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Assessment of the Costs and Returns in Organic Tomato Production and their Profitability in Zuru Local Government Area of Kebbi State, Nigeria

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ABSTRACT
The study assesses the costs and returns to organic tomatoes production in Zuru LGA of Kebbi State, Nigeria. The specific objectives of the study are to determine the profitability of organic tomato production, to determine the total costs of producing an acre of organic tomatoes, to determine the returns in organic tomato production, and to identify the costs per labour of organic tomato production. The population of the study area comprises of both male and female, four (4) villages in Zuru LGA were purposively selected, while simple random sampling was used to select ten (10) tomato farmers from each of these villages, making forty (40) sampled organic tomato farmers as sample size for this study. Data were collected using structured questionnaire. Descriptive statistics and farm budgeting technique were used as tools of analysis to achieve the stated objectives. The result of the descriptive statistics revealed that, only 15% of the respondents cultivates above 21 hectares of land, while the result of family labour shows that, 70% of the respondents use family labour. The result of the farm budget revealed the average total costs of organic tomato production to be ^56,236.66 per respondent. The result also revealed the total average variable costs to be constituting 96.32% of the total cost of production, and the total fixed costs on depreciation consist of 3.68% of the total fixed costs of production which is ^874 per/hectare. The study recommends that the organic tomato farmers should enlarge their farm land to achieve higher production output.
Key: Assessment, Costs, Returns, Organic Production and Profitability

INTRODUCTION
Tomato is one of the most commonly grown fresh market vegetables. Yet, since tomato are high yielding and labour intensive, ¼ acre, ½ acre and one acre production units are common with market gardeners. In Massachusetts, for

example, there are approximately 500 acres of tomatoes and approximately 500 vegetable farms. Since some of the larger farms produce 10-15 acres of tomatoes, quite a few farms grow less than one acre (McCraw *et al*, 1987).USDA (1992) reported that tomato yields of 650 to 850 boxes (30 pounds each) are common in the South Central U. S (e.g. Oklahoma). This is equivalent to 19,000 – 25,000 pounds or about 10 – 13 pounds per acre. Comparably fresh market yields of 23,000 – 27,000 pounds per acre are listed in Knott's Handbook for vegetable growers in 1990, the average fresh market tomato yields nationwide was 25,000,000 pounds per acre. Helen (1996), stated that production and marketing cost of intensively cultured tomatoes can be over $ 4,000 per acre with an expected gross return of $ 4,000 to $ 8,000 per acre. Gross returns of $ 18,000 are not uncommon. One organic farmer in New Jersey netted $10,000 an acre with 10 acres in production. Aderinola and Ogunbameru (1991) undertook a study of input elasticity and return to scale for irrigated vegetable production in Borno State, Nigeria. Their findings showed that there were increasing returns to scale for irrigated vegetable production on the project. A summary of their results showed return to growers labour and private profitability, ^4,631.60 - ^609.68 = ^4,022.92. Considering individual vegetables, it was observed that tomato was the highest receipts of 2, 0730.46 and pepper 796.14 (17.2%). In the analysis, it is shown that the total sum of individual vegetable sold or the total receipt was ^4,632.60 which is the total sum of individual vegetables sold. Alamu (1984) in his paper "The Small Scale Mechanized Farming" the only hope of the current Green Revolution in Nigeria was quoted to have said "Farmers are therefore aware of the economic benefits accruing from vegetable production, e.g. tomatoes, by judiciously timing the selection of selected crops and the application of new technologies to increase yields and produce high quality tomato for the demanding markets".

In an Alabama study, full-applied broiler litter at 18tons per acre produced 20% higher yields of earlier and larger tomatoes than commercial fertilizers. The litter was tilled-in and rye was used as a winter cover crop (Brown and James, 1995). In Nigeria, tomatoes yielded 44 and 42 tons per acre when swine manure or poultry manure was applied at 9tons per acre. Tomato yielded 37 and 42tons per acre on fields treated with sewage sludge or rabbit manure applied at 18tons per acre. Organic manures performed better than N.P.K treatments which yielded only 31tons per acre (Oikeh and Asiegbu, 1993). In a New Jersey

tomato study, soils well prepared with green manures and composts showed no yield response over two years to application of supplemental blood meal and alfalfa meal at nitrogen rates as high as 200 Ibs per acre. In California, yields of processed tomato grown following winter legume cover crops (Austrian- winter peas, bell beans, lana woolly-pod vetch berseen clover) were comparable to chemical nitrogen fertilizer treatments. Legume cover crops can provide nitrogen inputs sufficient to support 40- 45tons per acre of tomatoes (Bata, 1995). Researchers in Georgia, South and North Carolina investigated a vegetable production system using winter cover crops and various rates of nitrogen over a four years period. In all locations, cover crops produced higher yields and better quality tomatoes and other vegetables than applied nitrogen (Stivers, *et al.*, 1991).

Treating organically grown tomato crops with kelp and fish powder sprays yielded inconclusive results in a California study. The researchers concluded as had others before them that the efficacy of foliar treatments is ultimately dependent on multiple plants, soils and environmental factors (Tourte and Laura, 1997). Lorenz, *et al.,* (1988) in their study concluded that efficient harvesting, handling and marketing techniques are extremely in the production of this highly perishable crop. Harvesting tomatoes is very labour intensive. One source estimates 350 hours for each staked acre. For storage and shipping fruits can first be picked at the "breaker" stage of maturity, when the blossom end turns pink. Post-harvest temperature management is critical to maintain quality. Tomato may become damaged when stored below 55^0 F. The optimum temperature range for longest shelf life is between 55^0 F and 70^0 F.

Obaosegbe (1973) in looking at the marketing channels for fruits and vegetables showed that two major groups through which the fruits and vegetables move from the producer to the consumer in Nigeria are wholesale and retailers. In a study carried out by Mohammed (1971) on the problems of marketing of perishable products, a case study of tomatoes and onions were presented. He concluded that agricultural marketing is still at its traditional level and something should be done to improve the marketing efficiency. Akinerele and Edward (1973) estimated present losses of fruit and vegetables in Nigeria as 10% on the farm, 12-20% at wholesale level and 20-30% at retail level. They therefore recognized the need for preservation and processing so as to reduce

the excessive surplus in the harvest and maintain a constant supply during off season. They suggested that if simple preservation techniques could be employed, losses at farm wholesale and retail level would be substantially reduced.

Adekanye and Oladide (1981) referred marketing as the sum total of all business activities performed in the movement of commodities from the point of initial production until the commodities are in the hands of the ultimate consumers. According to the authors, marketing of agricultural products is performed in different stages. The initial stages require adequate planning to meet specific demands as well as the future projection of the market. The disposal of the processed products through sales to the ultimate consumer complements this stage of marketing, while the sales of raw materials to the industries to be processed, complete the setup. Other inputs such as seeds, fertilizers and pesticides that are supplied at subsidized rate to the farmers to enable them increase output can be categorized under marketing. Stevens (1977) noted that labour resources on small farms have two characteristics related to accelerate agricultural development. First, the author mentioned that, the supply of labour per unit of land is large in many small inputs, especially where population densities are high. Thus, the increasing supply of rural labour will tend to keep labour cost low compared to land and capital. Secondly, the author added that labour shortage during peak periods of labour demands usually at planting and harvesting is due to the seasonal nature of agriculture. This often limits the total amount of crop production.

Problem Statement

Tomato has proved very profitable with the highest receipt of 2, 0730.46 in a study carried out in Borno State. Also in a study termed "the small scale mechanized farming, the only hope of the current green revolution in Nigeria" that emphases on economic benefit accruing from vegetables and pointed out tomatoes as the number one example by judiciously timing the selection of selected crops and the application of new technologies to increase yields and produce high quality tomato for the demanding markets. With this background, I believe that introduction of organic method of farming in the production of tomato will in no doubt give a better yields which will attracts better market value, sales and costs, thereby increasing the profitability venture

of the tomato farmers. The study will help answer the following questions; is organic tomato production profitable? What are the total costs of producing an acre of organic tomatoes? Does organic tomato farming give better return? What are the costs per labour of organic tomato production?

Objective of the Study

The broad objective of the study is "Assessment of the Costs and Returns in Organic Tomato Production and their Profitability in Zuru LGA of Kebbi State, Nigeria." The specific objectives are to determine the profitability of organic tomato production, to determine the total costs of producing an acre of organic tomatoes, to determine the return in organic tomato production and to identify costs per labour of organic tomato production.

METHODOLOGY

The Study Area

The study was carried out in Zuru Local Government Area of Kebbi State. Zuru LGA lies between longitudes 44^0 E-66^0 E and Latitudes 42^0 N-58^0 N. The LGA is located towards the Eastern part of Kebbi State. It is located on a hilly terrain and is bounded in the Northern by Gummi and Bukkuyum LGAs of Zamfara State, North- West by Fakai and Koko- Besse LGAs, South-West by Yauri LGA, North-East by Danko/Wasagu LGA, South- East by Sakaba LGA and South by Rijau LGA of Niger State. The population of Zuru LGA is approximately 9,982 people and comprises of different tribes in every location of the Emirate which include Dakarkari, Hausa, Kambawa, Gelawa, Kukum and Dukkawa (NPC, 1991).

Population and Sample Size

The population for this study comprises of both male and female that practice organic tomato production in the study area. Zuru LGA is made up of four (4) administrative districts, namely Rikoto, Rafin Zuru, Dabai and manga in which the research work was carried out, and this was purposively selected. Simple random sampling was used to select 10 tomato farmers from each of these four (4) villages giving a total of 40 tomato farmers as sample size.

Data Collection Procedure

Primary data were collected using structured-questionnaire through personal interview by four (4) trained enumerators and the researchers in persons. The data collection was done in five (5) days sequentially. The information obtained from the respondents was recorded on pre-tested questionnaires. Secondary data used in this study were collected from official annual reports of the State government, reports from the journals, magazine and seminar reports.

Analytical Techniques

The following analytical techniques were used to achieve the stated objectives: descriptive statistics (Frequency count and percentages) were used to organize and summarized the stated objectives. Farm budgeting technique was one of the most familiar tools of analysis in production economics and farm management. The aim of farm budgeting is to compare how profitable different kinds of enterprise combinations can be. It can crystallize ultimately into the statement of costs and returns, based upon input and output data relevant to the problem in question (Robertson, 1988). Farm budgeting provides information on costs and benefits of the farming business. Gross margin is a very useful planning tool in situations where fixed capital form a negligible portion of the farming enterprises as it is the case in subsistence agriculture (Olukosi and Erhabor, 1987). The gross margin is calculated using the following formula:

GM = (P.Y) - VC

Where, VC = Variable cost

P = Price per basket

Y = Yield per basket, per hectare.

The gross margin (GM) of an enterprise is thus, the difference between the revenue and the variable cost of single unit. The GM has many uses in farm management analysis some of which includes the following:

- Useful where the same capital items are used in many different enterprises in a given farm.
- Useful in comparing the efficiency and profitability of different farm enterprises and farm plants.
- Apart from helping the farm manager to critically examine the variable cost component, GM can also be used as a budgeting tool for the farm. The GM has some limitations;

Returns can be obtained from scarce sources. It is only a good measure of general efficiency, because it tends to measure average relationships rather than marginal effects.

Net Farm Income (NFI)

The difference between gross farm income and the total cost of production. The NFI be withdrawn from the business without affecting the scale of operation of the business. NFI was calculated as follows; NFI = gm – FC.

Where NFI = Net farm income

GM = Gross margin, and FC = Fixed cost

Note: if net income is positive, it means the plant reorganization or the enterprise is profitable and worth investing. The fixed cost (depreciation on farm tools and equipment were calculated using the straight line method).

$$\text{Depreciation} = \frac{P-S}{N}$$

Where; P = Purchase price

S = Salvage value

N = Number of years of the assets

RESULTS AND DISCUSSION

Cost and Return to Organic Tomato Production

This section deals with the cost and returns in organic tomato farming, included here are profitability venture of the organic tomato cultivation, farm size, types of labour used, cost of labour hired by the respondents, prices of a hectare of land of organic tomato, cost per basket of fresh organic tomato, expected gross returns of organic tomato cultivated per hectare of land and cost and return analysis.

Profitability Venture of Organic Tomato Cultivation

In any farm business, one has to look out for the profit that will be received at the end of the whole farming activities. The organic tomato farmer does their organic farming with the sole aim of making profit. Table 1 below presents the responses of the respondents in regards to profitability venture of their organic tomato farming activities.

Table 1: Response of the Respondents' Profitability Venture on Organic Tomato Farming

Response	Frequency	Percentage (%)
Yes	34	85
No	6	15
Total	**40**	**100**

The Table above shows that 85% of the respondents were receiving profit from the sales of organic tomato, while 15% of the respondents revealed that they don't obtain profit from the sales of their organic tomatoes. The result shows obviously that majority of the respondents enjoyed profit in their organic tomato business which helps to increase their means of livelihood thereby raising their standard of living. This shows that organic tomato production is a profitable venture. This study commensurate with that of Aderinola and Ogunbameru (1991), that the production process of tomato was profitable and that there were increasing returns to tomatoes on the project which shows returns to growers labour and private profitability.

Farm Size

In order to improve on the production of organic tomato in the study area, opening of new land will permit sufficient growth in the production to meet the slow expansion of tomato demand and population growth in most low income areas. The Table below presents the distribution of the respondents' farm size.

Table 2: Distribution of the Respondents' Farm Sizes

Farm Size (hac.)	Frequency	Percentages (%)
>1-5	11	27.5
6-10	12	30
11-20	11	27.5
Above 21	6	15
Total	**40**	**100**

The result above revealed that 30% of the respondents cultivate between 6-10 hectares of organic tomato farm-land. This shows that there is need for the respondents to expand their organic tomato farm-land, since majority of the respondents cultivates the least numbers of hectares. This study encourages organic tomato farmers to invest more on tomato production so as to raise their standard of living and to increase the sizes of their farm-land in order to

achieve the desired level of output. This finding is contrary to that of MCcraw, *et al* (1987), which revealed that approximately 500 hectares farms of tomato were cultivated in Massachusetts, and that since some of the larger farmers cultivate 10-15 hectares of tomato, quite a few of them grow less than one (1) hectare.

Types of Labour used by the Respondents

Farm labour is mostly carried out by the family participation in most part of Nigeria. The organic tomato farmers mostly use family labour, despite the low level of education of the respondents in the study area, young school dropouts still take part in the organic farming activities. However, the respondents in the study area use both family and hired labour. The Table below shows the distribution of the respondents labour used.

Table 3: Distribution of the Respondents' Labour used

Labour Used	Frequency	Percentages (%)
Hired	12	30
Family	28	70
Total	**40**	**100**

Table 3 shows that 70% of the respondents used family labour, while 30% of them used hired labour. This result signifies that the respondents used family members in farm activities in order to reduce cost of hired labour, as it is clearly seen that family labour is more used in organic tomato production than the hired labour. Stevens (1977), in his study revealed that labour shortage during peak periods of labour demand, usually at planting and harvesting is due to the seasonal nature of agriculture, and this often limit the total amount of crop produced.

Costs of Labour Hired by the Respondents

This section deals with the costs of labour per hectare of organic tomato produced per year. Cost of labour normally depends on the type of labour needed by the person in question. An intensive labour may attract bigger cost, while the less intensive labour may attract smaller cost. The Table below presents the distribution of the respondents' costs of labour per hectare per year.

Table 4: Distribution of the Respondents' Cost per Labour/year

Cost/hectare of Labour	Frequency	Percentages (%)
>10,000	10	25
^10,000	10	25
^15,000	10	25
^20,000	8	20
Above 20,000	2	5
Total	**40**	**100**

Table 4 above revealed that 25% of the respondents pay less (>) than ^10,000 per hectare of labour cost, 25% of the respondents pays ^10,000 per hectare of labour cost, while 25% of the respondents pays ^15,000, 20% pays ^20,000 and 5% of the respondents pays above ^20,000.

This means that cost of labour varies by the individual respondents, this implies that the cost of labour spent on farm A (one hectare) may not be the same as the one spent on farm B (one hectare). This may be as the result of differences in soil texture, yield of the crop and so on which could either reduce cost or increase cost of labour.

Prices per Hectare of Organic Tomato sold/year, by the Respondents

Prices of organic tomato sold per year by the respondents defers due to the variation in Quality, shelf life, size of the tomato and the varieties used. The result below shows the distribution of the respondents' prices per hectare of organic tomato sold/year.

Table 5: Distribution of the Respondents' Prices/Hectare of organic Tomato sold/year

Prices/hectare/year	Frequency	Percentages (%)
>^30,000 only	18	45
^30,000 -^49,000only	12	30
^50,000-^60,000 only 5	12.5	
Above ^60,000 only 5	12.5	
Total	**40**	**100**

In view of the above Table, 45% of the respondents sales their organic tomato per hectare per year at the rate of less (>) than ^30,000 only, 30% of the respondents revealed that they obtain between ^30,000-^49,000 only, while about 26% of the respondents obtained from the sales of their organic tomato

between the prices of ^50,000-^60,000 and above ^60,000respectively. This confirms the finding on Table 4 above, that organic tomato production is a profitable venture, since majority (45%) of the respondents reported that they spend only less (>) than ^10,000 on labour per hectare per year, while in Table 5 they obtained at sales the prices of less than ^30,000 only, which indicate net profit and is worth investing because the net farm income is positive after removing the total labour costs. The above results agrees with that of Helen (1996), which revealed that production cost of intensively cultured tomatoes can be over ^460,000.00 per acre with an expected gross return of ^460,000.00 to ^920,000.00 per acre.

Costs per Basket of Organic Tomatoes by the Respondents

Organic tomato farmers are characterized by the good sense of weighing their organic tomato fruits before disposing them for commercial sales. This is been done so that they will be able to place value to each basket. The value of each organic tomato contained in a basket will determine the cost price of that basket. The Table below shows the distribution of the respondents cost per baskets of organic tomatoes produced.

Table 6: Distribution of the Respondents' Cost per Basket of the Organic Tomatoes

Cost per Basket	Frequency	Percentages (%)
>^100 only	10	25
^100-200 only	10	25
^201-300 only	6	15
^301-400 only	4	10
Above ^ 400 only	1025	
Total	**40**	**100**

The result on cost per basket revealed that 25% of the respondents sales their organic tomato per basket at the costs of less than (>) ^100 only, while another 25% of the respondents revealed that their organic tomato per basket cost above ^400 only. Significant number of the respondents say about 50% indicates that their organic tomato per basket cost between ^100 to ^400 only. The result of this finding shows significant profit on the production of organic tomato, since one third of the respondents revealed that they obtain above ^400 per basket of organic tomato. Tomato is highly marketable worldwide because of its

nutritional value in our daily diet. It is also considered to be grown for its commercial purposes in order to meet up with the demand of the increasing population of the world, which in turn raise the living standard of the producers, therefore its production should be encouraged.

Expected Gross Returns on Organic Tomato Production per Hectare of Land

This section presents the expected gross margin in organic tomato production. Gross profit margin here means the grand profit obtained from the organic tomato farm, after removing the total cost of production. The Table below shows the distribution of the respondents' gross profit margin in naira (^) per hectare of organic tomato produced per year.

Table 7: Distribution of the Respondents' Gross Profit Margin/hectare of Land

Gross Margin/Hectare	Frequency	Percentages (%)
>^10,000 only	3	7.5
^10,000-^15,000 only	12	30
^16,000-^20,000 only	15	37.5
^21,000-^30,000 only	7	17.5
Above ^30,000 only	3	7.5
Total	40	100

Table 7 above present the distribution of the respondents expected gross profit margin per hectare of organic tomato per year. The result shows that about 8% of the respondents obtained the gross profit margin of less than (>) ^10,000 only per annum on the sales of the organic tomato, 30% of the respondents had the gross margin of between ^10,000-^15,000 only, while about 38% of them obtained the gross margin of between ^16,000-20,000 only. This same result revealed that, about 18% and 8% of the respondents obtained the gross profit margin of between ^21,000-^30,000 only and above ^30,000 only respectively. From the look of the Table above, the gross profit margin of the organic tomato production is on the high side, therefore it is worth investing.

This finding agreed with that of Aderinola and Ogunbameru (1991) and Helen (1996), their findings revealed that production and marketing costs of intensively cultured tomatoes can be over ^460,000 per acre with an expected gross returns of ^460,000 to ^920,000 per acre. The summary of their result shows return to growers labour and private profitability of ^4,022.92. The gross

margin was one of the farm budgeting techniques used in computing the cost, returns and profitability of the difference between the total revenue of organic tomato production and the total variable cost of production for the respondents. Table 7 shows that organic tomato production was profitable in the study area. Therefore the organic tomato farmers considered the organic tomato production as a reliable source of income; in turn it will improve their living standard and encourage them to expand their organic tomato farm sizes.

COSTS AND RETURNS ANALYSIS

Costs of organic tomato production are the total expenses incurred in the process of production. This can equally be used to determine the profitability of the organic tomato production at the end of organic production period. Table 8 below shows the components of variable costs incurred in organic tomato production per hectare of organic tomato farm land. However, family labour costs rated highest with total of 68.92%, this is followed by hired labour cost, which rated 59.25%, storage costs is lowest with total of 0.32%.The total cost of organic tomato production incurred by all the respondents was ^602 1355.7, this gave an average total cost of ^56,236.66 per respondent or ^34,897.30 per hectare.

The total cost is made up of the "variable and fixed cost components". The variable cost consist of the expenses on seed, fertilizer, chemicals, family and hired labour, repairs of tools, transportation, costs empty baskets, and rental value of farm land. The total average variable cost constituted 96.32% of the total cost of production. Generally, the high labour cost may be linked with high labour demand during the period of production, thereby making labour supply to become limited and thus costly. The fixed cost consist of depreciation on farm tools and total equipments, this constituted 3.68% of the average total cost of production which is ^874 per hectare. This shows that there was less utilization of fixed inputs by the respondents, which depicts the subsistence nature of organic tomato production in the study area.

Table 8: Analysis of the Costs and Returns to Organic Tomato Production

Items of Costs/Returns	Amount/Hectare (^)	Percent of Total
(a) Variable Cost:		
Rental value of farm land	426.29	1.79
Seed	371.35	1.56
Fertilizer	688.82	2.93
Chemicals/Storage	77.75	0.32
Repairs of Tools	271.231.14	
Family Labour	12040.73	50.61
Hired Labour	6986.39	29.36
Transportation	475.30	1.99
Empty Baskets	98.35	0.41
Cost of Baskets	1477.46	6.21
Total Variable Cost (TVC)	**22,913.65**	**96.32**
(b) Fixed Cost:		
Depreciation on Farm Tools and Equipment	874.753.68	
Total Fixed Cost (TFC)	874.75	3.68
Total Cost of Production (TVC + TFC) =TC	23,788.40	100
© Returns:		
Sales of organic Tomatoes	12,864.87	41.25
Value of Organic Tomatoes	17,447.18	55.95
Sales of organic Tomatoes Stakes (Residues)	873.07	2.80
Total Returns (TR)	31,185.12	100
Net Farm Income (NFI)	7,396.72	
Returns per naira (^)		
Investment $\frac{TR}{TC}$	1.31	
Operating Ratio (OR) $\frac{TOS}{GI}$	0.74	
Fixed Ratio (FR) $\frac{TFC}{GI}$	0.03	
Gross Ratio (GR) $\frac{TE}{GI}$	0.76	

CONCLUSION

This study seeks solutions to the existing problems of costs and returns to organic tomato production in the study areas. The issues of concern in this

work were precisely discussed results were obtained in the cause of this study. Some of these results revealed returns to growers and private profitability. Contrary to what was obtained at Massachusetts in a study carried out by McCraw, *et al;* (1987), their study revealed that farmers were cultivating up to 500 hectares of tomato farm land, this study contradict their findings, since only 15% of the respondents cultivates above 21 hectares of land. Therefore, there is need for the tomato farmers to enlarge their tomato farm land in order to obtain maximum yields of organic tomatoes. The study also revealed that fixed costs input was utilized by the respondents, this depicts the subsistence nature of organic tomato production in the study areas.

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