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Resource-Use Efficiency Analysis in Cassava Production in some selected Local Government of Kogi State, Nigeria

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Abstract
This work examined the resource use efficiency in Cassava production in some selected local government area of Kogi State, Nigeria. Data for the study was collected from 150 cassava farmers in five local governments areas of Kogi East Senatorial Zone. The data collection was from June to October of the 2009 planting season. Multi-stage random sampling procedure was used in collecting the data. Production function analyses which incorporate the conventional neoclassical test of economic and technical efficiencies were used as the analytical technique. Findings revealed that the farmers were inefficient in the use of all the resources. However, inputs were under-utilized. The results show that there is need for making inputs affordable and accessible to the farmers so as to improve efficiency. Also policies that encourage the creation of non-farm employment opportunities to absorb the excess labour used in cassava production in the area should be formulated.
Key words: efficiency, cassava, production, Kogi State, resource use.

Introduction
Agriculture was the backbone of the Nigerian economy prior to the discovery of oil, Khalid (2008). It constitutes a significant sector of Nigeria's economy. The sector is significant in terms of employment of labour, contribution to Gross Domestic product (GDP) and until early 1970, agricultural exports were the main sources of foreign exchange earnings, Amaza and Olayemi, 2002 cited in Goni, Mohammed and Baba (2007). During the 1960s, the growth of the Nigerian economy was derived mainly from the agricultural sector. However, in more recent years, there has been a marked deterioration in the performance of Nigeria's agriculture. The contribution of agriculture to the GDP which stood at an average of 56% in 1960 – 1964 declined to 47% in 1965, 1969 and more rapidly to 32% in 1996 – 1998 (Amaza and Olayemi, 2002). The agricultural sector's changing share of GDP is partly a reflection of the relative productivity of the sector. Cassava, Nigeria's ultimate future crop has so many untapped potentials; cassava is both a food and industrial crop. It is also the fourth most

important crop after rice wheat, and maize, Jones (1995). Cassava continues to be one of the major staple food in Nigeria, 90% of its production is consumed locally as food in different forms such as: garri, fufu, starch, tapioca and flour. Nigeria ranks the highest as both producer and consumer of cassava with annual production of over 34 million tonnes of tubers, Khalid (2008). More so, in terms of area of land under food crop production in the country, cassava has seen an increase in land hectare since the coming of the Obasanjo's administration. The increase in cassava production as food and raw material for processing could not have come at a better time, when there is a rising global demand for cassava worldwide.

Therefore, the sector is booming sector for its diversified uses which covers industrial raw materials, livestock feeds, confectionary, drug production, (Abdullahi, 2003) and textile industries apart from its uses as a source of food for over 100 million people in Nigeria. Going by the report of the Raw Materials Research and Development Council (RMRDC) in 2004, cassava is cultivated in almost all the states of the federation. Due to its versatility, the cultivation of cassava presents little or no difficulty as it is known to grow in poor soil and tolerate poor husbandry. It can also withstand extreme weather conditions such as drought and excessive rainfall. It can be cultivated all year round and its root can stay in the soil for six (6) months to 2 (two) and half year maturity. Cassava can yield in good and poor soil up to 5-6 tons/ha without fertilizer. Yield of 40 to 60 tons/ha under favourable conditions such as sufficient sunshine, friable light textured and well-drained soil with sufficient moisture and balanced nutrients, Khalid (2008).

Cassava production is limited by poor varieties, the use of manual labour which limits the output and supply. It is also limited by the need of varieties that are resistant to pests and diseases. Furthermore, since it needs little fertilizer, access to it is poor. The lack of basic farm machinery is due to the lack of accessible fund which makes the farmers use the traditional method as method predominantly use in agricultural production in Nigeria, Cock (1985). The other problems include: the socio-economic and production characteristics of the farmers, inconsistent and unfocussed government policies, the poor infrastructure base which interacted in a synergism to asphyxiate the sector, resulting in low production (Okuneye, 2001).

The Federal Ministry of Agriculture (2000) estimated that the annual supply of food crops would have to increase at an average annual rate of 30% to meet food demand, and reduced food importation significantly. Studies have shown that aggregate cassava production in Nigeria has been growing at about in recent years (Khalid 2008; CBN 2004; Abdullahi, 2004). But the annual rate of population growth has been high (about 5%) (NPC, 2007). The reality is that Nigeria has not been able to attain self-sufficiency in cassava production despite being the world highest producer, and 8^{th} terms of volume of production for export. In 1998 to 2000, it produced 158, 620 tonnes, 169,062 tonnes, and 172,737 tonnes respectively while total production for 2003 was put at about 42 million tonnes, Khalid (2008). Again Goni, Mohammed and Baba (2007) said the constraint to the rapid growth of food production seems to be mainly that of low crop yields and resource productivity. The low agricultural productivity in Nigeria is revealed by the actual yields of major crops such as rice compared with potential yields (Federal Ministry of Agriculture, 1993). The implication is that there is scope for additional increases of output from existing hectares of cassava, if resources are properly harnessed and efficiently allocated. Hence, this study becomes crucial in examining the resources use efficiency of fanners in rice production.

Since increased output and productivity are directly related to production efficiency (Amaza and Olaycmi, 2002). The choice of Kogi State is premised on the fact that it is one of the cassava producing states in the country.

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This is given as: $MPPXi = Pxi/Po$
Where:
Pxi=the price per unit of resource input used
Po= the output (Cassava) price
MPP = the marginal physical product of resource input used
$APP \times Po = MVP$
$MVP/MFC = K$
Where:
MVP = marginal value product
MFC = marginal factor cost numerical constant
K = numerical constant

In an attempt to substitute the efficiency hypothesis, focus is centered on the estimated value of K and its closeness to unity (1). Efficiency is attained if: MVP = MFC.

Methodology

The Study Area

The study area Kogi State has two distinct seasons in a year; they are the wet and dry seasons. The state has an average maximum temperature of 34.50c and an average minimum temperature of 22.80c. Lokoja the state capital is generally hot all year round.

Kogi State is located between latitudes 60:33'and 80:44'N and longitudes50:22' and 70: 49' E. The state has a total population of about 3.278million (NPC, 2007) people with an average of about 228,964 farm families (Kogi State Min. of Agric, 1999). About 70% of the people live in the rural areas and mostly engage in one form of agricultural practice or the other. The average farm family in the state is made up of 7 people with an average farm size of about 2 hectares per farmer. Administratively, the State has 21 local government areas. They are Adavi, Ajaokuta, Ankpa, Bassa, Dekina, Okehi, Idah, Ijumu, Kogi, Ofu, Olamaboro and Kabba-Bunu. The rest are Ajaokuta, Ibaji, Igalamela-odolu, Lokoja, Mopamuro and Omala, Wikipedia, (2010).

There are two main seasons in the state. The wet season begins towards the end of March and ends towards the end of October. Metrological records have shown that rainfall start as late as April in some years and peak between august and September. Dry season begins in November and last till late February. The month of December and January are usually cold and dry due to the influence of the North-East winds that usher in the harmattan. The vegetation of the state consists of rain forest in the areas bordering rain forest zones of the country. Other parts consist of wooded savannah and grasslands. Some of the noticeable trees include locust-beans, baobab, akee-apple, shea-butter and Iroko among others.

Majority of the people of Kogi State are farmers and rural dwellers. The rich and highly diversified soil conditions with adequate rainfall provide the ample reasons for the predominant farming population of the state. Agricultural crops such as yam, cassava, maize, guinea-corn, rice, palm produce, cocoa, coffee, cashew, etc, are produced in the state. In addition to farming as the major occupation, a number of citizens are civil servants while a few others engage in commerce, weaving, etc. Mixed cropping is the predominant system of farming with the use of traditional hand implements. The land tenure system is based on family/clan arrangement and inheritance.

Data Collection

The data for the study was drawn from primary source with the aid of well-structured questionnaire. The questionnaires were administered to 150 cassava farmers selected through multistage sampling procedure. The first stage involved the random selection of farmers in the 5 selected Local Government Areas-Olamaboro, Ankpa, Omala, Dekina, and Ofu (LGAs) in the area. In the second stage, 2 local governments- Ankpa and Olamabaro prominent for cassava production were selected randomly out of the selected LGAs, based on the twenty available lists of cassava producing local government in 2005 from the Kogi State Ministry of Agriculture. Final samples were drawn using simple random sampling using the list of 30 cassava farmers associations in each of the local government selected. In the final analysis 30 respondents were drawn from each of the local government, in all, responses from 150 cassava farmers were used in the analysis.

Method of data analysis

The analytical procedure employed was production function analysis. This was used to obtain the parameters for the measurement of resource use efficiency of the cassava farmers. Four functional forms were tried and the lead equation was selected based on economic, econometric and statistical criteria including signs and magnitudes of the coefficients, the magnitude of R2, T-statistics, F statistics, Umoh and Yusuf, (1999). The function experimented with were linear, semi log, double log and exponential. The implicit function can be presented by the following equation:

Q = f (Xl. X2, X3, X4)

Where:

Q= Cassava output (kg)

X1=Quantity of seed (kg)

X2= Farm size (ha)

X3= Fertilizer (kg)

X4= Labour (man-day)

There were 3 types of labour in the study area, these are: family, hired and exchange (i.e. cooperation or 'Ugeha' or 'Oja' in Igala). This was adapted following (Umoh and Yusuf, 1999; Goni, M., Mohammed, S., and Baba, B. A. 2007.). In determining the Economic Efficiency of Resource use the following ratio was used to estimate the relative efficiency of resource use (r) r = MVP/MFC

Where:

MFC = Cost of one unit of a particular resource

MVP = Value added to rice output due to the use of an additional unit of input, calculated by multiplying the MPP by the price of output. i.e. MPPxi x Po

Decision rule

If r = 1, resource is efficiently utilized,

if r > 1, resource is underutilized while

if r < 1, resource is over utilized.

Economic optimum takes place where MVP = MFC. If r is not equal to 1, it suggests that resources are not efficiently utilized. Adjustments could be therefore, be made in the quantity of inputs used and costs in the production process to restore r = 1. Determining technical efficiency of resource use, the elasticity of production which is the percentage change in output as a ratio of a percentage change in input was used to calculate the rate of return to scale which is a measure of a firm's success in producing maximum output from a set of input.

EP = MPP/APP

Where:

EP = Elasticity of production

MPP = Marginal physical product

APP = Average physical product

If

$\sum$EP =1: Constant return to scale

$\sum$,EP < 1: Decreasing return to scale

$\sum$EP > 1: Increasing return to scale

Results and Discussion

The influence of production inputs on cassava output was determined with the aid of production function analysis. On the basis of a priori expectation, the statistical significance of the coefficients and the coefficient of determination the double logarithm functional form was chosen (Table 1).

Table 1: Regression results for cassava production in Kogi state

Variable	Double log	SE	T value	Semi Log	SE	T value	Exponential	SE	T value
Seed (kg)	0.127	0.61	2.112^{x}	-1141.829	10375.790	-0.426^{NS}	3.830E-05	0.035	0.785^{NS}
Farm size (ha)	1.274	0.34	0.396^{NS}	19029.884	2253.239	-0527^{NS}	7.710E-05	0.002	6.149^{xx}
Fertilizer (kg)	0.205	0.77	2.671xx	5592.763	3181.749	5.980 xx	4.142E-04	0.130	-0167^{NS}
Labour(man-day)	0.274	0.059	4.767xx	44.762	1182.168	4.733xx	1.976E-04	0.004	1.717^{NS}
R2	0.833			0.835			0.839	0.002	1.715^{NS}
-R2	0.823			0.834			0.828		

SE = Standard Error

Table 2: Values of estimates of efficiency parameters

Resource	Mean	APP	MPP	MVP	MFC	MVP/ MFC	Efficiency Gap	Divergence %
Seed	59.40	48.62	7.00	22000	26	7.40	285	98.10
Farm	2.25	1241.35	1579.00	55264.40	2000	27.64	3264.3	5.91
Fertilizer	50.68	72.85	14.95	522.57	32	17.44	492.57	94.28
Labour	153.01	14.79	4.75	132.25	226	0.59	95.74	72.42

Table 1 shows that all inputs were positively related to the cassava output. The value of the R2 reveals that approximately 83% of the variations in cassava output in the area were explained by the independent variables. Moreover, fertilizer and labour significantly affected the cassava output at one percent level. On the other hand, seed affected the output at 5 percent level of significance. Since the coefficient of the double log equation is the elasticity, the following can be inferred: a unit increase in the level of seed, farm size, fertilizer and labour will lead to 12.7, 127.4, 20.5 and 27.4 percent changes in cassava output respectively.

The value of the function coefficient which is 1.877 shows increasing returns to scale. This suggests that cassava farmers in the area can increase their cassava output by employing more of these four resources. Measure of technical efficiency of resource use such as Average Physical Product (APP), Marginal Physical Product (MPP), and Marginal Value Product (MVP) and Marginal Factor Cost (MFC) were derived (Table 2). The values of the MPP show that the farmers were more efficient in the use of land than the other resources. This suggests that if additional hectares were available, it would lead to an increase in cassava production/yield by 1580.89 kg among the farmers. This implies that the farmers are more technically efficient in the use of land. Of all the resources used, labour had the least MPP (4.75 kg). This shows inefficiency in the use of available labour. Given the level of technology and prices of both inputs and outputs, efficiency of resource use was further ascertained by equating the MVP to the productive MFC of resources. A resource is said to be optimally allocated if there is no significant difference between the MVP and MFC i.e. if the ratio of MVP to MFC =1 (unit). Table 2 further reveals that the ratios of the MVP to the MFC were greater than unity (1) for all the input but labour. This implies that seed, farm size and fertilizer were under-utilized, while labour was over utilized (less than one). This means that cassava output was likely to increase and hence revenue if more of such inputs (seed, land and fertilizer) had been utilized. The adjustment in the MVPs for optimal resource use (% divergence) in Table 2 indicates that for optimum allocation of resources more than 98% increase in seed was required, while approximately 6% increase in land was needed. Similarly, over 94% increase in fertilizer was needed. Labour was over utilized, and required approximately 72 % reduction for optimal use in cassava production.

Findings from this study revealed that cassava farmers were technically inefficient in the use of farm resources. The inefficiency of the farmers may be directly or indirectly linked to the high cost of fertilizer, rent and improved seeds. The implication of the study is that technical efficiency in cassava production in the Kogi state could be increased through better use of fertilizer, land and improved seeds.

Conclusion

The contribution of Cassava to the Kogi State and Nigeria's socio-economic life cannot be overemphasized as it serves as not only food for man, feed for animal but a raw materials for so many kinds of industries notably the pharmaceutical and automotive industries where it is being used in drug and medicine production and as ethanol (biofuel) to power cars. The demand for Cassava and its products within Nigeria and beyond the is strong and growing. Thus, as the largest producer, there is the need to efficiently utilize the resource input that would practically transformed its status from being a producing nation to an exporting nation which will open the gateway to sustainable economic growth and development that would revamp the agricultural sector once again.

Recommendations

- Ø The need for the improvement in resource use efficiency among the farmers is the responsibility of the individual farmers, government and research institutions. Thus, the extension agencies should communicate effective and efficient ways and sound economic farm policies to rural farmers in order to achieved this.
- Ø The provision of improved rural infrastructures and enabling policies (such as making available all agricultural inputs required at the right time and affordable prices) among others, are also required in order to enhance efficiency.
- Ø In addition, there should be policies that encourage the creation of non-farm employment opportunities that could be generated from cassava allied industries to reduce the employment rate in the country.
- Ø There should be the setting of export marketing board to increase Nigeria's export of cassava to earn more foreign capital for both the farmers and government.

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