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# RESOURCE PRODUCTIVITY OF YELLOW PEPPER FARMERS IN ENUGU STATE, NIGERIA

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## ABSTRACT

The paper examined the resource productivity of yellow pepper production in Enugu State, Nigeria .The specific objectives are to: determine the profitability of yellow pepper, its technical efficiency in the use of major production inputs. One hundred and twenty yellow pepper farmers were selected through the multi-stage random sampling technique and were interviewed using well structured questionnaire. The data collected were analyzed using budgetary analysis and stochastic frontier production function. The study also showed that yellow pepper production in the study area was profitable. Furthermore, the study determined the technical efficiency in the use of major production inputs, and found that most of the production coefficients were positive namely; amount spent on labour, amount spent on implements, farm size, quantity of seeds and cost of seeds planted. They all had direct relationship with output, with only fertilizer and pesticides being negative. Farm size, pesticides, amount spent on implements, quantity of seeds planted and cost of seeds planted were all significant at (5%) level, and the returns to scale was less than unity, indicating that yellow pepper production in the study area was in stage II of the production surface, which is the stage of efficient production and utilization of resources. The technical efficiency analysis revealed that 88.3 percent of the farmers had technical efficiency level of 0.76 and above, meaning that the sampled farmers were relatively technically efficient.

**Key words:** Yellow pepper, Resource productivity, Profitability, Budgetary Analysis, Technical-efficiency.

## INTRODUCTION

The word "pepper" is derived from the Latin word "piper" which means pepper. Pepper (Capsicumspecies) is specifically cultivated in South and Central America, Mexico, India, Indonesia, Thailand, Sri-lanka, Central Africa and also in West African countries. More than 30% of the world's pepper production comes from Vietnam, the largest producer of pepper in the world since 1999 (IPC, 2010). Pepper is rightly known as the 'king of spices' because its usage makes it the most essential spice in the world more than any other spices present (IPC, 2003). The production of pepper is dependent upon hot and moist weather conditions and that is why peppers grow or prosper in countries having this sort of climatic conditions (IPC, 2003).

There are five domesticated pepper species and twenty three wild species in the world. The five domesticated species are: Capsicum annum, Capsicum Chinese, Capsicum baccatum, Capsicum frutescens, Capsicumspecies.

Yellow pepper is a variety of Capsicum annum found growing in Enugu State (Uguru, 2005). It is among the principal vegetable crops grown in the state, based on its popularity, nutritional values, adaptability to the existing cropping system and potential to increase farmer`s income. It has a distinctive aromatic flavour and natural pungency, these classic qualities embedded in it enhances its use as condiments for flavouring of foods and sauces (Onwubuya et al., 2009). All cultural practices involved in the production of other species and varieties of capsicum annum, Capsicum Chinese, *Capsicum baccatum*, are also involved in the production of capscicum annum var. Nsuka yellow pepper. Uguru (2005) observed that *Capsicum annum* (yellow pepper) is grown as a sole crop.

This paper is aimed at acquiring relevant information on yellow pepper production, and also coming up with results that can enhance production of this crop. Due to the high nutritive value of this crop, enquiry into its current production potential in Nigeria and factors that influence its production is important. In lieu of this, this paper is aimed at answering the following research questions: What are the production potentials of yellow pepper in Enugu State, Nigeria? How efficient are the resources used in the production of yellow pepper? The aim of this paper is to investigate the resource productivity and profitability analysis of yellow pepper production in Enugu State.

### Hypothesis of the Study

The hypothesis of this study stated in the null form is that:
There is no significant relationship between the socio-economic characteristics of yellow pepper farmers and their productivity.

## 2.0. MATERIALS AND METHODS

The study area is Enugu State. The state covers a total of 7, 161 square kilometers of land mass and it is bounded in the south by Abia State and in the north by Kogi State. To the west, it`s bounded by Anambra State, while in the east its bounded partly by Benue State and Ebonyi State. The state consists of seventeen (17) Local Government Councils and three senatorial districts. According to the 2006 census, Enugu State population

stood at 5,590,513 people thus being among the most populous state in the country. There are two distinct seasons namely wet and dry seasons the wet season occurs between April and October, while the dry season occurs between November and March.

Primary data was used for this study. Primary data for this study was collected from one hundred and twenty randomly selected respondents with the aid of structured questionnaire. Multi-stage random sampling technique was used to select one hundred and twenty (120) yellow pepper farmers from the three (3) selected local government areas out of seventeen (17) LGAs in Enugu State.

Data collected from the field were amalyzed using budgetary analysis and stochastic frontier production function.., Stochastic frontier production function was employed to determine the technical efficiency of the farmers in the use of major production inputs in yellow pepper production. Budgetary analysis was used to determine the profitability of yellow pepper production GM= TR-TVC

Where TR= Total Revenue in Naira

TVC= Total variable cost in Naira. The decision rule is that: if GM>0, then the farm is profitable

However, the predicted individual farmers level of technical efficiency was calculated as the ratio of observed output Y to the corresponding frontier output Y* conditional on the level of output used by the farmers. Hence the technical efficiency of the farmers is expressed as,

$TE_i = Y_i/Y_i^* = f(X_i; \beta) \exp(V_i - U_i)/f(X_i; \beta) \exp V_i = \exp(-U_i)$, where: $Y_i$ is the observed output and $Y_i^*$ is the frontier output.

The technical efficiency range is between 0 and 1 that is ($0 \leq TE \leq 1$).

Two different models were specified for each farmer. Model I is one in which the inefficiency effects $U_i$ was absent. It is a special unique case of the stochastic frontier production function model in which gamma (Y) is assumed to be zero i.e. y=0. In order words, it assumes that the traditional (ordinary least square OLS) is an adequate representation of the stochastic frontier model. Model II is the general frontier model in which y=0. It's the ratio of the variance of farm specific technical inefficiency that is, $y = {}^{2}{}_{u}{}^{2}$. It measures the total variation of the output from the frontier, which can be attributed to technical inefficiency. For this study, a Cobb-Douglas production function of the following form was assumed.

$$\text{Log } Y\,1 = B_0 + B_1 \text{Log}X_1 + B_2 \text{Log}X_2 + B_3 \text{Log}X_3 + B_4 \text{Log}X_4 + B_5 \text{Log}X_5 + B_6 \text{Log}X_6 + B_7 \text{Log}X_7 + (v_1 - u_1)$$

Where: $Y_i$ =total output of the farmer measured in kilograms, $X_1$ = Amount spent on labor (N), $X_2$ = Farm size (Ha), $X_3$ = Amount of Fertilizer used (kg), $X_4$ = pesticides (litres), $X_5$ = Amount spent on farm implements (N), $X_6$ = Quantity of seeds used (kg), $X_7$ = Cost of planting materials (seeds) (N), V = Random error assumed to be independent of $U_i$ identical and normally distributed with zero mean and constant variance $N(0, {}^{2}u)$. $U_i$ is technical inefficiency effects which were assumed to be independent of $V_i$. They are non-negative truncation at zero or half normal distribution with $N(0, {}^{2}u)$. Where 1, 2 .....n. $B_i$ is unknown scalar parameter to be estimated.

**Technical Inefficiency Model:**

The inefficiency model specified for yellow pepper farmers to examine the effects of socio-economic variables on the technical efficiency of yellow pepper farmers was of the form:

$U_i = {}_{.}+ {}_{1}Z_1 + {}^{2}{}_{2}Z_2 + {}^{2}{}_{3}Z_3 + {}^{2}{}_{4}Z_4 + {}^{2}{}_{5}Z_5 + {}^{2}{}_{6}Z_6 + {}^{2}{}_{7}Z_7 + {}^{2}{}_{8}Z_8$,

Where $U_i$ = inefficiency effects, $Z_1$ = Age of the respondents (yrs), $Z_2$ = Level of Education of Farmers (yrs), $Z_3$ = Farming experience (yrs), $Z_4$ = Farm Distance (km), $Z_5$ = Major occupation, $Z_6$ = Gender, $Z_7$ = Land ownership status, $Z_8$ = Credit facilities, Where Z = 1, 2.....8.

3.0. RESULTS AND DISCUSSION

Profitability of Yellow Pepper Production using Budgetary Analysis

The summary of gross margin analysis, which is a measure of farm profitability is presented in Table 1. The variable costs in the study area include, cost of planting materials (Seeds), cost of labour, cost of organic and inorganic fertilizer, cost of pesticides, cost of implements, while total fixed cost and total revenue variable were also analyzed. The gross margin/hectare wasN261, 979.98 which indicated that yellow pepper production was profitable in the study area. The total revenue of N36, 213,700with a standard deviation of 252.092 was obtained for the yellow pepper farmers in the study area.

## Table 1: Cost and Return Analysis of Yellow Pepper Production

| Variables | Costs (N) | Mean | Standard deviation |
|---|---|---|---|
| Cost of planting materials (seeds) | 424,250 | 3535.416 | 2057.527 |
| Cost of labour | 1,184,902 | 9874.183 | 9942.656 |
| Cost of fertilizer | 1,803,000 | 15025 | 9440.792 |
| Cost of pesticides | 156,650 | 1305.416 | 1431.984 |
| Cost of implements | 357,300 | 2977.5 | 3239.636 |
| Total variable cost | 3,926,102 | | |
| Total fixed cost | 850,000 | | |
| Total revenue | 36,213,700 | 521.006 | 252.092 |
| Gross margin | 31,437,598 | | |
| Gross margin/ha | 261,979.98 | | |

**Source: Field Survey, 2012.**

Maximum Likelihood Estimates of Stochastic Frontier Production Function

The estimates of stochastic frontier production function are presented in Table 2. The farm model presents the estimated coefficients of the parameters of yellow pepper production variable and their t-ratio value which were consequently used to test for the significance of the estimated coefficients. From the analysis all the coefficients were positive except for fertilizer and pesticides. The estimated coefficient of the variables being positive implied that, amount spent on labour, amount spent on implement, farm size, quantity of seed and cost of seeds planted had direct relationship with the output. In order wards, yellow pepper output increases by the value of each co-efficient as each coefficient is increased by one, however farm size, pesticides,

amount spent on implement, quantity of seeds planted and cost of planting materials (seed) were significant at 5% level of significance. This is in conformity with the work of Ojo (2000 on factor productivity in maize production in Ondo State, Nigeria and showed that the economic resources of farm size, labour, seeds planted and capital, explained over 86% of the variations in the output of maize. The study showed that there were direct relationships between the output of maize and each of the independent variables and the factors like seeds planted, farm size and labour utilization were significant at 5% level. The study also revealed that planting materials (seeds) and operating expenses are important factors in agricultural production. The coefficient of each variable used in the analysis was less than unity but greater than zero which shows that elasticity of production (EP) is between zero and unity that is (0<EP<1). The economic implication of the findings is that the allocation and utilization of each variable was in stage II (stage of decreasing positive return to factors of production) meaning that the farmers were efficient in the allocation and utilization of their resources.

The analysis of return to scale (RTS) of yellow pepper production in the study area was the summation of the coefficients of elasticity of production used for the estimation of the stochastic frontier production function. The result of the computed RTS was 0.92 indicating that yellow pepper production in the study area was in stage II of the production surface and that yellow pepper production was in a stage of efficient production and utilization of resources. This finding is in conformity with Ogundari and Ojo (2005) work on determinants of technical efficiency of mixed crop farming in Ogun State Nigeria in which they recorded RTS of 0.945.

| Variables | Parameters | Coefficients | t-ratio | Std error |
|---|---|---|---|---|
| Constant | $_0$ | 0.0271* | 31.814 | 0.0009 |
| Amount spent on labour (N) | $_1$ | 0.1051 | 1.426 | 0.0737 |
| Farm Size (ha) | $_2$ | 0.0102* | 2.135 | 0.0048 |
| Fertilizer (kg) | $_3$ | -0.0071 | -1.532 | 0.0046 |
| Pesticides (litres) | $_4$ | -0.1320* | -2.51 | 0.0526 |
| Amount spent on implement (N) | $_5$ | 0.0621* | 3.012 | 0.0206 |
| Quantity of Seeds (kg) | $_6$ | 0.0210* | 6.195 | 0.0034 |
| Cost of Planting materials (N) | $_7$ | 0.8611* | 2.153 | 0.4 |
| **Inefficiency Model** | | | | |
| Constant | $Z_0$ | 1.032* | 3.671 | 0.2811 |
| Age (yrs) | $Z_1$ | 0.4001* | 2.419 | 0.1654 |
| Education (yrs) | $Z_2$ | -0.017 | -1.327 | 0.0128 |
| Farming Experience (yrs) | $Z_3$ | -0.720* | -4.232 | 0.1701 |
| Farm Distance (km) | $Z_4$ | 0.0281 | 0.809 | 0.0347 |
| Major Occupation | $Z_5$ | 0.0082* | 2.598 | 0.0032 |
| Gender | $Z_6$ | -0.983 | -1.214 | 0.8097 |
| Land ownership | $Z_7$ | -1.0012* | -3.01 | 0.3326 |
| Credit facilities | $Z_8$ | -0.7120* | -2.971 | 0.2396 |
| Sigma Squared | $^2$ | 0.325* | 7.231 | |
| Gamma | | 0.979* | 289.112 | |

Estimate is significant at 5% levelSource: Field Survey, 2012

## 4.0. CONCLUSION AND RECOMMENDATIONS

From the results, the yellow pepper farmers were fairly efficient in the use of their resources, and if more resources were made available to the farmers, it will lead to increased production in their output given from the increased return to scale value obtained from the study.

The low level of education was responsible for the low level of adoption of improved technologies that could improve the farms production potential and productivity. Fertilizer and pesticides were negative in the study area indicating that there was an over utilization of both inputs. The return to scale of yellow pepper production was less than unity meaning it was in the rational stage of production. The technical efficiency could also be improved upon by paying attention to the inefficient variables that had negative signs.

From the findings of this study, it's important to note that the importance of pepper in the Nigerian economy cannot be overemphasized, and in this regard the following policy recommendations are proffered to improve yellow pepper production.

1. Government and NGO's should help expose farmers to formal education such as adult literacy classes and training programmes as this would help reduce the level of inefficiency in resource use.
2. There is the need for Public- Private Partnership in the programmes provision of improved yellow pepper seeds and seedlings to yellow pepper farmers at a subsidized rate. Yellow pepper farmers should be encouraged to form co-operative societies, so as to make sourcing for loans easier and other agricultural inputs at cheaper rates.

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