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POST HARVEST PRODUCTION EFFICIENCY AND OUTPUT ELASTICITY IN CASSAVA PROCESSING ACTIVITIES IN RIVERS STATE

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ABSTRACT

While productivity may consider the quantity of output that emerges from a production process. Output elasticity measures the percentage change (response of output to input use) in output resulting from a given percentage change in input. Using the Cobb-Douglas production function, the responsiveness of the outputs of Garri and Fufu to labour in man-days and capital investment was analysed. Regression analysis was used to investigate how the outputs that emerged relates to the quantity of labour input employed.The study showed that in some agricultural zones in Rivers State and, in some products, there were negative response. A negative response to input use is an indication or suggests allocation inefficiency. Output efficiency measurement is very important in agricultural production in a profit oriented enterprise. Efficiency in cassava processing may be a function of several variables including volume of credit and processing technology in use. In the two variables studied, $\alpha + \beta$ were less than one, suggesting a decreasing return to scale generally.

Keywords: Elasticity, input, output, efficiency, response.

INTRODUCTION

In Africa, most cassava research is geared towards addressing key production and post harvest constraints, but, there has been a limited effort devoted to increasing the competitiveness of cassava in the industrial sector. Cassava largely is considered a food security crop associated with economically challenged communities in most parts of the tropics where it is grown. But, cassava is progressively shifting roles from being a staple food for human consumption to becoming an efficient industrial crop, particularly, in developing economies of Asia, Latin America and the African Caribbean and Pacific (ACP) nations (Baguma and Kawuki, 2006).

Cassava starch has numerous food application roles owing to its thickening and stabilizing properties. These physical and chemical characteristics are of importance in bakeries and confectionaries,. The pharmaceutical industry amongst others has also benefited from these properties of cassava starch.

Besides the food application uses of cassava starch, non-food application benefits such as remoistening gums for postage stamps and envelops, cloth finishing in the textile industry, glues for the wood and paper, industries amongst others are also worthy of note. These few highlighted applications of cassava starch have by far been advanced in Malaysia, the Far East and Latin America, with limited exploitation in Africa, which surprisingly registers the highest cassava acreage even when both Latin America and Asian cassava acreage is combined. The difference between the progress of cassava starch-based industries in some Asian countries Baguma and Kawuki (2006) reports is the differential government commitment towards cassava commercialization and increasing investment in research and development. The livestock sector has also been targeted in these nations for utilization of cassava, either through minimal processing or use of well-refined feed ration. Unfortunately, despite these progress in the Asian world, its utilization in the feed industry is still very low in most cassava growing communities in Africa, the Caribbean's and the pacific regions. Cassava plays a major role in food self-sufficiency in African because of its efficient production of good quality edible starch, tolerance to extreme climate stress conditions and suitability to African farming and food system. Thus, cassava can ensure the supply of relatively cheap raw materials to the industrial and manufacturing sector and promote their international competitiveness. In addition, the cassava processing sub-sector can play the role of supplying relatively cheap food to the urban industries and check inflationary tendencies where inadequate food availability leads to rising prices. Cassava can therefore play a role in the pace and pattern of industrial development in the economy

In spite of net food importation in Africa as from the early 1970s and food production growing at half the population growth rate from 1970 to 1985, cassava production in Africa has increased tremendously in the last four decades (FAO,2007). Food importation may not be a viable alternative where foreign exchange constraint exists and, so, cassava based food supply becomes necessary.. It is necessary that efforts to boost cassava competitiveness be addressed in terms of development across the cassava commodity chain, from, production, post-harvesting, processing, packaging, marketing and distribution. These would justify any institutional reforms and programmes to increase the economic potentials of cassava beyond subsistence production and processing. Equally important is the urgent need to develop and promote cassava processing activities that can support the industries economically. The transformation of cassava from a subsistence crop into an industrial crop would require practical commitment from the government, policy makers, industrialists and other key stakeholders towards the attainment of this goal. A plausible issue now should be emphases on input use efficiency to make cassava derivatives production economically attractive and competitive.

While productivity deals with the output that emerges from a production process, the concept of efficiency deals with the relative performance of the processes used in the transformation of factors into outputs. Efficiency can be categorized into two; allocative efficiency and technical efficiency. Farrel (1957) distinguished the two types of efficiency through the use of the frontier production function. Technical efficiency is defined by Xu and Jeffrey (1998) as the ability to produce a given level of output with a minimum quantity of inputs under a certain technology. Allocative efficiency refers to the ability to choose optimal input levels for given factor prices. Total efficiency is the combination of both technical and economic efficiencies. Production efficiency defines the degree of technical and allocative efficiency. There is scanty information on both economic and production efficiencies in cassava processing. Information also on allocative and technical efficiencies are also brief and scanty.

Farm efficiency measurement is very important in agricultural production. Bravo-Ureta and Evenson (1994) have recognized its role in increasing agricultural output. Agricultural production efficiency measurement can be verified through three distinct approaches; the cost based approach, profit and production function approaches.

In a study of the processing of cassava to garri, Chukwuji, Inoni and Ike (2007) have pointed out that efficiency in cassava processing is a function of several factors. They observed that technical efficiency or inefficiency among cassava processors can be explained by variations in their ages, levels of formal education, volume of production credit used among others. In their study in Delta State, the team observed that with the exception of age of processors all variables explaining inefficiency were negatively related with inefficiency. This implies that higher levels of educational attainment, use of credit, engagement in full-time bases among others encouraged better utilization of resources employed in garri processing. Education will encourage adoption of better management systems by producers and promotes the consciousness to maximize the full benefit of resource use. This is in agreement with the findings of Ahzar(1991) who observed that education brings about choice of better input combinations and use of existing inputs. The use of credit puts more pressure on the part of the processors to produce more output and therefore more income in order to meet personal cash needs and be able to pay back whatever was borrowed. Full-time involvement the team noticed in garri processing implies little or no income from other sources and no divided attention. In other words, those who are in garri processing in full-time bases are technically more efficient than part time processors. Chukwuji et al (2007) also commented that age had a positive effect on technical inefficiency of processors, indicating that the older ones were less efficient than the younger ones. The group attributed this trend to the fact that older people are less willing to adopt new ideas of doing things.

METHODOLOGY

The study was conducted in Rivers State. One of the states of the Niger Delta. Its southern boundaries terminate at the Atlantic Ocean. Delta and Bayelsa States lie West of it. It borders with Abia and Akwa Ibom States in the east and Imo in the North. Relative humidity is particularly high due to the high evaporation from the Myriads of creeks (Cassava Product Export Central Working Committee (CPECWC), 2002).

According to CPECWC (2002), Rivers State lies between latitudes 4^{0}15N and longitudes 5^{0}22E and part of the 800km stretch of the Nigerian coast where it covers a coastline space of 24km. It is located within the core Niger Delta Region which is the second largest Delta Region in the world. It has a land mass of approximately 16,40km^{2}.

The state was delineated into three (3) agricultural zones by the Cassava Processing Export Working Committee set up by the state government. The research also followed this delineation. Multistage random sampling was used in the selection of respondents in each of the agricultural zones. The zones are the Marine Coastal Zone (MCZ); the Fresh Water Salt Water Transitional Zone (FWSTZ) and, the Fresh Water Upland Zone (FWUZ). Five local government areas were randomly selected from each of the zones summing up to 15 local government areas and from each of the 15 Local Government Areas, 10 processors were randomly selected bringing the sample size to 150. Cobb-Douglas production function and Regression Analysis were used to investigate the research objectives. Structured questionnaire and Focus Group Discussions were extensively employed.

RESULTS AND DISCUSSION

Response of garri and fufu to input use

Output elasticity measures the percentage change in output resulting from a given percentage change in input. The exponents α and β in the analysis represent the Marginal Physical output in the various products. This section investigated the responses of Garri and Fufu to inputs of labour(L) in man-days and capital investment (K) using the Cobb-Douglass production function. The results are presented in Table 1.1.

Table 1.1: Response of Garri and Fufu to inputs of labour and capital

Zone	L^{α} Garri	L^{α} Fufu	K^{β} Garri	K^{β} Fufu
FWUZ	0.264	C^1	0.330	-0.097
FWSWTZ	0.523	0.150	0.298	-0.254
MCZ	C^1	C^1	C^2	C^2

Source: Field Survey, 2012.

C = constant (C^1 elasticity of output of garri and fufu to labour and C^2 elasticity of garri and fufu to capital investment)

The suffix α represents the exponent of labour and β that of capital invested. The sum of the exponents α + β determines the returns to scale on factor inputs. Returns to scale refers to a technical property of production that examines changes in output subsequent to a proportional change in all inputs. Where $\alpha + \beta < 1$, returns to scale are decreasing and if $\alpha + \beta > 1$ returns to scale are increasing.

The result from table 1.1 shows that a one percent increase in labour in man-days caused approximately a 0.26 percent increase in output in Garri production in the FWUZ while in the FWSWTZ, a one percent increase in labour in man-days caused approximately a 0.52 percent increase in Garri production. The result produced a constant relationship in MCZ. There was a constant relationship between labour in man-days and output of fufu in the FWUZ and MCZ but in the FWSWTZ, a unit increase in labour in man-days produced a 0.15% increase in output of fufu.

The response of output of Garri and Fufu to capital input was not very much different. A unit increase in capital produced approximately 0.33 percent increase in Garri in FWUZ and about 0.30 percent in FWSWTZ. There was also a constant relationship in the MCZ. In Fufu production, a unit increase in capital resulted in – 0.097 percent negative growth (suggesting diminishing returns) in FWUZ, another negative growth (– 0.25 percent) in the FWSWTZ was also observed. In effect, the marginal product for both capital and labour in man-days was negative in cassava processing in FWUZ and FWSWTZ an indication of severe allocation inefficiency. Empirically, this is reflected in a lower elasticity of output in the production function based on the sample. There was also a constant relationship between capital invested and output of fufu in the MCZ.

In effect, a negative response to input use is an indication or suggests allocation inefficiency. Empirically, this is reflected in a lower elasticity of output to capital and labour in the production, based on the sample. In all the variables studied α + β was less than one, suggesting a decreasing return to scale generally. This result is in tandem with results obtained from the regression analysis and average labour productivity discussed in the study which all point to labour inefficiency or low productivity in the system.

DETERMINATION OF INPUT/OUTPUT RELATIONSHIPS IN GARRI PROCESSING USING MULTIPLE REGRESSION ANALYSIS

This segment measured the relationship between the quantity of Garri and Fufu produced in the various agricultural zones and the quantities of labour inputs in man-hours, labour cost (in naira) incurred and quantity of raw tubers used. The results are presented in tables 1.2 and 1.3.below.

Table 1.2: Regression Coefficients of labour input in man-hours, cost of labour input in Naira and quantity of raw tubers used in Garri production.

Variables	**Coefficient in FWUZ**	**Coefficient in FWSWTZ**	**Coefficient in MCZ**
Labour input in man-hour per enterprise (X1)	0.221	-0.002	C^1
Labour input cost per enterprise (X2)	0.186	-0.006	C^2
Quantity of raw tubers used (X3)	0.599	1.003	0.766
Coefficient of determination (R^2)	0.780	0.997	0.380

Source: Field Survey, 2012

C = Constant (C^1 coefficient of labour supply in man-hours and C^2 coefficient of cost of labour)

The results of the study as presented in table 1.2 shows that a unit of labour in man-hours produced 0.22 units of Garri in FWUZ. In the FWSWTZ, output decreased by – 0.002 suggesting diminishing returns in labour supply in man-hours. Labour in man-hours had no correlation (perhaps because of the scanty number of processors) and appeared as a constant in MCZ. Output of Garri was 0.186 for every unit of additional investment in labour in FWUZ but produced a negative relation in FWSWTZ (-0.006). In the MCZ it appeared as a constant, had no correlation in the computing system. Output of Garri was 0.599 for every unit of raw cassava tuber used in FWUZ, 1.003 in FWSWTZ and 0.766 in MCZ. The coefficient of determination was 0.780 (78.0%) in FWUZ, 0.997 (99.7%) in FWSWTZ and just 0.380 (38.0%) in the MCZ. The percentages show the variation in the productivity of labour in man-hours, cost of labour and the amount of raw cassava tuber used that can be predicted or accounted for through the correlation or the regression line. The remaining percentages of the variation can be other factors which may include sampling error.

DETERMINATION OF INPUT/OUTPUT RELATIONSHIPS IN FUFU PROCESSING USING MULTIPLE REGRESSION ANALYSIS

This section measured the relationship between the quantity of fufu produced and inputs of labour in man-hours, cost of labour in Niara and the quantity of raw tubers used. The coefficients of these inputs are presented to table 1.3.

Table 1.3 Regression coefficients of labour in man-hours, cost of labour in Naira and Quantity of raw tubers used in Fufu production.

Variables	**Coefficient in FWUZ**	**Coefficient in FWSWTZ**	**Coefficient in MCZ**
Labour input in man-hour per enterprise (X1)	C^1	0.093	C^1
Labour input cost per enterprise (X2)	0.023	-0.295	C^2
Quantity of raw tubers used (X3)	0.749	0.840	C^3
Coefficient of determination (R^2)	0.505	0.626	-

Source: Field Survey, 2012.

C = Constants (C^1 -coefficient of labour input in man-hours, C^2 -coefficient of cost of labour and C^3 - coefficient of quantity of raw tubers used)

The study showed that in both the FWUZ and MCZ labour input in Man-hours was a constant. Also, all the variables were constants in MCZ; there was no correlation. Only two people in this zone processed cassava into fufu (cassava processing is a rare activity in this zone). Ouput of fufu was 0.093 per unit of labour in man-hours in the FWSWTZ but appeared constant in other zones. Output was 0.023 per unit of investment in labour (cost of labour) in FWUZ but had a negative effect in FWSWTZ (output was -0.295). For every unit of raw tubers used, output was 0.749 in FWUZ and 0.840 in FWSWTZ. The coefficient of determination in FWUZ was 0.505 (50.5%) and 0.626 (62.6%) in FWSWTZ. This implies that the relationship in the productivity of labour in man-hours and labour input cost to the output can be predicted or accounted for up to the value indicated through the regression line, the remaining variation can be other factors which may include sampling error.

Enterprises with low productivity (such as the cassava industry in Rivers State) may attempt to increase labour input but still suffer loss in competitive abilities because of ineffective management practices, inadequate technology and the subsistence nature of the cassava processing industry in Rivers State may be other factors impacting productivity.

CONCLUSION

The cassava processing industry in Rivers State suggests being a subsistence venture when the outputs that emerged from the production processes are considered. The output response to inputs of labour in man-days and capital investment show signs of resource allocation inefficiency which may be consequent on production technology in use and deficiencies in management abilities

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