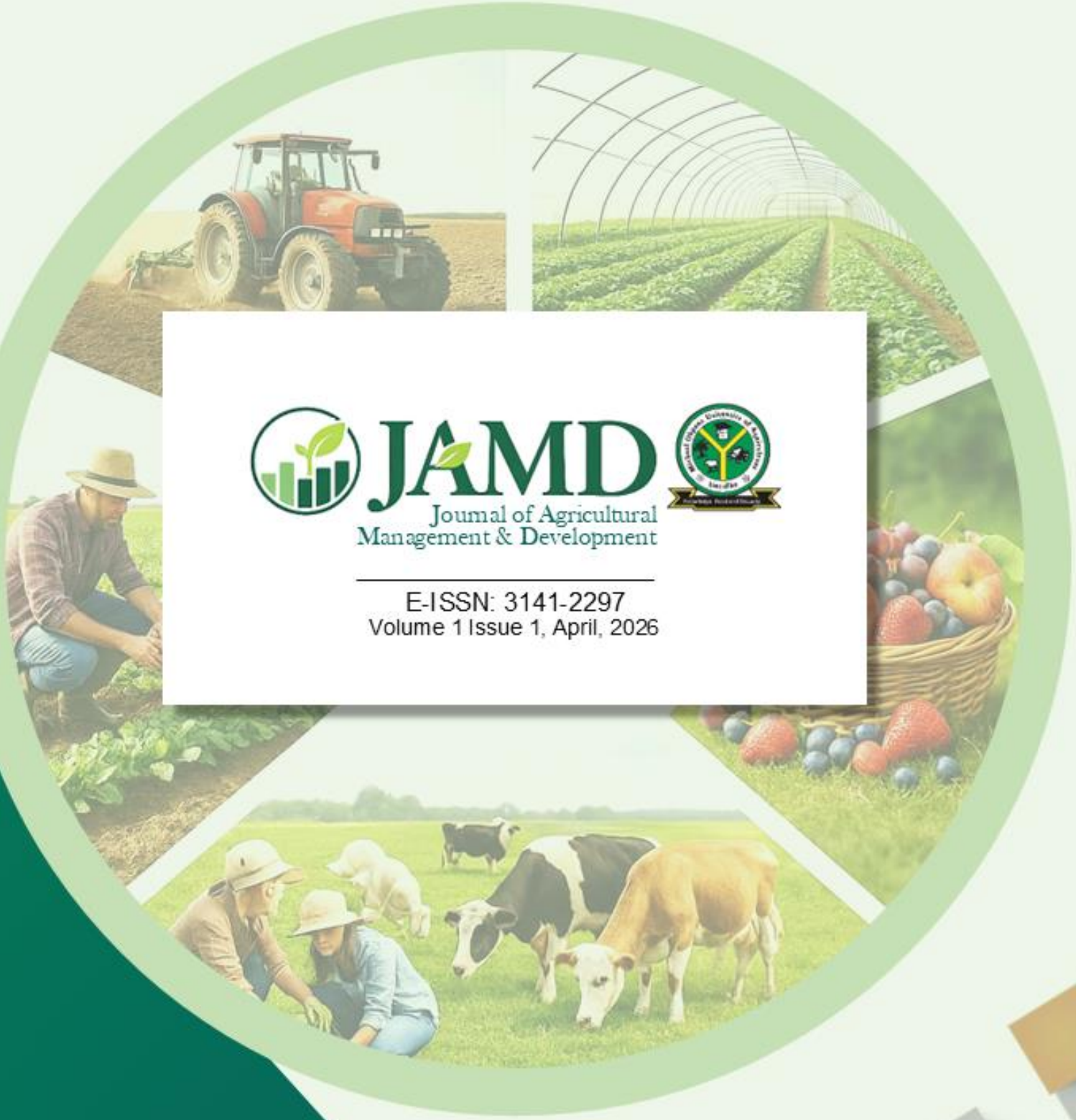

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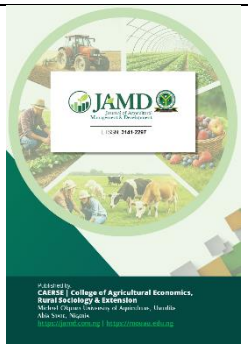

Economics of Tomato Production on Ogbuoji Farm in Edda Local Government Area of Ebonyi State

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ABSTRACT

The study analyzed the economics of tomato production on Ogbuoji farm, in Edda local government area of Ebonyi state. The specific objectives were to describe the socio-economic characteristic of tomato farmers, estimate the resource use efficiency in tomato production, identify the constraint associated with tomato production and analyze the profitability of tomato production on Ogbuoji farm. Random sampling was employed to sample 48 respondents who constituted the sample size. Data were collected primarily using structured questionnaire and analyzed with the aid of descriptive, stochastic frontier production function and cost-benefit ratio. The results showed that young farmers were single, educated, experienced and fairly large-scale farmers. Price of labour (1%), price of seeds (5%), price of irrigation (5%), price of capital (1%), price of fertilizer (10%), price of stock (10%) and farm size (1%) were the major predictors of production but Seed and labour resources was effectively utilized. Pest and diseases greatly constrained the farmers in the production of tomatoes in the study area. The study therefore recommended that all the resource variables must be considered when designing a technological package for tomato production and should be further exploited to improve productivity level of the farmers in the study area.

Introduction

Tomato is globally cultivated for its fleshy fruits and is known as a protective food because of its special nutritive value and its widespread production (Ajibare *et al.*, 2022. Tomatoes are eaten directly as raw vegetables or consumed in a variety of processed products like ketchup, sauce, chutney, juice, diced, soup, paste, puree, etc. It is a rich source of vitamins A and C, and it also contains minerals like iron, phosphorus and is the richest source of nutrients, dietary fibers, antioxidant like lycopene and beta-carotene, compounds that protect cells from cancer (Punit and Arindam, 2019).

Tomato was originated from Southern and Central America; it is known to be a native of Brazil. The current the scientific name of tomato is *Solanum lycopercicum*, it belongs to vegetable family called Solanaceae. The total output world production capacity of fresh tomato fruit in 2021 was about 186.107,972 metric tonnes with China accounting for 37% of global production, India is ranked the second (Ajibare et al., 2022) Other countries that are also leading in tomato production are the United States of

America, Turkey, Egypt, Iran, and Italy (Oishimaya,2017; Kushwaha, 2018). Aminu and Sadi (2020) reported that Nigeria is now considered the 14th largest producer of tomato in the world and second to Egypt in the African continent, producing a total of about 1.51 million metric tons of tomato, which is valued at ₦ 87.0 billion, cultivated on a land area of 254,430 hectares in Nigeria, the recorded drop in the production level of tomato from 6 million tons down to 1.86 million tons and subsequently to 1.51 million metric tons which have now resulted to its scarcity and this may be as a result of low return on investment in the tomato production due to high risk involved, unplanned production process and distribution network problems (FAO, 2010). Nigeria is an agrarian country with about 70 percent of the population engaged in agricultural production (Yusuf 2020).

Resource use efficiency can be defined as the ability of a farm firm to derive maximum output per unit of resources used in the line of the production cycle. The efficiency of resource use and its predisposing determinant factors is important for guiding any decision-making that makes farm business planning better (Muhammad-Lawal et al., 2013). Efficiency in general terms has a link with and it is associated with the possibility of attaining an optimal level of total output from a given bundle of production inputs at least cost combination (Guta *et al.*,2020). Understanding the level of resource use efficiency and its predisposing factors is particularly of high policy relevance for tomato production, a crop that has recently gained prominence and popularity in terms of poverty alleviation and food security of farming households in Nigeria (Tilaye, 2010). To ensure maximum profit level and efficiency of resource use, a farmer must utilize the available resources at hand to the level where their marginal value product (MVP) is equal to their marginal factor cost (MFC) under perfect competition. The efficiency of a resource is determined by assessing the ratio of MVP of inputs (based on the estimated regression coefficients) and the marginal factor cost MFC (Kafle and Shresth, 2017). Inefficiency in the use of available resources according to (Idah, 2007) has prevented the ability of farmers to increase the level of food production resulting in low income of farmers all over the nation.

However, the efficiency of tomato production is often affected by disparities in access to resources such as land, credit, inputs, and labour (Umeh *et al.,* 2021). Ayinde et al., (2013a) opined that, it is of importance to have strategy to put farmers concerns and experiences at the centre of research design, implementation, monitoring, and evaluation.

Tomato production is a critical component of smallholder farming systems, contributing significantly to food security, income generation, and agricultural development in Nigeria. Despite its importance, the productivity of tomato farming in many regions, including Edda Local Government, Ebonyi State, remains suboptimal. This challenge is attributed to inefficiencies in the use of key production resources such as land, labor, capital, and inputs. Studies have shown that resource use inefficiency is a common issue in Nigerian agriculture, often resulting from limited access to improved technologies, inadequate knowledge of best practices, and infrastructural deficits (Umeh *et al.,* 2021). Efficient utilization of resources is crucial for enhancing productivity and profitability in tomato production. However, empirical evidence on the resource use efficiency of tomato farmers in Edda Local Government is scant. Previous studies in other regions suggest that inefficiencies in resource use are influenced by socio-economic factors, access to credit, and extension services, as well as market dynamics (Yakubu et al., 2019; Adetunji & Rauf, 2020). It is with this concern that this study embark in assessing the profitability of tomato production in Ogbuoji farm, in Edda Local government Area. The specific objectives were to:

i. describe the socio-economic characteristic of tomato farmers onObuoji farm
ii. estimate the resource use efficiency in tomato production on Ogbuoji farm
iii. identify the constraint associated with tomato production on Ogbuoji farm
iv. analyze the profitability of tomato production on Ogbuoji farm.

Methodology

This study was conducted in Ogbuoji farm, in Edda Local Government Area of Ebonyi State. Ogbuoji farm lies about 2.5 km along the Owutu–Ogbu Edda Road, next to the Anyebe Stream. It is located on the eastern margins of the Benue Trough in the Afikpo Basin [NIPC, 2023]. Edda Local Government Area (LGA), also known as Afikpo South, is located in Ebonyi State, Nigeria. Administratively, it's designated as Afikpo South LGA by the Nigerian government, but is referred to as Eddaland by its inhabitants. Eddalands are characterized by their shared language, culture, and traditions, making it a

highly homogeneous LGA. The LGA's headquarters is located in Nguzu. Edda LGA Experience a distinct dry and rainy season with temperatures ranging from 16°C to 38°C.

The study made use of survey research design. Out of a total population 55 workers at Ogbuoji farm, the study randomly sampled 48 workers and their opinions on issues concerning the impact of revenue generation on rural development were taken. A structured questionnaire was used to collect the data from respondents. Objective one (1) and three (3) was analyzed using descriptive statistics such as tables, frequency and percentage. Objective two (2) was analyzed using stochastic frontier production function model and resource use efficiency method. Stochastic frontier production function was used to empirically estimate the resource efficiency of the tomato enterprise. The model is specified as:

$$In\pi^*B=In\beta_0^*+\beta_1^*Inq_1+\beta_2^*Inq_2+\beta_3^*Inq_3+\beta_4^*Inq_4+\beta_5^*Inq_5+\beta_6^*Inq_6+\beta_7^*Inq_7+\beta_8^*Inq_8+Vi-Ui \quad (1)$$

Where;
π^*B = Normalized profit (in ₦ per basket of tomato)
q_1 = price of labour
q_2 = price of seeds
q_3 = price of irrigation
q_4 = price of capital inputs
q_5 = price of fertilizer
q_6 = price of Stock
q_7 = farm size (hectare of tomato farm)
q_8 = annual depreciation on durable capital items
Vi = normal random error assumed to be independent and identically distributed
Ui = non-negative random variables associated with the resource efficiency of the respondents

The Resource-use efficiency stated as:

$$r = MVP/MFC \quad (2)$$

Where;
MVP = Marginal value product of a variable input,
MFC = Marginal factor cost,
r = Efficiency ratio.

The MVP was estimated as follows:

$$MVP = MPP.PY \quad (3)$$

Where;
PY is the price of output, and MPP is the marginal physical product.
The decision rule implies that; if r =1, resources are efficiently used. If r > 1, resources are underutilized, if r<1, resources are over utilized.
Objective four (4) will be analyze using cost-benefit ratio, which is specified as;

NR = TR-TC
RoI= TR/TC
Where NC= Net returns, TR= Total revenue, Tc= Total cost, ROI= Return on investment

Results and Discussion

Socioeconomic characteristics of the tomato farmers

Results from Table 1 showed that majority (66.67%) of the respondents were between the ages of 31-40 years old. By implication, most of the farmers were within the middle age groups, energetic, productive and rational decision makers within the farm organization (Emenyonu *et al,* 2010). 58.33% of the respondents were single, while 37.5% of them were married. Nwigwe et al (2020) who opined that married farmers are more responsible and equipped to engage in improved farming practices that will translate to better income. 95% of the respondents in the study area had one form of education or another. 41.67% of the respondents had stayed in the farming between at least 9 years. Enemosah *et al* (2022) stated that the more experienced a farmer is, the more efficient he/she will be in decision-making processes and he/she would be willing to take risks associated with adoption of innovations. Majority (95.83%) of the

respondents agreed that the tomato farm size was between 7-9 hectares. Major source of water in the study area for the tomato production is that from borehole with 79.17 percent of the farmers affirming to it. 75% of the respondents confirmed the adoption the drip type of irrigation. 83.33% of the respondents sourced there tomato seedlings through seed companies and 83.33% of the respondents agreed that tractor was the major type of farm machinery used in the farm.

Resource Use Efficiency in Tomato Production

Table 2 shows the results of stochastic frontier normalized profit function for the resource efficiency of tomato production enterprise. The estimates of sigma-squared (σ^2) for the tomato function was 4.2272 and it is significant at 0.01 probability levels, indicating that it are significantly different from zero. It assures us of the goodness of fit as well as the correctness of the specified distributional assumptions of the composite error term. The value of the gamma ($\boldsymbol{\gamma}$) is high 0.9667 and it showed that the unexplained variation in the output of tomato is the major sources of random errors. It also indicates that about 96 percent of the variation in output of tomato was caused by inefficiencies of the producers.

The result indicates that the MLE estimate of price of hired labour, capital inputs and farm size were 0.1151 and 0.5420 respectively and was significant at 1% level. This implies that a 1% increase in the use of hired labour, capital and farm size will result in a 0.1151%, 0.0345% and 0.5420% increase in the level of profit. The MLE estimate of price of seeds and irrigation were 0.1206 and 0.2265 and significant at 5% level. This implies that a 1% increase in the use of price of seeds and irrigation will result in a 0.1206% and 0.2265% increase in the level of profit. The MLE estimate of price of fertilizer and stock is 0.1470 and 0.2225 and were significant at 10% level. This implies that a 1% increase in the use of fertilizer and stock will result in a 0.1470% and 0.2225% increase in the level of profit.

Determination of Resource Use Efficiency

The concept of efficiency indicates the maximum benefits derived from allocation and use of resources. The result in Table 3 showed that the ratio of the marginal value product (MVP) to Marginal factor cost (MFC) was 1 for cost of labour and cost of seeds, and it implies the efficient utilization of these resources due to availability of labour and seeds to carry out farming. The ratio of the marginal value product (MVP) to Marginal factor cost (MFC) was; 0.27 and 0.41 for Cost of irrigation and Cost of fertilizer. This indicates that costs of irrigation and fertilizer were less than 1 implying over-utilization of the resources. While capital inputs and farm size was above 1; 1.17 and 1.49 respectively, indicating under-utilization of both resources. The under-utilization of these resources may due to their unavailability to carry out farming in the study area. Farmers are still facing problems of inefficiency of resource allocation in the study area.

Constraint Associated with Tomato Production

The result on Table 4 shows that most dominant constraint was the incidence of pest and disease (95.83%) and high input cost (75%) . The economic implication is that, since tomato is a perishable commodity, its producers will likely suffer loss from pest and disease attack if it is not discovered quickly.

Profitability of Tomato Production

Table 5 shows that the total fixed cost of production per annum was N166,994, the total variable cost of production per annum is N314,682, the total cost per annum N481,676 and the total revenue was given as N1,670,566. The Net revenue which is the annual profit is N1,188.890. The rate of return on investment of N3.47 was obtained by (TR/TC), implying that for every N1 invested yields a profit return of N3.47. Overall, this result shows that tomato production is profitable and is supported by the findings of. Nwigwe *et al*. (2020).

Conclusion and Recommendations

In conclusion, majority of tomato were young farmers are single, educated, experienced and fairly large-scale farmers. Price of labour, price of seeds, price of irrigation, price of capital inputs, price of fertilizer, price of stock and farm size were the major predictors of production but Seed and labour resources was effectively utilized. Pest and diseases greatly constrained the farmers in the production of tomatoes in the study area. All these variables must be considered when designing a technological package for this resource and should be further exploited to improve productivity level of the farmers in the study area.

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Appendix

Table 1: Socioeconomic characteristics of the tomato farmers

Socioeconomic characteristics	Frequency	%
Age of respondents (years)		
< 30	8	16.66
31 – 40	32	66.67
41 – 50	5	10.42
Above 50	3	6.35
Total	48	100
Marital status		
Single	28	58.33
Married	18	37.5
Separated	2	4.17
Total	48	100
Educational qualification		
No formal education	2	4.17
FSLC	10	20.83
ND	20	41.67
BSC/HND	16	33.33
Total	48	100
Farming Experience (years)		
1 – 3	10	20.83
4 – 6	17	35.42
7 – 9	20	41.67
Above 10	1	2.08
Total	48	100
Size of farm (ha)		
1-3	-	-
4-6	2	4.17
7-10	46	95.83
Above 10	-	-
Total	48	100
Source of water		
Rain water	10	20.83
Borehole	38	79.17
River water	-	-
Municipal water	-	-
Total	48	100
Type of irrigation		
Manual watering	11	22.92
Drip irrigation	36	75
Sprinter irrigation	-	
Furrom irrigation	1	2.08
Total	48	100
Source of seed		
Local seeds	-	-
Own seed	8	16.67
Agricultural extension	-	-
Seed companies	40	83.33
Total	48	100
Types of machinery used		
Tractor	40	83.33
Plough	7	14.58
Harvester	1	2.08
Total	48	100

Source: Field survey data 2024

Table 2: Maximum Likelihood Estimates of Parameters of the Stochastic Frontier Production Function for the Measurement Resource Efficiency of Tomato Production

Variables	Parameters	Coefficients
Constant	β_0	1.2267(2.4835)
price of hired labour	β_1	0.1151(2.3772)***
price of seeds	β_2	0.1206(3.0205)**
price of irrigation	β_3	0.2265(2.6301)**
price of capital inputs	β_4	0.0345(0.6841)***
price of fertilizer	β_5	0.1470(2.1110)*
price of Stock	β_6	0.2225(2.6346)*
Farm size	β_7	0.5420(2.1251)***
Annual depreciation	β_8	-0.1549(-1.8201)*
Log-likelihood function		-37.8776
Sigma squared(σ^2)		1.1324(4.2272)***
Gamma (γ)		0.9667(152.934)***
L-R test		78.1824

Note:***,** and * implies statistical significance at the 0.01, 0.05 and 0.10 probability levels respectively. Values in parenthesis are t-ration

Table 3: Determination of resource use efficiency

Inputs	MPP(kg/Unit of input used)	MVP (₦)	MFC (₦)	MVP/MFC	Efficiency
Labour	320	2240	2198	1	Efficiently Utilized
Seeds	30.54	274.86	324.77	1	Efficiently Utilized
Irrigation	22.08	154.56	553.91	0.27	Over-Utilized
Capital inputs	4421	35,368	30233	1.17	Under-Utilized
Fertilizer	300	1200	2920	0.41	Over-Utilized
Farm size	1.05	19.95	13.4	1.49	Under-Utilized

Source: Field survey data 2024

Table 4: Constraints to tomato production

Variable	Frequency*	Percentage
Pest and diseases	46	95.83
Lack of quality seeds	2	4.17
High input cost	36	75
Water scarcity	2	4.17
Access to market	12	25

Source: Field survey data, 2024. *= multiple responses

Table 5: Cost-benefit analysis of tomato

Item	Amount
Fixed inputs	
Land rent	40,561
Cost of machineries	122,433
Depreciation on equipment	4,000
Total fixed cost (TFC)	166,994
Variable inputs	
Cost of seed	41,250
Cost of fertilizer	12,122
Cost of transportation	34,566
Marketing charges	3,344
Labour cost	223,400
Total variable cost (TVC)	**314,682**
Total Cost (TC)	481,676
Total Revenue (TR)	1,670,566
Net Revenue (TR-TC)	1,188,890
Net return on Investment (TR/TC)	3.47

Source: Field survey, 2024