



**COST-BENEFIT ANALYSIS OF TOMATO PRODUCTION AMONG
SMALL-SCALE FARMERS IN KANO RIVER IRRIGATION PROJECT
AREA OF KANO STATE, NIGERIA**

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ABSTRACT

This study was aimed on analysis of tomato production in Kano State of Nigeria, with specific objectives of finding the profitability of tomato production among small, medium and large scale farmers in the study area. A total of 60 tomato growers were sampled study area through application of stratified and random techniques in an appropriate statistical procedure. Well-structured questionnaires were used for the data collection. Farm budgeting and cost concept techniques as used in India were used to analyze the primary data. The study reveals an average Net Income generated for tomato production in the study area as ₦779,168/ha. A sample average Benefit Cost Ratio (BCR) for the different farm groups in the study areas was revealed as; 1:3.6. The study indicated that, tomato production and marketing is highly profitable in the study area. It can be concluded that tomato production is profitable at all small, medium and large scale of production in the study area. It was therefore, recommends that the farmers should continuously create efficiency of resource use, which is, avoiding wastages so as to sustainably make more margins in the study area.

Keywords: Benefit Cost Ratio (BCR), Cost, Kano, Kura, Returns, Tomato.

INTRODUCTION

Agriculture remains Nigeria's largest employer of labour, accounting for 70% and contributing about 29.15% of the GDP in real term Federal Ministry of Agriculture and Rural Development [FMARD] (FMARD, 2018). Having all these importance, agriculture continues to face a number of problems and challenges. The major ones are adverse climatic conditions, lack of appropriate land use system resulting in soil and other natural resources degradation, limited use of improved agricultural technologies, the predominance of subsistence agriculture and lack and or absence of business oriented agricultural production system, limited or no access to market facilities resulting in low participation of the smallholder farmers in value chain or value addition of their produces (Bezabih, 2010). This paper focuses on tomato which is one of the world's most important vegetable crops. It is an edible, often red fruit or berry. It is herbaceous annual crop scientifically known as *Lycopersicon esculentum* belonging to the nightshade family *Solanum lycopersicum*, commonly known as tomato plant. The tomato is consumed and used in diverse ways, including raw as an ingredient in the preparation of household dishes, sauces, salads, and drinks. The report of Food and Agriculture Organization (FAO, 2015) of the United Nations "State of the Food Insecurity in the World", Global hunger has continued to decline, albeit gradually, to an estimated 795 million undernourished people, or a reduction of 167 million hungry people over the last ten years. This decline has been most pronounced in developing countries, despite significant population growth.



MATERIALS AND METHODS

Purposive sampling was used in selecting the specific study areas, where Kano states was purposively selected due to high engagement of farmers in vegetable production activities along the Kano River Irrigation Project (KRIP) area. In total 3 villages were selected purposively for the study, the village names are; Karfi, Kosawa and Kura which are all located around the Kano River Irrigation Project (KRIP) area. A total of 60 tomato growers were randomly selected using simple random technique from each of the sampled villages. 27 tomato marketers and 6 consumers were selected randomly through application of appropriate statistical procedures and interviewed with well-structured questionnaires.

Data were collected from both primary and secondary sources. Primary data was collected by conducting interview with farmers using some well-structured questionnaires which were administered directly to the selected tomato growers and marketers in the respected areas of these two countries. Secondary data were sourced from various publications, Journals, Textbooks, Internet, Library and reports from the department of agriculture in the respective study area.

Tools of analysis

The data collected was entered, cleaned, processed and analyzed using Microsoft excel and SPSS software. The analytical tools used include;

Descriptive statistics:

The descriptive statistics tools used include; the Frequency, Mean, Median and percentages. Arithmetic mean of a set of values is the ratio of their sum to the total number of values in the set. Thus, if there are a total of *N* numbers in a data set whose values are given by a group of *x*-values, then the arithmetic mean of these values is given by the formula below.

$$X = \frac{\sum i}{N} = \frac{x_1 + x_2 + \dots + x_n}{N} \dots (1)$$

where;

X = Mean

Σ = Summation sign

X_i = Individual Observation

n = 1, 2, 3.....*n*th observation

N = Total number of observation (sample size)

The mean (*X*) was used to compute the mean of quantitative data obtained from the field.

Percentage: In mathematics, a percentage is a number or ratio expressed as a fraction of 100. It is often denoted using the percent sign, “%”. It also a dimensionless numbers (a pure number). Hence it mathematically expressed as,

$$\% = \frac{X}{N} \times 100 \dots (2)$$

where;

% = Percentage

X = Individual observation

N = Total observation (sample size)

It was used to determine the proportion of the respondents to a particular response. Objective 3 and 4 were analyzed using the descriptive statistics tool by estimating the frequency of occurrences (*F*), percentages (%) and finally ranking based on the most appropriate postharvest loss management strategies practiced and problems faced by the tomato growers in these two countries so as to see the best method that ensure the sustainability and



profitability in tomato production. This is because, governments must construct postharvest losses risk management programs that minimize distortions in resource allocation and reduce opportunities for rent-seeking behavior.

Farm budgeting and financial ratios

These include detailed analysis of cost and returns of tomato production and marketing such as net income, family labour income, farm business income and input-output ratio. These include the detailed analysis of all cost and returns of the individual incurred and generated in quintals per hectare, the various measures used for the analysis include;

Net Farm Income (NFI) analysis:

It is the difference between the Gross Farm Income (GFI) and Total Cost (TC) of production. It is mathematically represented as;

[NFI = GFI - TCP] ... (3)

But,

[TCP = TVC + TFC] ... (4)

The Gross Farm Income (GFI):

This is obtained by adding the total revenue generated by selling tomatoes produced by the farmers, value of home consumed, value of given as gift and value of the byproduct.

Total Fixed Cost (TFC);

Is the cost incurred for the purchase of all fixed items or inputs used by the farmer during production process?

Family labour income:

It includes net income or loss plus imputed value of wages for the labour of farmer and his family.

Farm business income:

It is the gross income minus total expenses of production excluding wages of family labour, interest on owned and rental value of land. It is measure of the earnings of a farmer and his family for their capital investment, labour and managerial work. It can be expressed as:

FBI = Family labour income + interest on working capital + rental value of land ... (5)

Farm Investment income:

Net Income + Rent of owned land + Interest on fixed capital ... (6)

Depreciation value (D) on farm tools and equipment was computed using a straight line depreciation method as expressed below;

[Depreciation value (D) = $\frac{P-S}{N}$] ... (7)

where;

P = Purchase price

S = Salvage value

N = Expected life span of fixed asset

Total Variable Cost (TVC) was obtained from the sum of the cost of all variable inputs used in the production process, such as fertilizer, seed, labour and other marketing costs.

Measures of cost concepts

Cost analysis is important in the study of agricultural production economics because it provides a basis for financial decision making of to produce or not to produce and how much to invest and produce. Hence in this study, the method of evaluation and costing which have become conclusive in the field of farm management studies in India was adopted. These concepts are explained as:

Cost A1: This covers all the expenses incurred by an owner operator (operation cost). It includes;



- Cost of hired human labour
- Operational costs
- Cost of seed used
- Cost of manures and fertilizers
- Cost of crop protection (insecticides and herbicides)
- Cost of irrigation charges
- Charges of bullock labour (Owned & hired)
- Cost from land revenue (rentals)
- Depreciation on fixed capital
- Coast of tractor power used on farm (hired & owned)

Cost A2: This is the sum of Cost A1 and the rent paid for leased land as;

$$\text{Cost A1} + \text{Rent paid for leased land} \dots (8)$$

$$\text{Cost A} = (\text{Cost A1} + \text{Cost A2}) = \text{Total Variable Costs (TVC)} \dots (9)$$

$$\text{Cost B} = \text{Total Fixed Cost (TFC)} \dots (10)$$

Cost A2 + Rental value of owned land + Interest on fixed capital

Cost C: Cost B + imputed value of family labour

RESULTS AND DISCUSSION

Land Use Pattern

Table 1 reveals the per farm total cultivated area is observed to be 1.0 hectares, 2.86 hectares, and 8.82 hectares at small, medium and large farms, respectively along with 4.23 hectares as an overall sample average. The overall sample average of irrigated area is only 3.12 to the total cultivated land.

Table 1: Farm Size Holding under Irrigation in the Study Area (ha)

SNo.	Particulars	Size of Farms Group			Sample Average
		Small	Medium	Large	
1	Total owned land area	1	2.86	8.82	4.23
2	Total cultivated	0.72	1.66	4.52	2.30
3	Irrigated area	1	2.86	5.5	3.12
4	Un-irrigated area	-	-	3.32	1.11
5	Area under other crops	0.38	1.2	4.3	1.96

Source: Field survey, 2016

Factor wise Distribution of Cost per Hectare in Different Size Groups

All cost realized by the farmers during tomato cultivation were computed within all the different farm size groups in the study area and the proportionate contribution of each input used in the total cost was also computed in percentage as revealed on the Table 2. The cost of tomato production per hectare for the small scale farmers is greater than that of the medium farmers which is also greater than that of that of the larger farmers group in the study area. The cost of tomato production per hectare for the small scale farmers is greater than that of the medium farmers which is also greater than that of that of the larger farmers group. The cost of cultivating tomato for the small, medium and large groups of farmers was found to be ₦228,999/ha, ₦208,599/ha and ₦208,111/ha, respectively. The average cost of cultivation in the study area is ₦215,236/ha.



Table 2: Distribution of Tomato Production Cost per Hectare in the Study Area

Particulars	Small	Medium	Large	Sample Average
(A) Variable cost charges				
Hired Human Labour	14974.61 (6.5)	13038.69 (6.3)	12134.57 (5.8)	13382.61 (6.2)
Bullock Labour	8109.148 (3.5)	5121.97 (2.5)	2681.83 (1.3)	5304.32 (2.5)
Tractor power Used in farm	18373.68 (8.0)	14052.84 (6.7)	14943.17 (7.2)	15789.9 (7.3)
Cost of Seed	29770.05 (13.0)	32746.43 (15.7)	39272.93 (18.9)	33929.82 (15.8)
Manures & Fertilizers	24992.27 (10.9)	20056.74 (9.6)	15505.37 (7.5)	20184.78 (9.4)
Irrigation charges	3130.647 (1.4)	3130.65 (1.5)	3130.647 (1.5)	3130.65 (1.5)
Plant protection	1132.115 (0.5)	1153.98 (0.6)	1155.12 (0.6)	1147.09 (0.5)
Interest on working capital (8%)	8038.595 (3.5)	7144.09 (3.4)	7105.89 (3.4)	7429.53 (3.5)
Sub-total	108521 (47.4)	96445.4 (46.2)	95929.5 (46.1)	100299 (46.6)
(B) Fixed cost				
Land revenue	680.5755 (0.3)	680.58 (0.3)	680.58 (0.3)	680.58 (0.3)
Depreciation on fixed capital	4165.12 (1.8)	2813.05 (1.3)	3924.65 (1.9)	3634.27 (1.7)
Rental value of owned land	34709.35 (15.2)	34709.35 (16.6)	34709.35 (16.7)	34709.35 (16.1)
Rent paid for leased land	34709.35 (15.2)	34709.35 (16.6)	35026.95 (16.8)	34815.2 (16.2)
Interest on fixed capital (12%)	8911.73 (3.9)	8749.48 (4.2)	8920.98 (4.3)	8860.73 (4.1)
Sub-total	83176.1 (36.3)	81661.8 (39.1)	83262.5 (40.0)	82700.1 (38.4)
Cost (C)				
Family labour charges	37301.98 (16.3)	30491.73 (14.6)	28919.1 (13.9)	32237.59 (15.0)
Total cost	228999 (100.0)	208599 (100.0)	208111 (100.0)	215236 (100.0)

Note: values in the parentheses are percentages of the total

Source: Field survey, 2016

Cost Concepts of the Different Sample Farms in Different Size Groups

Method of evaluation and costing which have become conclusive in the field of farm management studies in India was adopted and used for estimating the cost concepts in this study. The result obtained on Table 3 and Figure 1 reveals that, the average costs (Cost A, Cost B and Cost C) per hectare in the study area are, ₹100,299.00/ha, ₹82700.1/ha, and ₹32,237.6/ha , respectively. These indicate that, all the different components of the cost concepts are found to be higher in the small size group, followed by medium and finally the large group as obtained. The average total cost of tomato production in the area regardless of farm size group was found to be ₹215,236.00/ha.

Table 3: Cost Concepts for Tomato Production per Hectare in Study Area (₹/ha)

S. No.	Cost Concepts	Size of Farms Group			Sample Average
		Small	Medium	Large	
1	Cost A (N/ha)	108521	96445.4	95929.5	100299
3	Cost B (N/ha)	83176.1	81661.8	83262.5	82700.1
4	Cost C (N/ha)	37302	30491.7	28919.1	32237.6
Total Cost		228999	208599	208111	215236

Source: Field survey, 2016

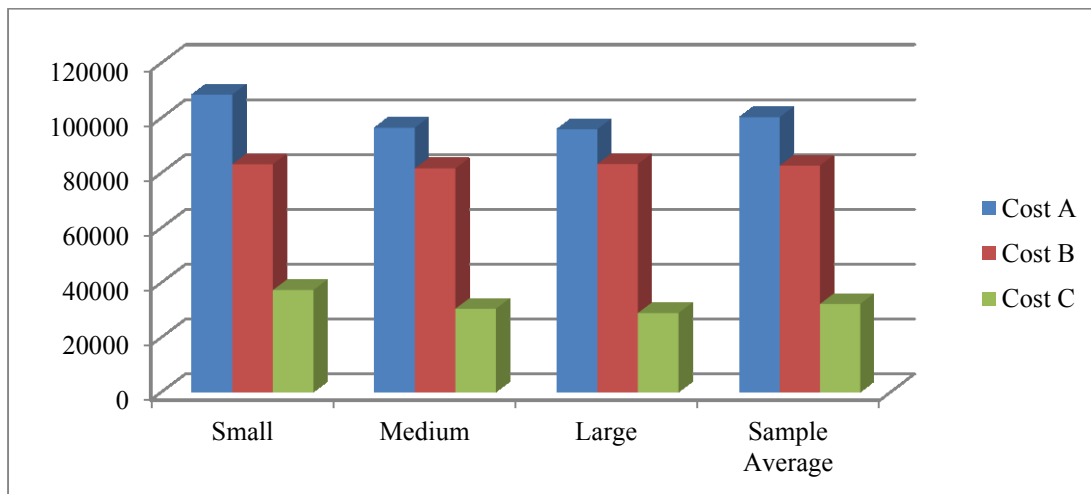


Figure 1: *Distribution base on cost of production per hectare in study area*

Measure of Farm Income

The result on Table 4 reveals that, the Gross income or revenue generated from tomato production per hectare is higher in Small (₹889,822.00/ha) size farm group than the Medium (₹751,441.00/ha) and Large (₹696,240.00/ha) groups. An average output or yield in 100Kg per hectare was also found to be 60810Kg/ha, 49790Kg/ha and 47510Kg/ha for small, medium and the large group of farmers with total sample average yield quantity of 52704Kg/ha for all groups respectively. The result also reveals a total sample average Net Income, farm business income, farm investment income and family labour income as, ₹563,932.00/ha, ₹74,376.5/ha, ₹607,502.00/ha, and ₹32,237.6/ha.



Table 4: Measures of Farm Income across Different Size Farm Groups in the Study Area

SNo.	Income measures	Small	Medium	Large	Average
1	Yield (Kg)	60810	49790	47510	52704
2	Rate(N/100 Kg)	2926.57	3018.44	2930.92	2958.64
3	Gross Income (N)	889822	751441	696240	779168
4	Net Farm Income (N/ha)	660823	542842	488129	563932
5	Farm Business Income (N/ha)	80049.9	72345.2	70734.3	74376.5
6	Farm Investment Income(N/ha)	704444	586301	531760	607502
7	Family Labour Income (N/ha)	37302	30491.7	28919.1	32237.6
8	Cost of Cultivation (N/ha)	228999	208599	208111	215236
9	Cost - Benefit ratio	1:3.9	1:3.6	1:3.3	1:3.6

Source: Field survey, 2016

CONCLUSION AND RECOMMENDATIONS

It can be concluded that tomato production is profitable at all small, medium and large scale of production in the study area. Hence, we can also see that there was a decrease in cost of production along the farm size groups from small, medium to the large groups. The study therefore, recommends the farmers to continuously create efficiency of resource use, which is, avoiding wastages so as to sustainably make more profits in the study area.

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