

Comparative Analysis of Productivity of Cassava Based Crop Mixture under Modern and Indigenous Technologies in Anambra State, Nigeria

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This study compared and analyzed indigenous and modern agricultural technologies used in cassava production in Anambra State. Multi-stage sampling technique was used in sample selection. A total of 160 farmers were purposively selected from the four Agricultural zones that made up the state based on the use of modern and indigenous technologies. Data were collected using structured questionnaire. Descriptive statistics and total factor productivity were used in analyzing the data. The result of the analysis showed that both categories of farmers are within the working class age bracket of 40 and 60 years. The modern technology users were found to be more educated, have larger farm holding and higher average income per hectare than their counterparts. Farmers that used indigenous technologies have larger household size than those that used modern technologies. The total factor productivity (TFP) ratios computed for modern and indigenous technology users are 1.493 and 0.758 respectively. Sequel to the fact that the Z-calculated was higher than the Z-tabulated, the null hypothesis was rejected. This implies that there was a statistically significant difference between the productivity of farmers that used modern technologies and those that used indigenous technologies. The F-ratio also tested confirmed the higher variance in TFP for the two categories of farmers which shows a higher significant difference in the mean values. It was therefore concluded that the use of modern technologies in cassava production should be encouraged because they ensure higher agricultural productivity among farmers. [Nwaiwu et al. Comparative Analysis of Productivity of Cassava Based Crop Mixture under Modern and Indigenous Technologies in Anambra State, Nigeria. International Journal of Agricultural Science, Research and Technology, 2012; 2(1):17-21].

Key words: Productivity, Modern, Indigenous, Technology, Dissemination

1. Introduction

Agricultural technology has historically played a critical role in alleviating hunger and poverty. Today nearly over 70% of the Nigeria population live below the poverty level not withstanding the abundant natural and human resources which the country is endowed with (Kormawa et al, 2002). More than 5% of this number live and work in rural areas and depend largely on agriculture for their livelihoods (Kormawa et al, 2002). Therefore, meeting the demands of these people will require productivity increases, appropriate technologies and product diversification to ensure broad-based economic growth capable of improving standard of living of the people. Given that 90% of the food consumed in poor countries is produced locally, the economic and physical well being of poor countries will depend on stabilizing and increasing agricultural productivity in these countries via more effective practices and technologies (NEPAD, 2002). Ahmed (1981), asserted that this needed increase in productivity must come by

technological changes and improvement on existing indigenous agricultural technologies. According to Obasi (2000), technology to farmers must be such that will be appropriate for use under the conditions in which the farmers operate. Although appropriateness of technology does affect agricultural productivity, the technology must be disseminated and this is largely done through agricultural extension service (Obasi, 2000). Technology dissemination needs better coordination from different agencies particularly from the national ministries of Agriculture, planning and rural development (Beets, 1996).

Agricultural practices in place today came about through increased scientific and technological knowledge that led to mechanization, improvement in cultivars, management practices, improved plant nutrients and crop protection technologies. Other technologies such as enhanced nutritional value of crops, improved pest and disease resistant varieties, vaccine delivery, improved water management, decreased harvest and post harvest losses, may



Abstract

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increase returns and stimulate economic growth especially in the light of projected environmental changes with associated social and ecological costs. As it has been observed that increased productivity with modern agricultural technologies and practices have engendered both social and ecological costs and benefits, therefore this study to comparatively analyze these alternative technologies available to the farmers in cassava production stands a right step in the right direction.

Technology has been variously defined as the state of knowledge or study of new scientific and industrial skills, and the utility of the environmental tools, machine and implements, techniques and organizations for solving problems for human survival or achieving some degrees of material and physical comfort (Bennett, 1978; Imade, 1982). Indigenous technology refers to the local methods, systems and techniques that are unique to certain people living within a geographical locality and as adapted and acquired through experience by the people to suit their needs. Indigenous technologies are those inputs (seeds, seedlings tools, planting materials) and management practices and ways of manipulating the environment, which are of traditional origin on local people (Idachaba, 1987). Whereas indigenous technology means as above, modern technology can be said to be the knowledge and usage of tools, techniques, crafts, systems or methods of organization, or is a material product (such as clothing). FAO (2003) defined modern agricultural technologies as the invention and use of machine and other revolutionary innovation in production.

Several indigenous and modern technologies are available and practiced by farmers in Anambra State. It is evident also that several studies have been conducted on the use of technologies in agricultural production. These studies reveal that so much have been done by research institutes and government to improve the indigenous and modern agricultural technologies available to farmers. Despite these efforts per hectare, Sarma and Kunchai (1991) observed that agricultural productivity continues to decline over the years. It was obvious that amongst these numerous studies, literature on comparative studies on the use of these alternative technologies is still very scanty. This work is therefore, designed to bridge that knowledge gap between the usefulness of modern and indigenous technologies through a comparative analysis of the productivity of cassava producers that used either of the two technologies. Besides, the observed low agricultural productivity condition despite government and research institutions' investment in developing technologies

will be ameliorated when the findings of this study are implemented.

It was hypothesized that no significant difference existed between the productivity of cassava producers that used modern technology and those that used indigenous technology.

2. Materials and methods

This study was conducted in Anambra State, one of the nine agro-ecological zones located in the Southeastern part of Nigeria. It is located between longitude $6^{\circ} 20' N$, and latitude $7^{\circ} 0' E$. According to FGN (2006), it occupies a total area of $4,844 km^2$ and a population of 4,177,828 people with 2,117,984 males and 2,059,844 females.

Multi-stage sampling technique was adopted in this study to ensure that a representative sample of the population was selected. 160 respondents were purposively selected to represent 80 cassava farmers that used modern technology and 80 others that use indigenous technology. In this study, farmers who were found to use inorganic fertilizer were categorized modern technology users, while those who did not use inorganic fertilizer but rather used organic manure as alternative to organic fertilizer were categorized indigenous technology users. Data for this study were collected with the use of structured questionnaire. These include data on the farmers' socio-economic characteristics, farm production records which includes farm size, input and output data in relation to costs and revenue, the type and available farming systems and technologies used, plus the indigenous technologies practiced in the area.

Descriptive statistics such as mean was used to analyze the socio-economic characteristics of the respondents while the Total Factor Productivity Index was used to determine the productivity status of the two categories of cassava producers as thus; The Total Factor Productivity Index (TFP) is given as

$$TFP_m = Y_{im} / X_{im} \quad (\text{for modern technology users})$$

$$TFP_n = Y_{in} / X_{in} \quad (\text{for indigenous technology users})$$

Where TFP_m = the total factor productivity for cassava producers that used modern technology

TFP_n = the total factor Productivity for cassava producers that used indigenous technology

Y_i = Total Quantity of Output of farmer i in value terms (Naira)

X_i = Total Cost of Inputs used by farmer i (Naira)

m = Represents cassava producers that used modern technology

n = Represents cassava producers that used indigenous technology

i = Sample size which ranges from 1-80 for each category of cassava producers.

Furthermore, the mean (TFP) for both categories of farmers were computed and Z-test statistic used to compare the two mean productivities using the formulae stated below;

$$Z_{cal} = \frac{\bar{X}_m - \bar{X}_n}{\sqrt{SE_m^2 + SE_n^2}}$$

Where

Z_{cal} = the Z-test statistic used to compare difference between two means from two sample sets

\bar{X}_m = the mean total factor Productivity for cassava producers that used modern technology

\bar{X}_n = the mean total factor Productivity for cassava producers that used indigenous technology

TFP_m = the total factor productivity for cassava producers that used modern technology

TFP_n = the total factor Productivity for cassava producers that used indigenous technology

SE_m^2 = standard error of TFP_m

SE_n^2 = standard error of TFP_n

3. Results and discussion

Socio - economic Characteristics of Cassava Producers in the Study Area

The Socio - economic characteristics of cassava producers in the study area phrased in Table 1.

Table 1: Distribution of farmers according to socio-economic characteristics

Variable	Mean Value	
	Modern Technology	Indigenous technology
Age (years)	43	50
Educational Level (years)	14	7
Household size (number of persons)	6	8
Plot size cultivated (Ha)	0.141	0.082
Cash expense on cassava enterprise (₦)/Ha	185,716	239,732
Annual income from cassava enterprise (₦)/Ha	203,972	170,244
Mean TFP	1.493	0.758

Table 2: Estimated statistical parameters

PARAMETERS	Technology	
	Modern	Indigenous
Mean TFP	1.493	0.758
Variance (S^2)	1.398	0.2031
Standard deviation(S)	1.1825	0.4507
Standard error (S_e)	0.2365	0.0901
Z-test (calculated)	2.91	
Z-test (tabulated)	1.96	
F-ratio (calculated)	6.88	
F-ratio (tabulated)	1.25	

Based on the Table 2 rejected the null hypothesis which says that there is no significant difference between the productivity of cassava producers that used modern technology and the productivity of those that used indigenous technology.

According to Table 1, the mean ages of cassava producers that used modern and indigenous technologies are 43 and 50 years respectively. This implies that the farmers that mostly use modern technologies are the younger ones who are relatively less conservative and easily accept innovations. It can also be said that due to the relative difficulty involved in the use of most modern technologies, younger farmers tend to adopt new technologies more than the older colleagues. The farmers mean educational levels are 14 years and 7 years for modern and indigenous technology users respectively. This also confirms why the level of adoption or use of modern technologies is higher among the modern technology users than the indigenous technology users. It is expected that higher levels of education should prepare a farmer to have the requisite skills, knowledge and confidence to learn and adopt modern technologies.

Furthermore, the household size of indigenous technology users is higher than those of the modern technology users with mean values of 8 and 6 persons respectively. These also agree with our previous discussion where the modern technology users are found to be younger and have higher level of education. It is true because more educated people are expected to be in a better position to adopt and implement birth control strategies, hence their lower household size than their counterparts. Table 1 also shows that the size of farms cultivated by the two categories of farmers is less than one hectare with 0.141ha and 0.082ha for modern and indigenous technology users respectively. This result agrees with the findings of other researchers (Olayide, 1980; Nwaiwu, 2007) that Nigerian agriculture is essentially small scale in structure as over 90% of the farming population are holders of less than 6 hectares of land. Also according to Ogunbile and Olukosi, (1991) 85% of the food produced in Nigeria comes from farms of not more than two hectares in size. The fact that the modern technology users have higher farm holdings could be attributed to their use of modern technologies that encourages larger farm size due to mechanization, use of fertilizers, herbicides, pesticides etc.

Besides other features noticed on the use of indigenous technology, it was discovered that their cash expense per hectare is greater than those of the modern technology users with the values of N239,732 and N185,716 respectively. This could be attributed to lack of economies of large scale

production and non use of some modern technologies that have been found to be cost effective. For instance the use of herbicide to control weed is expected to be cheaper/ha than the use of manual labour to weed. Also the use of manual labour in making planting structures do not only lead to drudgery, it also wastes time and is more costly than the use of tractor etc. Further to these, the average income per hectare for modern technology users is higher than that of the indigenous technology users with values of N203,972 and N170,244 respectively. This is obviously attributable to larger scale of operation as shown in their level of farm size and their use of modern technologies that ensure larger scale production and hence higher income.

Table 1 also shows the mean total factor productivity of the modern and indigenous technology users as 1.493 and 0.758 respectively. This suggests that the use of modern technology is more technically efficient than the use of indigenous technology. This follows from the fact that total factor productivity measures the total value of output produced divided by the total value of inputs used. It is good measure of the technical efficiency of the two approaches to cassava production and is further subjected to the t- test statistic to determine whether there is a significant difference in these means.

According to table 2, the variances and standard errors of the total factor productivities for modern and indigenous technology users are 1.398 and 0.2031; 0.2365 and 0.0901 respectively. The t-cal of 2.9 is greater than the t-tab of 2.00. This lead to the rejection of the null hypothesis and the conclusion that the productivity of cassava producers that used modern technology is higher than the productivity of cassava producers that used indigenous technology with 5% probability of type one error. Also the F-cal of 6.88 is greater than the F-tab of 1.98 also at 5%. This equally confirms that the total factor productivity of the modern technology users of 1.493 is truly and significantly higher than the total factor productivity of the indigenous technology users of 0.758. This is also in tandem with the average income per hectare of N203,972 and N170,244 for modern and indigenous cassava producers respectively.

4. Conclusions

It is therefore concluded that the use of modern and improved technologies in cassava production does not only ensure increases in agricultural productivity but also ensures that enough food is produced hence a panacea to the lingering food insecurity situation in Nigeria and Sub-Saharan Africa at large. With the use of modern technologies of production, agricultural productivity and income per hectare is better at 1.493 and N203,973

respectively than for indigenous technology use at 0.758 and N170,244 respectively.

Sequel to this obvious discovery, it is recommended that appropriate agricultural technologies should be made available and affordable to the teaming resource poor farmers that are found in the study area and Sub-Saharan Africa as a whole. Besides, extension agents should also be encouraged to intensify their innovation dissemination strategies so as to increase the level of adoption of available improved technologies of agricultural production.

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