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Resource Use Efficiency and Profitability Analysis of Tomato Production *(Lycopersicum Esculetum Species*) in Federal Capital Territory, Nigeria

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ABSTRACT

This study evaluated resource use efficiency and profitability analysis of tomato production in Federal Capital Territory, Nigeria. The specific objectives were to: determine the socio-economic characteristics of tomato farmers; analyze the cost, returns and profitability of tomato production, evaluate factors influencing output of tomato production, estimate resource use efficiency of tomato production, and identify the constraints facing tomato farmers in the study area. Multi-stage sampling technique was used. Primary data were collected through the use of well-structured questionnaires administered to 100 sampled tomato farmers. Data were analyzed using the following tools of analysis; descriptive statistics, gross margin analysis, financial analysis, Cobb-Douglas production functional model and resource use efficiency index. The results show that 83% of sampled tomato farmers were male. About 54% of the sampled respondents were above 41years of age. Majority 79% of the sampled respondents had less than 5 members per household. The results of costs and return analysis show that total average revenue realized by tomato farmers in the study area was about ₦146,430.00 and total variable cost was ₦23,057.30. The cost of labour was about ₦ 16,416 representing 70% of the proportion of the cost of tomato production in the study area. The gross margin obtained was ₦123,372.7 with operating ratio of 1.58 and rate of return on investment of 5.38 respectively. Factors influencing total output of tomato in the study area were household size (P<0.01), farm size (P<0.01), seed input (P<0.05), and labour input (P<0.01). Seed input, labour input, and chemical inputs were underutilized. The results further show that the sampled farmers encountered the following constraints in the cause of tomato production in the study area, land tenure system, lack of good road, inadequate capital, high cost of input and lack of price control. Therefore, the following recommendations were made; financial institutions should provide affordable financial support to tomato farmers and also encourage female farmers to participate in tomato production, improved seed varieties should be made available to farmers for increase in productivity, agricultural extension agents should be provided and organize training on post-harvest practices in order to increase farmers' incomes and minimize tomatoes wastages in the study area, tomato farmers should form themselves into cooperatives in order for them to assess inputs and subsidies from the government, and also pool their resources together for easy access to inputs and negotiate price.

Keywords: Resource, Use Efficiency, Profitability, Tomato Production, Nigeria.

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I. Introduction

Tomato (*Lycopersicum esculetum*) is classified among the members of the Solanacae family [1] and [2] Across the globe, tomato is also categorized as a healthy diet reason is because the fleshy fruit contains some elements of Calcium and Vitamin K which always helps in maintaining strong bones in the body. Tomato is a vital and very important vegetable crop that is under considerable use in Nigeria [3]. 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 2014 was about 223.47 million tons with China producing 105,31 tons as the world leading tomato producer [4]. India is ranked the second

largest tomato-growing country after China [5]. According to Food and Agricultural Organization (FAO), India produces a total of 18,735.91 thousand tons of tomato, which is about 8% of total world tomato production in an area of almost 882.03 thousand hectares of land, which in turn is 1.46 % of the total area under tomato cultivation in the whole world [6]. Other countries that are also leading in tomato production are the United States of America, Turkey, Egypt, Iran, and Italy [7], [8]. [4] 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 [9]. The tomato crop is a complementary commodity that has a significant health benefit, and it also contains antioxidants, like ascorbic acid (vitamin C), vitamin A, and tocopherols (vitamin B). Tomato is one of the most important vegetable crops cultivated for its fleshy [10]. The crop also contains potassium, iron, and calcium. The 'lycopene' in tomato fruit acts as an anti-carcinogen, which can prevent cancer, especially prostate cancer. The domestic consumption and demand for tomatoes are growing due to the increase in population. Tomato may be eaten fresh as a salad or they may be pressed into pastes or purees, which are used for cooking in soups or stews and producing fruit drinks. Moreover, it is available at a low price as compared to other vegetables. Tomato is included in the major vegetable crop traded in the world vegetable. In the year 2005, five million (5,000,000) metric tons of tomato commodities were traded in the global market at an estimated value of over five billion US dollars. In the same year under review, Nigeria imported about 28,972 metric tons of canned tomato paste costing US$30 million in foreign exchange [6]. From the period of 2010 to 2016, Nigeria imported 65,809 tons of processed tomato paste which was worth over ₦11.7 billion annually. However, the bulky nature of tomato, its seasonality, poor method of storage systems, bad roads, inadequate nature of network channel of distribution and the likes attributes to the scarcity of tomato in Nigeria. Therefore, the existing gap in demand and supply between rainy season period of production and irrigation system in the dry season must be handled with precision, in other to avert these problems.

The major aim of conducting financial analysis is to reach the production capacity that will generate profit in terms of profit margin, which can display the amount of Profit the producer of a particular product produces on its sales at different stages of an income ratio [11]. Profitability is defined as the ability of a farm business to earn profit. It can also be referred to the ability of a farm, firm or a farm enterprise to make returns from an investment based on its resources and compares with other investment. It shows how efficiently the management can make profit by using all the resources available at their disposal [12]. Profit in any business enterprise is an absolute term, whereas the term profitability is a concept which is relative. However, the two terms are related closely, and they are mutually interdependent; they have different roles they play in farm business enterprise. Profit can be referred to the totality of income earned by the enterprise during the specified period of time, while the word profitability refers to the operating efficiency level of the enterprise. It is the ability of the farm business enterprise to make a profit from the sales of the product it produces. Profitability indices include return on capital invested, benefit-cost ratio, return on assets, return on equity, return on sales, and return on investment among others [13]. The profitability status of any farm business determines whether a farmer stays in business or quits. Profitability in a farm business measures the ability of the farmers to cover their costs of operation and it is a very important concept because it provides incentives for entry into and longevity in the farming business.

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 [14]. 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 [15]. 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 [16]. 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 [17]. Inefficiency in the use of available resources according to [18] has prevented the ability of farmers to increase the level of food production resulting in low income of farmers all over the nation.

The Agricultural production system of the people living in rural areas in Nigeria is featured and characterized by limited access to farmland due to land tenue system, poor access to production inputs as a result of high costs, an underdeveloped irrigation system, inadequate market orientation, disease outbreak, inadequate infrastructures, poor technology, inadequate extension advisory services and low output [19], [20]. In Nigeria, about 50% of the tomato produced by the farmers has been lost due to lack of appropriate preservation methods and accessible storage facilities by tomato farmers [21]. However, the perishable nature of tomato, its seasonality, the nature of its bulkiness, and inadequate production and storage infrastructure, contributes to the existing problems that lead to losses after harvest as a result of poor market formation in Nigeria [17]. Perhaps, the farmer's inability to have access loan and credit facilities, makes the farmers to be using traditional and primitive farm implements/irrigation engines, small farm size, lack of fertilizers, lack of adequate government support inconsistent policy and the like. Tomato and tomato products are very

important parts of the human diet all over the world. Currently, the tomato has been classified among the crops that have a higher consumption rate in developed countries and is often referred to as a luxury crop. In developing countries like Nigeria, tomato fruit has become an important part of the food basket as well. Tomato is one of the most widely consumed vegetables in Nigeria, it is acceptable by all families. There is a scarcity of tomato crops in some seasons that are resulting in high and expensive prices of the available tomato, the level of production as well as productivity is very low in Nigeria. Vegetable production like tomato crops can contribute to the rural livelihood and increase in income of farmers and development as a result of high added value including the high nutritional value that the products provide. Unfortunately, tomato is not only a seasonal but highly perishable crop, and it deteriorates a few days after the harvest, losing almost all their nutritive value, and required quality attributes and some could likely result to total waste rendering it to be useless. In developing countries like Nigeria, storage, packaging, transport and handling techniques are practically non-existent for perishable crops like tomatoes, so this allows for considerable losses of produce like tomatoes most times. Furthermore, improper postharvest sanitation, poor packaging practices, and mechanical damage during harvesting, handling, and transportation resulting from vibration by undulation and irregularities on the road can enhance tomato wastage [18]. It is distressing to note that much is being devoted to planting crops, so many resources spent on irrigation, fertilizer application, and crop protection management could only to be wasted in a few days after harvesting [19]. Post-harvest losses have been highlighted as one of the determinants of the food problem in most developing countries like Nigeria and its prominent with tomato crops [20]. Thus, a reduction in post-harvest losses increases food availability hence, alleviation of food insecurity problems [28]. Some authors have researched similar topics [29], [4], [1] they concentrated more on the efficiency and profitability of tomato production across Nigeria and some on-profit efficiency and technical efficiency of other crops [3] [21] but none of such studies have been seen carried out in order to investigate the resource use efficiency and its profitability in the federal capital territory. There is a research gap in the existing literature regarding resource use efficiency and the level of profitability of tomato production in the study area, we are not aware of the existing literature on the topic that investigates about resource use efficiency of tomato production in the county. Therefore, this research aims at filling the knowledge gap in the literature. Hence this study investigated resource use efficiency and profitability of tomato production in the federal capital territory, Nigeria.

A. Research Questions

This study intends to provide answers to the following research questions:

i. What is the socio–economic characteristics of tomato farmers?
ii. What are the costs, returns and profitability analysis of tomato production?
iii. What are the factors influencing output of tomato production?
iv. What is the resource use efficiency of tomato production among farmers?
v. What are the constraints facing tomato farmers in the study area?

B. Objectives of the Study

The broad objective of this study is to analyze resource use efficiency and profitability of tomato (*Lycopersicum esculetum*) production in the Federal Capital Territory, Nigeria. The specific objectives were to:

a. determine the socio-economic characteristics of tomato farmers,
b. analyze the costs, returns and profitability analysis of tomato production,
c. evaluate factors influencing the output of tomato production,
d. estimate resource use efficiency of tomato production, and
e. identify the constraints facing tomato farmers in the study area.

II. Materials And Methods

A. The Study Area

This study was conducted in Abaji Area Council in Federal Capital Territory, Nigeria. The local government is located on Latitudes 8.47470Nand Longitudes 6.94510E, Abaji is located North of Kogi State, with Gwagwalada, Kuje and Kwali Area Councils to the East and Niger State to the North and West. In Abaji, the wet season is oppressive and overcast, the dry season is humid and partly cloudy, and it is hot all year round. Over the course of the year, the temperature typically varies from 640 F to 940F and is rarely below 57 0F above 1000F. Abaji has an area of 999Km and a population of 58,642 people at the 2001 census [22], Abaji Area Council is the smallest, by population, of the six area councils in the federal capital territory. Abaji area council is predominantly inhabited by the Ebira Koto, a sub-group of the larger Ebira ethnic group who are also found in the neighboring KotonKarfe local government area of Kogi state. Abaji consists of ten wards namely, Abaji Central, Abaji northeast, Abaji South East, Agyana, Pandagi, Alumamagi, Gawu, Gurdi, Nuku, Rimbaebagi and Yaba. Economic activities include, trading, animal rearing, food, vegetable, and cash crop production. The occupation of the people is farming, and they plant yam, maize, pepper, and tomato among others.

B. Sampling Techniques and Sample Size

Multistage sampling technique was used to select the tomato producers. Firstly, purpose sampling technique was adopted and used to select Abaji Area Council, because of the predominance of tomato production in the area. In the second stage random sampling technique was employed in selecting five (5) wards out of ten (10) wards were selected through a ballot box raffle draw the ten (10) wards was written on the piece of paper well shaken together and 5 wards were selected one after the other without replacement the five wards selected were Abaji South East, Gawa, Yaba, Nuku and Gurdi. In the third stage, two (2) villages were randomly selected from each ward making a total of ten (10) villages. In the fourth stage, ten (10) tomato farmers were selected per each village using simple random procedure making a total

sample size of (100) tomato farmers administered to the required sampled farmers for an interview in the study.

C. Method of Data Collection

Data for the study were mainly from the primary source. Data were gathered through an interview schedule; closed and open questionnaires were used in collecting primary data on tomato production through the use of a well-structured design questionnaire in the study area.

D. Method of Data Analysis

The following analytical tools are used to achieve the stated objectives:

i. Descriptive Statistics
ii. Gross Margin Analysis
iii. Financial Analysis
iv. Cobb Douglas Production Function (OLS)
v. Resource Use Efficiency Index

E. Descriptive Statistics

This includes meaning, frequency distributions, and percentages, etc. This was used to have a summary statistic of data collected. It was used to achieve specific objectives (i) and (v) to summarize the socio-economic characteristics of tomato farmers as stated in the specific objective and the constraints facing tomato farmers in the study area.

F. Gross Margin Analysis

Gross Margin is a very useful planning tool in a situation where fixed cost is negligible portion of farming enterprise. According to [23]. it was used to determine the profitability of the farm enterprise. Gross Margin model is shown in (1) and (2).

$$GM = GI_i - TVC_i \quad (1)$$

$$GM = \sum_{i=1}^{n} P_i Q_i - \sum_{i=1}^{n} P_j X_j \quad (2)$$

where,
GM = Gross Margin (Naira)
GI_i= Gross Income (Naira)
TVC_i= Total Variable Cost (Naira).
P_i = Price of Tomato Out Produced (₦/Kg)
Q_i = Quantity of Tomato Output Produced (kg/ha
This was used to achieve specific objective two (ii) which is to estimate of the costs and returns of tomato production in the study area.

G. Financial Analysis

In order to evaluate the strength and financial positions of tomato enterprises, operating ratio and rate of return per naira invested were considered. An operating ratio (OR) according to [23] is stated as (3).

$$\mathrm{OR} = \frac{\mathrm{TVC}}{\mathrm{GI}} \quad (3)$$

where,
OR = Operating Ratio (Units),
TVC = Total Variable Cost (Naira),
GI = Gross Income (Naira).

An Operating Ratio (OR) that is less than one (1) implies that the total revenue obtained from tomatoes production was able to pay for the cost of variable inputs used in the enterprise (23). The rate of return per naira invested (RORI) in tomatoes production is stated thus:

$$\mathrm{RORI} = \frac{\mathrm{NI}}{\mathrm{TC}} \quad (4)$$

where,
RORI = Rate of Return per Naira Invested (Units),
NI = Net Income from Marginal Maize Production (Naira),
TC = Total Cost (Naira).

$$\mathrm{NFI} = \mathrm{GI} - \mathrm{TVC} - \mathrm{TFC} \quad (5)$$

Fix cost was considered negligible at the short run in tomato production.

The financial analysis was used to achieve part of specific objective two (ii).

H. Cobb–Douglas Production Function (OLS)

The Cobb-Douglas production function is stated as (6).

$$\mathrm{LogY} = \beta_0 + \beta_1 \mathrm{Log}\, X_1 + \beta_2 \mathrm{Log}\, X_2 + \beta_3 \mathrm{Log}\, X_3 + \beta_4 \mathrm{Log}\, X_4 + \beta_5 \mathrm{Log}\, X_5 + \beta_6 \mathrm{Log}\, X_6 + \beta_7 \mathrm{Log}\, X_7 + \mu_i \quad (6)$$

where;
Y_i = Output of Tomato (Kg),
β_0= Intercept,
$\beta_1 - \beta_7$= Regression Coefficients,
X_1= Household Size (Units)
X_2= Farm Size (Hectare)
X_3 = Extension Visit (1, Extension Visit; 0, Otherwise),
X_4= Seeds Input (Kg),
X_5= Fertilizer Input (Kg),
X_6= Amount of Insecticide (Litres)
X_7= Labour Input
U_i= Error Term

This tool was used to achieve the specific objective (iii) which is to examine the factors influencing output of tomato production in the study area.

I. Resource Use Efficiency Index

To measure the resource use efficiency of tomato production among farmers in the study area, the estimation of Marginal Value Products (MVP) of the variable resources used were conducted by multiplying the Marginal Physical Product (MPP) of the inputs with the price of the output. The values obtained were compared with the cost of Marginal Factor Cost (MFC) resource costs so that inference can be made on the efficiency of resource use by the tomato farmers. Equation (7) was estimated to determine the resource use efficiency of tomato production by the farmers:

$$\mathrm{r} = \frac{\mathrm{MVP}}{\mathrm{MFC}} \quad (7)$$

where;
r = Efficiency Ratio (Units)
r = 1, Resources were Efficiently Utilized by the farmers,
r > 1, Resources were Under Utilized by the farmers, and
r<1, Resources were Over Utilized by the Farmers.
The MPPs and, MVPs were derived as (8).

$$\text{Linear:MPP} = \frac{dy}{dx} = b_i; MVP = b_i . P_y \quad (8)$$

$$\text{Semi-Log: } MPP = \frac{bi}{\bar{x}}; MVP = \frac{bi}{\bar{x}} . P_y \quad (9)$$

$$\text{Double–Log(Cobb Douglass); MPP} = \frac{bi}{\bar{x}} \text{MVP} = \frac{bi}{\bar{x}} . P_y \quad (10)$$

The Elasticity of Production (E_P) is the regression coefficients.

Return to Scale (RTS) was estimated as (11).

$$RTS = \sum_{i=1}^{n} E_P \quad (11)$$

This was used to achieve specific objective four (iv).

III. Result And Discussions

A. Socio-economic Characteristics of the Sampled Tomato Farmers in the Study Area

Table I presents the analysis of the socio-economic characteristics of the sample tomato farmers in the study area, the results show that majority 83% of sampled tomato farmers were male while 17% were female tomato farmers this implies that tomato farming is mostly performed by male farmers in the study area. This is in line with [24] which indicates dominance of male folk with high literacy in tomato production in the study area. This finding also agrees with [1], that adult males engaged in land clearing, planting and weeding. Majority 92% of the sampled respondents were married; this is an indication that there were sufficient labour supplies for tomato farming operations in the study area. Also the study revealed that about 54% of the sampled respondents fall within the age ranges of 41-50 years and 51 and above years this is an indication that tomato farming is being carried out by older farmers this finding is contrary with the findings of [3] and [4] who found that tomato farming was mostly carried out by young farmers in Kebbi and Kogi State, Nigeria respectively. The majority (79%) of the sampled respondent had a family size of 1-5 members per household and 57% had tomato farming experience of 1-5 years in the study area and 32% of sample respondents had 1-6 years of experience in tomato production. About 40% of the sampled tomato farmers had no formal education while 46 attained primary level of education in the study area, education of determines their level of technology adoption and ability to use input appropriately to maximize profit. This is in line with [25] and [1] who reported that the education level of farmers will improve the productivity and efficiency of tomato production. The results also indicated that 60% of the sampled tomato farmers acquired land through inheritance while 31% purchased the land for tomato production, majority (90%) of the sampled farmers were not members of farmers' associations or cooperatives only 10% of the sampled respondents belong to a cooperative association in the study area, being a member of cooperative helps the farmers to pool their resources together and maximize the profit they can also use their association to attract funds from government and non-governmental organization and negotiate price since government and NGOs mostly deals with groups.

TABLE I: Socio-Economic Characteristics Of The Sampled Tomato Farmers In The Study Area

Variable	Frequency	Percentage Mean
Sex		
Female	17	17.0
Male	83	83.0
Marital Status		
Married	92	92.0
Single	8	8.0
Age (Years)		43
20	7	7.0
21-30	13	13.0
31-40	26	26.0
41-50	19	19
51 And above	35	35
Household Size (Units)		5
1-5	79	79.0
6-10	17	17.0
11 -15	3	3.0
16 And above	1	1.0
Farming Experience (Years)		6
1-5	57	57.0
6-10	32	32.0
11-15	8	8.0
16 And above	3	3.0
Education Level		
None	40	40.0
Primary	46	46.0
Secondary	14	14.0
Method of Land Acquisition		
Inheritance	60	60.0
Purchase	31	31.0
Rent	9	9.0
Cooperative Membership		
No	10	90.0
Yes	90	10.0
Access To Credit		
No	95	95.0
Yes	5	5.0
Farm Size (Hectares)	-	0.4321
0.1-1.0	80	80.0
1.1-2.0	20	20.0

Source: Field Survey (2021)

More so 95% of the sampled farmers were not able to access credit, credit is an essential factor that can lead to an increase in total output of tomato farmers that had access to credit could use the credit to acquire necessary inputs required for tomato production. The results further revealed that the majority 80% of the sampled tomato farmers were small scale farmers cultivating 0.1-1.0 ha of land while 20% cultivates about 1.1-2.0 ha of land. The average arm size cultivated by sampled tomato farmers was 0.43 hectares in the study area. This result is in line with [4] who discovered that tomato production is mostly cultivated by small scale farmers in the study area.

B. Cost Incurred, Returns and Profitability of Tomato Production by Sampled Farmers in the Study Area

The costs and return analysis are presented in Table II, the results of the analysis revealed that the total average revenue realized by tomato farmers in the study area was about ₦146,430.00 and the total variable cost was ₦23,057.30. The cost of labour was about ₦ 16416 representing 70% of the proportion of the cost of tomato production in the study area, followed by the cost of chemical ₦ 4764 carrying 20% proportion of the total cost of tomato production on an average basis in the study area. The gross margin obtained was ₦123372.7 with operating ratio of 1.58 and rate of return on investment of 5.38 respectively.

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TABLE II: COST AND RETURNS INVOLVED IN TOMATO PRODUCTION IN THE STUDY AREA

Variables	Average Value (₦)	Percentage
A. Total Revenue	146,430.00	-
B. Variable Cost	-	-
Seed	1,072.80	0.046
Fertilizer	1,090.00	0.047
Labour	16,416.00	0.71
Chemical	4,674.00	0.20
Transportation	804.50	0.034
C. Total Variable Cost	23,057.3	-
Gross Margin	123372.7	-
NFI	123,372.7	-
Operating Ratio	1.58	-
RORI	5.35	-

Source: Field Survey (2021)

The implication of these results implies that every ₦ 1 invested in tomato production yield ₦ 5.38 which covers taxes, commission profit and other expenses involved in the tomato production cycle in the study area. This is in line with [4] who reported that financial ratios reflect the true value of profit or gain that can be realized for every ₦1 investment made to the business. The ratio not only indicates substantial return to the enterprise, but also a high-level efficiency in the use of capital this result is in line with the findings of [4] and [26] who found that tomato production was profitable in Kaduna and Kebbi State, Nigeria respectively.

C. Factor Influencing Total Output of Tomato Production in the Study Area

Table III presents the results of the Cobb Douglass production functional model as a lead equation, the results show that the factors influencing the total output of tomato in the study area were household size, farm size, seed input, and labour. The coefficient of household size was statistically significant at (P<0.01) and it influence the output of tomato positively. The magnitude of the coefficient of household size (0.309) implies that a percentage change in the household size will result in 30.9% increase in the total output of tomatoes in the study area. Larger household size supplies more labour required for farm operations and as a result of the higher number of labour used it might lead to expansion of farm size thereby resulting in an increase in the output of tomatoes as well as profitability this finding is consistent with [26]. Farm size influence tomato output positively and was statistically significant at (P<0.01). This result signifies that percentage change in farm size will result in 20.6% increase in the total output of tomatoes in the study area. Farm size is a determinant factor of output in production provided that all other inputs are held constant as farm size increases output will also increase due to economies of size. Seed input influences total output of tomato positively and it was statistically significant at (P<0.05). The coefficient of seed (0.815) implies that percentage change in seed input planted on tomato farm will result in 81.5% increase in the total output of tomato in the study area.

TABLE III: RESULTS OF THE COBB DOUGLASS PRODUCTION FUNCTIONAL MODEL (OLS) FOR FACTOR INFLUENCING TOTAL OUTPUT OF TOMATO IN THE STUDY AREA

Variables	Coefficients	Standard Error	t-value
Constant	0.5045613	0.0286095	7.67
Household Size	0.3095501	0.0960152	3.22
Farm Size	0.3140497	0.257564	3.00
Extension Visit	0.1250804	0.1467741	0.85
Seed Inputs	0.8146234	0.362007	2.25
Fertilizer	0.0082009	0.1500954	0.05
Chemical	0.1954063	0.1673785	1.17
Labour	0.2072148	0.0878251	2.36
Return to Scale	2.478	-	-
R- Square	0.674	-	-
Adjusted R	0.454	-	-
F-Value	4.164	-	-
Durbin-Watson	1.919	-	-

Source: Field Survey (2021)

The coefficient of labour influenced tomato output positively and it was statistically significant at (P<0.01). The magnitude of the coefficient of labour (0.088) implies that a percentage change in the labour supply of tomato production results in 8.8 % increase in total output of tomatoes in study area. This result is in line with [27] who reported that labor and land are the main determinants of tomato production.

Tomato production is relatively sensitive to labor and land. If there is a one percent increase in the household size, farm size, a number of labour and amount of seeds would increase tomato production in the study area. The coefficient of multiple determination R- Square (0.674) implies that 67.4% of the variation in the total output of tomato in the study is explained by the independent or explanatory variables included in the model. The F-value of (4.164) is the joint contribution of all the explanatory variables to total output of tomato in the study area and it was statistically significant at (P<0.01) probability level this is in agreement with [1] who selected Cobb Douglass as the lead equation for tomato production and obtained similar results in Kogi State, Nigeria.

D. Resource Use Efficiency of Tomato Production in the Study Area

Table IV shows the resource use efficiency of maize production in the study area. r=1 shows that resources employed by the farmers were efficiently utilized while r>1 shows that resources employed by tomato farmers were underutilized and r <1 shows that the resources employed by the farmers were overutilized. The farm size ratio was 0.869 which shows that the land resources used by tomato farmers in the study area were overutilized. The seed input ratio was 21.016 which revealed that the resource was underutilized by maize farmers in the study area. The labor input ratio was 32.117 which depicts that the labor resource use was underutilized by tomato farmers in the study area.

TABLE IV: RESOURCE USE EFFICIENCY OF MAIZE PRODUCTION IN THE STUDY AREA

Value Factor Unit	MVP	MFC	MVP/MFC	Remarks
Seed	22,535	1,072.8	21.016	Under utilized
Fertilizer	226.967	1,090.00	0.208	Over utilized
Chemical	5,408.05	4,674.00	1.157	Under utilized
Farm Size	8,691.60	10,000.0	0.869	Over utilized
Labour	57,348.56	179.00	32.117	Under utilized

Source: Field Survey (2021)

Also, the fertilizer input ratio was 0.208 which indicates that fertilizer was overutilized by sampled tomato farmers in the study area and the agrochemical ratio was 1.157 which shows that agrochemicals were under-utilized by tomato farmers in the study area. This result is in agreement with (27 & 28] who reported in their research work on the impact of resource utilization on the output which states the efficient utilization of the available resources determines the rate of output that will be obtained. This result is also in line with [29] who reported that over-utilization of resources implied that less of the profit maximization of the resource was used. The possible reasons for the overutilization of the resources could be the inability of the farmers to allocate their resources technically as a result of a lack of know-how on the use of each available resource at their disposal. The results further show that farmers do not utilize any of the resources efficiently in tomato production which could have resulted in the optimum level of tomato production in the study area.

E. Constraints Faced by Sampled Tomato Farmers in the Study Area

Table V presents the analysis of the constraints faced by the sampled respondents the results show that majority 93% of the sampled tomato farmers believed the land tenue system which is the method of land acquisition is among the major challenges of tomato production in the study area. Also 90% of the respondents identified lack of good road as the problem militating against tomato production in the study area, bad roads to market may lead to damage of the produce as a result of accident or delay of reaching the market in good time and could lead the tomato to perishability before reaching the desired market this is in consonant with [30] who opined that post-harvest occur due to delays in transport arrangements and long distances to urban markets. [31] also reported that bad roads are among the major problems that affect tomato production, and the farmers are the ones at the receiving end. Table IV further depicts that about 76% and 99% of the sampled respondents identified inadequate capital and high cost of inputs as the major constraints against tomato production in the county, inadequate capital could make a farmer unable to purchase input due to the fact that the cost of inputs is very high, and it may lead to low output of tomato in the study area. The sampled farmers also opined that among the problems identified in tomato production in the study area were poor marketing system, lack of loan from government, lack of price control, and breakout of diseases in the study area, this finding is also in line with [31].

TABLE V: CONSTRAINTS FACED BY SAMPLED TOMATO FARMERS IN THE STUDY AREA

Constraints	Frequency	Percentage
Land tenue system	93	93.0
Lack of good road	90	90.0
Inadequate capital	76	76.0
High cost of inputs	99	99.0
Poor marketing system	93	93.0
Lack of loan from government	94	94.0
Lack of price control	99	99.0
Outbreak of Diseases	90	90.0

Source: Field Survey (2021)

IV. CONCLUSION AND RECOMMENDATIONS

This study evaluated resource use efficiency and profitability of tomato production in the Federal Capital Territory, Nigeria. Due to the findings emanating from this study, the study concludes that most of the farmers producing tomatoes in the study area were elderly farmers and mostly male farmers, the study also found that tomato production was profitable in the study area the farmers were no efficiently utilizing the available resources at their disposal which resulted in a low output of tomato in the study area. The factors influencing the total output of tomatoes in the study area were household size ($P<0.01$), farm size ($P<0.01$), seed input ($P<0.01$), and labour ($P<0.01$). The results further show that the sampled farmers were faced with the following constraints in the cause of tomato production in the study area, land tenure system, lack of good roads, inadequate capital, high cost of input, lack of price control and disease outbreak. Therefore, the following recommendations were made:

1) Financial institutions should provide affordable financial support and credit facilities to tomato farmers and also encourage female farmers to participate in tomato production
2) Improved seed varieties should be made available to farmers for an increase in productivity at a subsidized rate
3) Agricultural extension agents should be provided and organize training on post-harvest practices in order to increase farmers' incomes and minimize tomatoes wastages in the study area
4) Government should make provision of tractors and other farm implements to help farmers carry their operation easily to reduce the labour cost in tomato production
5) Tomato farmers should form themselves into cooperatives in order for them to assess inputs and subsidies from the government, and also pool their resources together for easy access to inputs and negotiate price

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