Comparative Analysis Of The Productivity Of Sustainable Cassava Farming Under External And Internal Input Use In Imo State Nigeria.

Nwaiwu Innocent[1], Odii Marshall[1], Ohajianya Donatus[1], Eze Chiedozie[1], Oguoma Nicholas[1], Ibekwe Christopher[1], Henri-Ukoha Adanna[1], Kadiri Fausat[1] , Amaechi Clifford.[2],Oguh Joy[2],

1. Department of Agricultural Economics, Federal University of Technology P.M.B.1526,Owerri, Imo State, Nigeria.

2. Imo State Polytechnic Umuagwo, Nigeria.

niuche2004@yahoo.com

ABSTRACT:

This sturdy analyzed the productivity of cassava farmers under external and internal input use. Primary data were collected from 200 smallholder cassava farmers selected using a multi-stage sampling technique. Questionnaires were administered to the farmers using cost-route approach. Data were collected on the farmers' socio-economic characteristics and values of input used and output produced. Data were analyzed using partial productivity approach and comparison made with Z-statistics. The results showed among others that there was no significant difference between the partial productivity per hectare of the average farmer that used external input and one that used internal input. Their average income per hectare were found to be significantly different from each other and stood at ₦93,750 and ₦106,443 for external and internal input users respectively. It is recommended therefore that internal inputs use should be encouraged and external inputs used as complementary inputs where inevitable. [New York Science Journal 2010;3(10):12-16]. (ISSN: 1554-0200).

Key words: External input, Internal input, Sustainability, Analysis, and Comparison.

INTRODUCTION

Cassava ranks highly as a major staple food crop particularly for the low income earners and resource-poor farmers in the developing economies of Sub-Saharan Africa. (Hahn *et al.* 1989). However, in the recent times, cassava is progressively gaining a strategic position in the global trade as a result of the efforts by various research and development stakeholders in developing value-added cassava-based products for human consumption and industrial uses (Onyeka *et al.* 2005).

The performance of smallholder farmers in Nigeria is observed to be unsatisfactory. Considering the slow rate of growth or even stagnation in the wake of rapid population growth, the sector has failed to keep pace with the demand of households and industries for farm produce either for food or raw material. Despite the potentials of cassava in addressing the increasing food demand of the growing population in Africa as well as in the diverse uses to which it is subjected, IITA (1990) notes that the average production of cassava in Africa is currently below average. The interaction/activities of various factors limit the productivity of cassava. These among others include poor primitive technology in use, small uneconomic holdings under cultivation, poor availability and utilization of improved production input such as mechanical, biological and chemical technologies for treating ecological factors. The critical issue is how to improve farm productivity in a sustainable manner without pronounced threat to the environment. From the foregoing, emphasis has been on resource productivity with little or no consideration of sustainability of the resources used. Therefore the objective of this study is to determine and compare the productivity of cassava farmers in Nigeria under the use of external and internal inputs using partial productivity approach.

Efficiency is an important factor of productivity growth as well as stability of production especially in developing agricultural economies (Hazarika and Subramanian, 1999) Heady (1982) states that optimum productivity of resource implies an efficient utilization of resource in the production process. That is, attainment of a production goal without waste. Technical efficiency has been defined by Heady (1982) as the measure of a firm's success in producing maximum output from a given set of inputs. In this study, also, external input, is defined as artificially manufactured, very capital intensive in procurement, usually purchased, depends on very high skill and technology to produce, use and not readily available to the resource poor farmers. Internal inputs refer to those inputs that are naturally endowed, relatively very cheap to procure, do not require high skill to use, depends on indigenous technology, very readily

available and affordable to the farmers. Sustainability on the other hand refers to the farmers' capacity to optimally improve agricultural productivity by rational utilization of both internal and external resources and being conscious of conserving the catchments environments (Harwood, 1987).

Information gap exists in this sort of investigation. Previous studies by various writers have indicated wide range of productivity and efficiency variation in resource use in Nigeria without deriving the implication of external and internal inputs use in relation to sustainability in cassava production. Among these are Ajibefun and Aderinola (2004), Amaza and Olayemi (2000) and Odii (2004). Olayide and Heady (1982) are of the opinion that resource productivity is definable in terms of individual inputs or a combination of them. Furthermore, productivity is defined as the relationship of output to one type of input such as labour, capital or energy and additionally as the relationship of output to a combination of inputs. In this context, land, capital, labour and management productivities can be defined as the ratio of total output to inputs of land, capital, labour and management respectively. This is the ratio which Ehui and Spencer (1990) termed partial productivity in that it is the ratio of total output to a single input.

MATERIALS AND METHODS

The study was conducted in Imo State in the Eastern Region of Nigeria. Imo State has a land area of 553,000 hectares and had a population of 2,485, 635, made up of 1,166,448 (1.3%) males and 1,319,187 (1.5%) females,(FOS, 1999). The state has boundaries with Abia, Anambra, Enugu and Rivers States (Menakaya and Floyd, 1976). There are 27 Local Government Areas (LGAs) that make up the administrative authority seats of the state. There are three agricultural zones in the state and these are Owerri, Orlu and Okigwe zones. The landscape is undulating with runoff from catchments emptying into the low terrace basins of Imo River, Njaba River, Otamiri, Mbaa, Orashi, Oguta lake and other water bodies domiciled in the area. The soil varies from eroded acidic soil on the coastal plain, sandy and alluvial soil along the low terrace of the water basins. The soils PH ranges from 5.0 to 5.5 (ISMANR, 1986). On estimation, ISMANR (1986) reports 84% of the total land as being potentially productive with 48% put into the cultivation of arable crops under rotational bush fallow system while 36% is under plantation crops.

The area has tropical climate characterized by high rainfall and temperature ranges of 1500mm to 2300mm and $34^{O}C$ to $37^{O}C$ respectively. Correspondingly, the vegetation is tropical rainforest that has suffered lots of deforestation. The occupation of majority of the inhabitations is farming. Almost every family farm as a primary or secondary occupation, cultivating mainly arable crops like cassava, yam, cocoyam, maize, vegetables and tree crops like oil palms, coconuts, oranges, mangoes and numerous others. The production systems vary from smallholders multiple cropping using internal inputs to those using external inputs additionally.

The data for this study was collected from a sample frame of 400 cassava farmers proportionately drawn from the registers of Village Extension Agent (VEAs) in the three agricultural zones of the state. A random sample size of 240 respondents consisting of 80 from each of the three zones of the state was made. Questionnaires were administered to the respondent farmers by trained enumerators, village extension agents, and the researcher. In the end, only 200 responses (100 each of external and internal input users respectively) were used in the analyses. The information collected bothered on their socio-economic characteristics and farm production operations inform of input variables, output and their prices.

Analytical Procedure

Data were analyzed using Partial Productivity approach (PP). Partial Productivity is the ratio of the total quantity of output to each of the inputs used in the farm, such as land, labour, fertilizer and others.

$$P = \frac{Y}{X_j}$$

$$j = 1, 2 \ldots n$$

Where P = Index of partial productivity

Y = Quantity of total output

X = Quantity of each input used in the production

j = Respective input factor

The ratio was computed for both internal and external inputs used and were compared using the Z-test statistic specified as:

$$Z_{cal} = \frac{P_e - P_i}{\sqrt{\frac{S_e^2}{n_e} + \frac{S_i^2}{n_i}}}$$

Where

Z_{cal} = Z calculated value for judging the significance of the mean difference in the two samples

P_e = Mean partial productivity for a particular resource under external input use.

P_i = Mean partial productivity for the same resource in P_e above but under internal input use.

S_e^2 = The variance of partial productivity for a particular resource under external input use.

S_i^2 = The variance of partial productivity for the same resource as in Se^2 above but under internal input use.

n_e = Sample size for farmers that used external inputs.

n_i = Sample size for farmers that used internal inputs.

RESULTS AND DISCUSSION

The average socio-economic and resource endowment statistics of the respondent cassava farmers are presented in Table 1. The average respondent farmer is 51 and 53 years of age respectively for external and internal input users respectively.

Table 1: Average statistics of socio-economic and resources endowment variables of the respondents.

VARIABLE	MEAN VALUE	
	External Input	**Internal Input**
Age (years)	51	53
Educational Level (years)	13	7
Household size (number of persons)	5	11
Plot size cultivated (Ha)	2.32	1.94
Labour input (Mandays)	46	42
Quantity of fertilizer used /Ha (tons)	0.84	0.48
Cash expense on cassava enterprise (₦)/Ha	64,956	49,845
Annual balance (₦)/Ha	93,750	106,443

Source: Survey data, 2005.

This shows that both groups are of middle age and capable enough to engage in viable cassava production enterprise. This age group is sedentary enough to be consistent with farm transactions and operations. On the average also the external input user has 13 years of formal education while the internal input user has 7years, implying that farmers with higher literacy level used more of external input and vice versa. The plot size and labour input average for these groups of farmers were 2.32ha and 46 mandays and 1.92ha and 42 mandays for the external and internal input users respectively. Correspondingly, the quantity of fertilizer or organic manure (tonnes) and cash expense were 0.84 and 64,956; and 0.48 and 49,845 for the external and internal input users respectively. This finding indicates that the external input users use higher quantum of these resource inputs than the internal input users. Interestingly, the annual revenue of the internal input users was ₦106,443 and higher than that of the external input users which is ₦93,750. On hectare average the internal input user showed a better business enterprise than the external input user as confirmed by a Z-test at the 5% level (Z_{cal}, 15.52 > Z_{tab}, 1.96).

Partial Productivity of Cassava under the Use of External and Internal Input.

Table 2: Mean partial productivity per hectare of cassava under the use of external and internal input.

Factor	External	Internal
Land	22.52	800.40
Labour	2.75	9.08
Capital	17.45	10.25
Fertilizer/Organic Manure	137.88	672.50

The mean partial productivity per hectare of cassava under external and internal input use is shown in Table 2. The implications are that for each unit of land put into cassava production among the external input user farmers, the contribution to total output is 22.52 units of partial output product which is lower than 800.40 for internal input users on average. The partial productivity of fertilizer or organic manure input is higher and more productive at 672.50 among internal input users than 137.88 among the external input users. However, the partial productivity of capital for both groups are close though higher at 17.45 for external input users than 10.25 for internal input users.

The comparison of the partial productivity of the productive factors – land, labour, capital and fertilizer is shown in Table 3. It indicates that the partial productivity of all these factors among cassava producers that used external inputs is not significantly different from those of cassava producers that used internal inputs.

Table 3: Comparative analysis of partial productivity of resource used between external input user-farmer and internal input user-farmer

Resource		External	Internal
Sample Size (n)		100	100
Land	Mean (P)	22.52	800.4
	Standard Deviation(s)	133.187	7233.105
	Z_{cal}		-1.07
	Z_{tab} at 0.05		1.96
	Decision:	Accept the null hypothesis (Ho)	
Labour	P	2.75	9.08
	S	10.92	4.73
	Z_{cal}	-1.43	
	Z_{tab} at	0.05	1.96
	Decision:	Accept the null hypothesis (Ho)	
Capital	P	17.45	10.25
	S	8.92	78.07
	Z_{cal}	0.92	
	Z_{tab} at	0.05	1.96
	Decision:	Accept the null hypothesis (Ho)	
Capital	P	137.88	672.50
	S	865.12	3145.14
	Z_{cal}	-1.64	
	Z_{tab} at	0.05	1.96
	Decision:	Accept the null hypothesis (Ho)	

Source: Survey data, 2005.

CONCLUSION AND RECOMMENDATONS

This study has shown vividly that the internal input user cassava farmers in the study area operate more sustainable farming than the external input user cassava farmers. The comparative analyses confirmed that despite the larger cost of using external input, there were no significant differences in the partial productivity (ie, technical efficiency) of the respective input/factors used in cassava production between the two groups. More so, the income realized in using internal input is significantly more than that of using external input. The internal inputs are also more readily available and affordable to majority of the resource poor farmers in the study area. This is however consistent with their small holding capacity.

Conscious of the fact that agricultural sustainability as explained by Liebheart (1987) involves minimizing the use of external inputs and maximizing the use of internal inputs which already exist on the farm, it becomes convenient to conclude that the use of internal input be highly encouraged against the much use of external inputs. However, in a situation where the use of external input becomes inevitable (such as under intensive farming owing to land constraint) it is recommended that such inputs be used at a very restricted and controlled rate and in a way complementary to the internal inputs. This would promote agricultural sustainability in farming business operations.

Correspondence Author:
Nwaiwu Innocent Uche
Department of Agricultural Economics
Federal University of Technology,Owerri
Nigeria.
E-mail- niuche2004@yahoo.com
Tel: 2347031336540.

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