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Determinants of Profitability of Small Scale Tomato Irrigation Production in Talata Mafara and Maradun Local Government Areas of Zamfara State, Nigeria

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ABSTRACT
The study determinants of profitability of small scale tomato irrigation production in Talata Mafara and Maradun Local Government Areas of Zamfara State, Nigeria. A combination of purposive sampling and Slovin's formula was used to select one hundred and fifty-three (153) irrigated tomato farmers for the study. Data were collected with the aid of structured questionnaires and were analyzed using gross margin and linear regression analysis. Result showed that the return per naira invested was 0.66, meaning that for every ₦1 invested an additional 66kobo was gained, which depict that irrigated tomato production is profitable. The linear regression result revealed that coefficients for age, farm size and the cost of irrigation, household size, output of tomato and cost of manure significantly influenced the profitability of irrigated tomato farming in the study area. It was concluded that irrigated tomato production is profitable. The study recommended that government and NGOs should encourage tomato production under irrigation.
Keyword: Profitability, Small Scale, Tomato Irrigation Production

INTRODUCTION

Tomato production in Nigeria is considered to be important. This is because tomato not only serve as a food crop but even more as a major source of income for rural households. It is also considered as a main source of raw material for the tomato processing industries (Cetin and Varda, 2008). Tomato is produced in many parts of Nigeria as wet and dry season or irrigated crop, and commercial quantities are obtained in many states in the northern part of Nigeria. Nigeria is ranked second largest tomato producer in Africa and thirteenth largest in the world, producing 1.7 million tonnes annually at average of 25 to 30 tonnes per hectare (Federal Ministry of Agriculture and Rural Development, 2013). This makes it perhaps the most important popular vegetable crop grown all over the country (Cyprian, 2014). Due to its easy adaptability to irrigation, it has become one of the principal crops cultivated on Fadama lands (wet land) (Tanko, Jirgi and Ogundeji, 2010).

Irrigation is the artificial application of water to land for the purpose of an all year round agricultural production. It is one key driver behind growth in agricultural productivity, increasing household income and alleviation of rural poverty (Yakubu, 2008). In other words, irrigation farming serves as an alternative employment and additional source of income.

Government efforts and studies on the development of irrigation agriculture in Talata Mafara and Maradun Local Government Areas have majorly concentrated on improving the productivity of irrigation farmers. These were believed to improve farmers' income, raise their standard of living and consequently address poverty and unemployment (Lawal, Aminu and Gambo, 2019). Despite these efforts, small-scale irrigation systems' performance in terms of food production and economic growth has not been impressive, neither is there any meaningful change on the income and standard of living of the farmers (Food and Agriculture Organization FAO, 2010). It is expected that with a diversification in the domestic tomato farming by irrigation, the production of tomato by irrigation will be improved and it will increase the national economy and reduce poverty. The study aimed at enlightening the farmers about the various methods of irrigation and thus increasing their production and income. Consequently, the specific objectives were to analyze the profitability and the determinants of the profitability of small scale tomato irrigation farming in the study area.

METHODOLOGY

Description of the Study Area

The research was conducted in Talata Mafara and Maradun Local Government Areas of Zamfara State, Nigeria, Zamfara State is located on latitude 12°10'N and 12.167°'N and longitude of 6°15'E and 6.250°'E. Zamfara is tropically warm with temperature rising up to 38°C (100.4°F) and above between March to September. Rainy season starts in late May to September while cold season known as Harmattan lasts from December to February. It has an annual rainfall pattern ranging from 500mm to 1300mm per annum (Wikipedia, 2010).

Talata Mafara Local Government has an area of 1,430km² (550sq mi) with a projected population of 3,065,874 based on annual growth rate of 2.5% (National Population Commission, 2006). Tomato production in the area is carried out under rain fed condition and irrigation. Irrigation most often involves using water pumping machine to drown water from a moving river in the area. The study area has lots of potentials for tomato farming, the high temperature (40.0°C) and low relative humidity (54.7%) make the environment conducive for the production (IAR Meteorological Unit, Zamfara State, 2019). The inhabitants are mostly farmers (crop growers) and Animal rearers (Nipost, 2009), major crops includes millet, sorghum, tomato, onion, pepper and sweet potato.

Sampling Procedure and Sample Size

Based on a reconnaissance survey carried out on the study area, a two multistage sampling technique was used for the study. At the first stage, two (2) local government areas out of fourteen (14) were purposively selected. Those were Talata-Mafara and Maradun Local Government Areas. The criteria used for the purposive selection had to do with the intensity of irrigated tomato production in the area. At the second stage, three communities were selected from each of the two selected Local Governments. Hence, a total of six (6) communities were chosen for the study. Those were Ware Damtse, Tungar Danga, Matusgi, Goron Na Maye, Dosara, and Tungar Sadau. The respondents were selected by the use of Slovin's formula.

$$n = \frac{N}{1 + N(\alpha)2} \quad (1)$$

Where,

N = Sample size (Representative of the entire population)
N = Sample frame (Total population)
A = precision level

To get the number of respondent per each community:

$$C = \frac{N}{n} \times x \quad (2)$$

Where,

N = Total number of irrigated tomato farmers per community
n = Total number of registered farmers
x = Total number of sample size

Method of Data Collection

Primary and secondary data was used. The primary data was collected with the aid of structured questionnaires and with the assistance of field enumerators under the supervision of the researcher. Information collected was based on 2017/2018 irrigated tomato production and data on socio-economic characteristics such as age, sex, marital status, household size, educational level, farm size, as well as variable inputs used in tomato production such as cost of fertilizer, cost of manure, cost of labour and cost of irrigation and value of the output of tomato production.

Model Specifications

Gross Margin Analysis

Gross margin evaluate the profitability of small scale irrigated tomato production. It assesses and delineates the costs and revenue structure of a production system with a view to estimating its income generating potential or profitability. It involves the estimation of gross revenue and total variable cost of production, of which the difference between the two estimates gives a measure of Gross margin (Olukosi and Erhabor, 1988; Kainga and Seiyabo, 2012). This is given as:

$$GM = GI - TVC \quad (3)$$

Where,
GM = gross margin (₦)
GI = gross farm income (₦)
TVC = total variable income (₦)

Linear Regression Analysis

Inferential statistics regression is the measure of the functional relationship between two or more variables, that is, the dependent and independent variables. The dependent variable (Y) shows the output and is dependent on the independent variable. On the other hand, the independent variable (X) shows the socio-economic factors affecting the production by the farmers like age of farmers, level of the farmers education, household size, extension visit, occupation, access to credit, and farming experience. The strength of the relationship and the nature of the relationship between X and Y were determined using the simple regression model. Linear function assumes a linear relationship between the dependent and independent variables. This was used to estimate the determinants of profitability of small scale irrigated tomato production. It is implicitly specified as;

$$Y = f(X_1, X_2, X_3 \ldots\ldots\ldots\ldots X_{13}) \quad (4)$$

Explicitly, the model for linear regression becomes;

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \ldots\ldots\ldots + \beta_{13} X_{13} + e \quad (5)$$

Where,
Y = Value of tomato output (Total income based on output of tomato obtained in bags or baskets)
X_1 = Sex/gender (gender of the farmers; male or female)
X_2 = Age (the number of years of a farmer from birth up to the period of data collection; in years)
X_3 = Marital status (married to a spouse or not, divorced or widowed)
X_4 = Household size (the number of family members in a house; in number)
X_5 = Education (the years spent in receiving formal education)
X_6 = Farm size (hectares)
X_7 = cost of irrigation (₦)
X_8 = cost of seed (₦)

X_9 = cost of fertilizer (₦)
X_{10} = cost of manure (₦)
X_{11} = cost of petrol (₦)
X_{12} = cost of agrochemicals (₦)
X_{13} = cost of labour (₦)
X_n = Value of other independent variable
$\beta_1 - \beta_{13}$ = Regression coefficient
$\propto$ = Constant term
e = Error term (factors of production beyond the farmers' control)

RESULTS AND DISCUSSIONS

Estimated Profitability of Irrigated Tomato Production

The profitability of the irrigated tomato enterprise is presented in Table 1. The result showed that there was moderate return on investment for irrigated tomato production. The result showed that ₦ 181,555.95 was spent as the total variable cost (TVC) on irrigated tomato production by the respondents, which realized a return of ₦ 300,601.30 as the total revenue, giving a gross margin (GM) of ₦119,045.34. The return per naira invested was ₦0.66, meaning that for every ₦1 invested, an additional 66 kobo is gained on the total production. This shows that irrigated tomato production is profitable. The result is in tandem with Tanko *et al.,* (2010) who obtained a similar result among Fadama tomato farmers in Niger State, Nigeria.

Table 1: Estimate of the profitability of irrigated tomato production

Items	Average amount (₦)	Percentage
A. Revenue	300,601.30	
B. Variable Cost		
cost of irrigation	52,792.21	34
cost of seed	4,948.70	3
cost of fertilizer	46,694.92	11
cost of manure	1,876.62	1
cost of petrol	2,298.70	1
cost of agrochemicals	4,964.29	3
cost of labour	67,980.52	46
Total variable cost	181,555.95	100
C. Gross Margin	119,045.34	
D. Return on Naira Invested	0.66	

Source: Field work, 2018

Determinant of Profitability of Irrigated Tomato Production

The determinant of profitability in irrigated tomato farming is presented in Table 2. The result indicates that the coefficient of (R^2) was 0.48 which implies that 48% of variation of gross return was explained. The remaining 52% of the total production is significantly influenced by the independent variable.

The coefficient for age was positive and statistically significant at 1% level of probability. This implies that an increase in age of the respondents would lead to an increase in productivity. The increase in age could make them to have a mastery of irrigated tomato production activities, especially in aspects of management and resource utilization. It significantly influences the rate and level of output which is positively related to productivity. The positive sign coefficient implied that yield increased with age of the farmer. This is in line with the findings of Osanyinlusi and Adenegan (2016), who stated that age was positively related to productivity. Household size was negative and significance at 5% level of profitability. This might be due to the increase in the number of household, resulting in a unit increase in the amount of variable inputs used, which is against the expectation. However, it is contrary to the findings by Sekumade and Toluwase, (2014),

who deduced that increases in farmer's household size will increase family labour and invariably increase output and profitability of farmers.

Farm size was significantly and positively related to profitability at 1% level. This shows that as the size of the farm increases, the profitability of the tomato farmers in the area increases. Thus, the bigger the irrigated tomato farm, the higher the profitability. This is in line with the results of Ajibefun *et al.*, (2002) which portrayed that large farm size enhanced profitability among farmers in the dry savannah and humid forest agro-ecological zones of Nigeria. On the other hand, the cost of labour had negative relationship with profitability at 10% level, implying that as cost of labour increased, the farmers' profitability decreased in the study area. This goes against the finding of Fasoranti (2013), and may be due to poor farm management or over usage of the labour force. Cost of manure utilized by the respondents was significant at 5%. Quantity of manure used had positive relationship with profitability among the irrigated tomato farmers in the area. This indicates that the higher the use of manure, the more profitable the irrigated tomato farming becomes. This also suggests that when irrigated tomato farmers adopt and utilize manure appropriately, it would lead to increased profitability. The cost of irrigation is significant at 1% level of profitability, showing that an increase in the level of irrigation will lead to a unit increase in the total profitability of irrigated tomato farmers in the study area. This agrees with the study of Mitiku, Bezabih and Jema (2015) who reported that the cost on irrigation is significant at 10% for 3 crop choices characterized with Irrigation use.

Table 2: Regression estimate of the determinant of profitability of irrigated tomato farmers

Variable	Coefficient	Standard error	T-value
Constant	39079.530	16706.500	2.339
Age	4830.332***	1903.436	2.538
Sex	-90025.730	56038.410	-1.607
Marital status	-8199.471	57402.040	-0.143
Household size	-7817.579**	3280.205	-2.383
Educational level	12366.350	16307.070	0.758
Farm size	141451.500***	54032.080	2.618
Output of tomato	-71.512**	34.342	-2.082
Cost of fertilizer	1.330	1.247	1.067
Cost of manure	19.811**	8.880	2.231
Cost of labour	-3.544*	2.076	-1.707
Cost of irrigation	5.634***	2.061	2.734
Prob> F	0.0000		
R-squared	0.48		
Adjusted R-squared	0.44		

Source: Field work 2018. Note: ***, ** and * significant at 1%, 5% and 10% levels of probability, respectively.

CONCLUSION AND RECOMMENDATIONS

This study has proved that for every ₦1 invested in irrigated tomato production in Talata Mafara and Maradun Local Government Areas of Zamfara State, there was an additional 66 kobo gain on the total production. However, variables such as age, household size, farm size, output of tomato, cost of manure, cost of labour, and the cost of irrigation were the factors that statistically significantly influenced the profitability of irrigated tomato farmers in the study area. Therefore, it is recommended that there should be policies geared towards encouraging irrigated tomato farming. Since this mode of tomato production is profitable in the study area, it is ideal for the irrigated tomato farmers to have access to credit facilities, improved seeds and effective extension service to boost tomato production and in turn enhance profitability, thereby encouraging more production and increasing the rate of self-employed.

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