Farmers (n = 84)

Table 1 shows that about 35.71% of the farmers fall within the age group of 21 – 30 years while 21.43% were age group of 31 – 40. This result indicated that majority of the farmers fell into active farming age and concentration of labour in the study area. However, women dominated in arable crop production and this affected efficiency allocation as the level of hours spent by women might affect the use of labour resource. Majority (54.76%) of the farmers possessed secondary education, 16.67% had Diploma Certificate, 8.33% had primary education while 3.57% had no formal education. The findings showed that majority of the farmers can read and write. Education plays significant role in skill acquisition and technology transfer. It enhances adoption of new farm technology and ability to plan and be more efficient in the use of inputs than their counterpart with little or no education. Table 1 also indicated that 45.24% had a family size of 1 – 3 persons, 26.19% had 4 – 6 persons while 15.48% had 7 – 9 persons. The implication of these sizes of family might lead to scarcity of labour in the area and consequently reduce the efficiency of labour use. In Nigeria, farmers rely on household members for supply of about 80% of the farm labour requirement due to increasing cost of hired labour. A farm family with a large household size produces more crops with low cost per unit output than a family with smaller household size. Farm size showed that the farmers were small-scaled. Over 48% had a farm size of 1 – 2 hectares while 27.38% had below one hectare. The size of a farm is a strong determinant of the expected output/yield. On years of farming experience the table indicated that 41.67% of the respondents had 1 – 9 years of experience in arable crop production, 32.14% had between 10 – 19 years experience while 15.48% had between 20 – 29 years experience. It therefore implied that the respondents were well experienced in arable crop production. On variety of crops cultivated, the table showed that majority (69.05%) of the respondents cultivated local variety while 30.95% cultivated improved variety. Respondents' preference to local variety than the improved might be due to taste and storability of the local variety. Table 1 also showed that the frequency of Extension Agents visits. The findings indicated that majority (72.62%) of the respondents were not visited in their arable crop farming activities, 15.48% were visited twice, 7.14% were visited once while 4.76% were visited thrice. The 'no visit' for majority of the farmers might be due to the dearth of extension agents in the study area. However, regular extension visitation is very important and vital to keep farmers abreast of new farm technologies.

Table 2: Distribution of farmers according to Land Ownership

Table 2 showed that 48.81% of the respondents farmed on inherited land while 29.76% cultivated communal land. This indicated that there is land shortage to increase arable crop production in the study area which consequently affected the use of land and its allocative efficiency. It was observed that most farmers practiced mixed cropping system as a result of land scarcity. According to Obasi land is a fixed asset and constitutes a great limitation to Nigerian farmers.

Table 3: Distribution of farmers according to quantity of fertilizer used

Table 3 displayed the quantity of fertilizer used by arable crop farmers in the study area. Over 17% of the farmers used 1200kg of fertilizer, 14.3% used 1250kg and 500kg respectively while 10.7% used 400kg. The quantity of fertilizer used affected production. Okezie and Okoye in their study on the determination of technical efficiency among garden egg farmers in Isiala Ngwa North Local Government Area of Abia State, Nigeria observed that output was dependent on amount of soil fertility in garden egg production. In other words, soil fertility is powered by the quantity of fertilizer applied to the soil.

Table 4: Distribution of farmers according to cassava output (kg)

Table 4 shows the distribution of farmers cassava output. Twenty five percent of the farmers had cassava output of 501 – 1000 kg, 13% produced 1001 – 1500kg, 10.71% produced 2501 – 3000 kg while 9.52% produced 1501 – 2000 kg of cassava. The poor output of cassava might not be unconnected with problems of land scarcity, inadequate credit facilities, high cost of labour, high cost of improved varieties of input etc. According to Onumadu and Ukanwolu, these problems are the bone of agricultural production in developing countries such as Nigeria.

Table 5: Distribution of farmers according to problem they encountered which negatively affect resource allocation

Table 5 presented the problems arable crop farmers encountered which negatively affected their resource allocation. The entries showed that inadequate credit facilities among the farmers was the most important factor that constrained the farmers in resource allocation in the study area as reported by 80.95% of the respondents. This was followed by land scarcity and high cost of labour as reported by 57.14% and 53.57% of the respondents respectively. Others were inadequate and high cost of improved varieties of input (46.43%). This finding is in agreement with the assertion that inadequate credit facilities are one of the major obstacles that limits agricultural production in Nigeria. The result is also supported by Obasi that land is fixed asset and constitutes a great limitation to Nigerian farmers.

Table 6: Maximum Likelihood Estimate of Stochastic Frontier Production Function using Coelli 4.1 to Estimate Technical Efficiency

Table 6 indicates the Maximum Likelihood Estimate of the Stochastic Frontier Production Function using Coeli 4.1, the result shows that the coefficient of age and sex were negative. This agreed with the findings of Okoye and Onyenweaku who reported that age of the farmer accounts for the technical efficiency of the farm resources and that the older a farmer becomes, the more he/she is unable to combine his/her resources efficiently.

Table 7: The Marginal Value Product (MVP) and Marginal Factor Cost (MFC) of the Factors Inputs of Arable Crop Farmers

Result in Table 7 shows that MVP and MFC of resources used in production of arable crop in the study area. The MFC of farmland was the tribute paid by the tenant farmer which was ₦2000/ha on average. Labour was 1,500 per man – day that was the average market wage rate of hired labour, fertilizer, ₦2,000 per 50 kg bag, cassava stem ₦50.00 per bundle which was the average market price. The high MVP of farm size indicated that there was high return to land and therefore increasing land area might have an important effect upon farm output. It also implied that expanding the present extensive margin of cassava might be more profitable. Hence additional units of land might generate larger additional output of cassava. The MVP shows that additional revenue that would be carried for extra unit of each specified factor used. This was essential in elucidating the amount of the specified factors needed to achieve production efficiency. This is against the finding of Tanko, Nkereuwem *et. al*. and Mbanasor in which all the inputs were underutilized. The implication of this finding was that small-scale cassava farmers can use additional financial capital effectively to produce more output.

CONCLUSION

Based on the findings of the study, the following conclusions were drawn:

1. Majority of the farmers were female and both male and female farmers were in their active farming ages. They were literate and small-scale farmers with almost twenty years farming experience.
2. Local crops were preferred to improve crops. Majority were not visited by extension agents throughout a month.
3. Most of the farm land cultivated was inherited. Various quantities of fertilizer were applied to increase the soil fertility.
4. Output of crops was poor due to lack, inadequate, high cost of inputs. The MLE of Stochastic Frontier Production Function using coel 4.1 showed that the coefficient of age and sex were negative. The high MVP of farm size showed that there was high return to land which might have important effect upon farm output. The MFC showed that small-scale cassava farmers can use additional financial capital effectively to produce more output.

It was recommended that policies and programmes that world enable farmers to have more access to land should be put in place. Extension services need to be improved in the area so as to educate the farmers on how to optimally allocate the use of their resources as to have meaningful harvests.

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Table 1: Distribution according to socio-economic characteristics of the farmers (n = 84)

Variables	Frequency	Percentages
Age in years		
Below 20	12	14.29
21 – 30	30	35.71
31 – 40	18	21.43
41 – 50	12	14.29
51 – 60	4	4.76
61 – 70	8	9.52
Gender		
Male	30	35.71
Female	54	64.29
Level of Education		
No formal education	3	3.57
Primary	7	8.33
Secondary	46	54.76
Diploma	14	16.67
Degree	14	16.67
Household Size		
1 – 3 persons	38	45.24
4 – 6 persons	22	26.19
7 – 9 persons	13	15.48
10 – 12 persons	9	10.71
13 – 15 persons	2	2.38
Farm Size (ha)		
Below 1	23	27.38
1 – 2	41	48.81
3 – 3.9	5	5.95
4 – 4.9	15	17.86
Farming Experience (years)		
1 – 9	35	41.67
10 – 19	27	32.14
20 – 29	13	15.48
30 – 39	2	2.38
40 – 49	3	3.57
50 – 59	4	4.76
Variety of Crop Cultivated		
Local Variety	58	69.05
Improved variety	26	30.95
Frequency of Extension visit (s) (monthly)		
No visit	61	72.62
Once	6	7.14
Twice	13	15.48
Thrice and above	4	4.76

Source: Field Survey, 2013

Table 2: Distribution of Farmers According to Land Ownership

Sources	*Frequency	Percentage
Inheritance	41	48.81
Rent/Leave	12	14.29
Free hold	5	5.95
Communal ownership	25	29.76
Tenant at government will	15	17.85

Source: Field Survey, 2013 *Multiple responses

Table 3: Distribution of Farmers According to Quantity of Fertilizer Used

Quantity of fertilizer (kg)	Frequency	Percentage
400	9	10.7
500	12	14.3
600	5	6.0
650	3	3.6
700	9	8.3
750	6	7.1
800	6	7.1
1000	6	7.1
1200	15	17.9
1250	12	14.3
1300	3	3.6

Source: Field Survey, 2013

Table 4: Distribution of Farmers According to Cassava Output (kg)

Cassava output (kg)	Frequency	Percentage
400 – 500	3	3.57
501 – 1000	21	25.00
1001 – 1500	11	13.09
1501 – 2000	8	9.52
2001 – 2500	3	3.57
2501 – 3000	9	10.71
3001 – 3500	5	5.95
3501 – 4000	3	3.95
4001 – 4500	3	3.95
4501 – 5000	6	7.14
5001 – 5500	3	3.57
5501 – 6000	5	5.95
6001 and above	4	4.76

Source: Field Survey, 2013

Table 5: Distribution of Farmers According to Problem they Encountered which Negatively Affect Resource Allocation

Allocation	Frequency	Percentage
High cost of labour	45	53.57
Inadequate and high cost of improved varieties of input	39	46.43
Pest and disease	34	40.48
Inadequate credit facilities	68	80.95
Poor infrastructure and transport facilities	22	26.19
Use of crude tools	15	17.86
Lack of storage and processing facilities	22	26.19
Problem of land	48	57.14
Poor yield	18	21.43
No problem	5	5.95

Source: Field Survey, 2013 *Multiple responses

Table 6: Maximum Likelihood Estimate of Stochastic Frontier Production Function using Coelli 4.1 to Estimate Technical Efficiency

Production factors	Parameters	Coefficient	Standard Error	T - value
Constant term	B_0	8.299	1.670	4.967
Fertilizer (x_1)	B_1	4.856	1.678	2.893**
Farm size (x_2)	B_2	1.403	1.8207	7.706 NS
Planting material (x_3)	B_3	3.347	1.945	1.7204*
Labour (x_4)	B_4	3.992	2.002	1.993 NS
Efficiency Factors				
Age (z_1)	a_1	- 0.3356	3.044	1.1027 NS
Sex (z_2)	a_2	- 01980	5.737	3.451 NS
Education (z_3)	a_3	6.074	3.229	1.881**
Extension (z_4)	a_4	1.873	1.655	2.131***
Household Size (z_5)	a_5	1.337	6.359	2.103**
Farming experience (z_6)	a_6	1.656	5.087	3.255***
Diagnostic statistics σ^2		3.718	1.127	3.298***
Variance ratio ≈		4.366	1.574	2.773**
Likelihood function =	- 27.32822			

Source: Adapted from frontier 4.1 MLE/Field Survey, 2013

Table 7: The Marginal Value Product (MVP) and Marginal Factor Cost (MFC) of the Factors Inputs of Arable Crop Farmers

Factors	MVP	MFC
Fertilizer (kg)	0.373	2000
Farm size (ha)	0.278	2000
Labour (hr)	- 0.315	1500
Stem	0.242	50
Factors	**Efficiency Indices**	**Required Percentage Change**
Stem	0.00484	99.95
Fertilizer	0.000186	99.98
Farm size	0.000139	99.98
Labour	0.00021	99.97

Source: Field Survey, 2013