International Journal of Agricultural Science, Research and Technology in Extension and Education Systems (IJASRT in EESs)
Available online on: http://ijasrt.iau-shoushtar.ac.ir
ISSN: 2251-7588 Print
ISSN: 2251-7596 Online
2020: 10(4): 149-156

Received: 19 October 2020
Reviewed: 10 November 2020
Revised: 17 November 2020
Accepted: 04 December 2020

A Profit Approach Comparison between Tomato Grown under Organic and Inorganic Methods in a Typical Nigeria's Soil

Hamza Babagiwa Aliyu and *Muhammad R. Ja'afar-Furo
Department of Agricultural Economics and Extension,Faculty of Agriculture,Adamawa State University, PMB 25, Mubi,Nigeria. * *Corresponding author: jaafar436@adsu.edu.ng*

Abstract

The role of tomatoes as nutritive vegetable crop in the diet of most humans has been stressed or advanced by many scientists. This study therefore, assessed the profitability of tomato production using organic and inorganic fertilizers on a typical irrigated soil in Hong Local Government Area, Adamawa State, Nigeria, with the intent of ensuring a more acceptable measure of sustainability among rural farming communities. A total of 120 (60 in each category) producers were purposely selected from 2016/2017 irrigation season for the study. Data were collected through a cost route method by application of structured questionnaire and complemented with interview and group discussions. Descriptive statistics (frequency distribution and percentage), Gross Margin Analysis and Net Farm Income were engaged in the analysis of data. Findings showed that most of the farmers were married males aged between 31 and 60 years with farming experience ranging from 11 – 20 years. A larger proportion of the farmers had first school leaving certificates and cultivated less than a hectare of farmland. While the most popular organic fertilizers among the farmers were cow dung and small ruminant droppings, Nitrogen-Phosphorus-Potassium 15-15-15 (NPK) fertilizer was largely applied among the respondents. The returns on Naira invested for users of organic and inorganic fertilizers were 2.5 and 0.73, respectively, signifying that the former farms were more profitable. Conclusively, it can be stated that the application of organic fertilizers yielded more profit than the chemical fertilizers. Therefore, institutions of concern should strongly work towards making the application of organic fertilizers more popular.

Keywords: Analysis, Crop, Farmers, Production

1. Introduction

Tomato, which is scientifically referred to as Lycopersicon esculentum is a vegetable crop which its origin is still debated. Although technically known as a fruit, the crop is believed to have spread across the world from the South America (Anonymous, 2019). As the second most valuable vegetable next to potato, the current world production is pegged at 100 million tonnes of fresh fruit per annum cultivated on 3.7 million hectares of land (Jones, 2015). Tomato is a crop that serves several uses ranging from nutritive, medicinal to economic values.

The nutritive and health properties of tomato have been sufficiently highlighted by food scientists in the literature. For instance, Magee (2006) reported that some vitamins, minerals and antioxidants in tomato have been discovered to reduce the risk of prostate cancer in men and slow the growth of pancreatic cancer by 30%. Of the remaining nine health benefits of tomato mentioned in the report, combining its paste and pizza sauce contribute immensely in improving the cardiovascular system, and general wellbeing of man. Similarly, Giovannucci (1999) extensively reviewed tomato and its related products, lycopene and cancer taking into cognisance the epidemiological perspective, and concluded that the intake of tomato and tomato-related products have been documented to be linked with lowering the risk of a variety of cancers and

improving the health status of human. Associated with this vital role is the consumption of lycopene, a carotenoid mainly found in tomatoes. As a crop that is being consumed virtually worldwide, tomato has been contributing to the advancement of economies of both developing and developed nations. In the United States alone in the year 2017, the USDA (2018) reported that approximately 1.42 and 14.7 million tonnes of fresh market and processed tomatoes were harvested from approximately 311,500 acres worth US$1.67 billion. Also, the Netherlands in Europe which was the largest global exporter in 2017 raked-in US$2b accounting for 22.2% of world exported tomatoes that year (ZFI, 2018). However, Iwuoha (2017) affirmed that although tomatoes are Africa's most consumed fruits, unfortunately it does not produce adequately to meet its demand. The continent spends nearly US$1b on importation annually to bridge the deficit, in spite of possessing the appropriate environment for production. In Nigeria, most of the 19 Northern States have good plain land for production of tomatoes in commercial quantities. Ranked as the 16th nation on the world scale of tomato production, Nigeria accounts for 10.8% and 1.2% of Africa's and global total output, respectively (Akibu, 2014). Further, with all the potentials at the nation's domain, the production processes are still saddled with numerous constraints, ranging from diseases, nematodes, and insect pests to inappropriate soil fertilisation. In fact, Iwuoha (2017) noted that despite the Nigeria's position on the global production, the country still import tomato products in form of purees, pastes and canned stuff amounting to US$500m annually, placing the country as one of the largest tomato paste importers in the world. This absolutely calls for a rethink in the agricultural policy of the nation towards a holistic improvement in the value-chain of the production system.

The task before Nigeria presently is not only about production of this precious vegetable crop (tomato) to meet its deficit and exporting glut, but also applying the safest methods while doing so at profitable level and still maintaining sustainability through massive introduction of value-addition. This position even becomes more imperative taking account of Iwuoha's (2017) attestation that over 50.0% of harvested tomatoes in Nigeria never make it to market due to poor storage facilities and lack of processing options, leading to huge losses. While several studies (Ghorbani et al., 2006; Cox, 2015; Ogundare et al., 2015; Tsado, 2016; Makinde et al., 2016) had been conducted in the technical field of production, especially the effects of utilisation of various fertilizers on plant growth and fruit yield, dearth of information exists in the economic aspect. This study therefore, described the demographic characteristics of tomato farmers in the area, major types of fertilizers used by farmers, determined the profitability between farming using organic and inorganic fertilizers in tomato production, and identified the constraints experienced by the tomato growers.

2. Materials and methods

2.1 The Study Area

This study was conducted in Hong Local Government Area (LGA) of Adamawa State, Nigeria; known for its prominence in tomato production using irrigation methods. As one of the 21 LGAs in the State, it is located at the North-East region of the country on longitude 10.13' 54'N and latitude 12.55' 49'E. The predominant ethnic groups are Kilba, Hausa, Margi and Fulani. The major crops grown in the area include groundnuts, rice, maize, tomato and sorghum. Small-scale livestock production is also popular among the people (Tukur and Ardo, 1999). Ray (1999) reported that the geological materials and soil type of Hong LGA is characterised by gravel to sandy loam with PH of 5.1 – 6.1 indicating moderate to high. The soil is shallow to moderately deep and well drained. The vegetation are composed of Northern Guinea Savannah and Sudan Savannah zones, and mean annual rainfall of 900mm to 1100mm (Akosim et al., 1999).

2.2 Sampling Procedures and Data Collection

Multi-stage and purposive sampling procedures were employed in selection of districts and tomato farmers, respectively, for the study. In the first stage, three most tomato producing districts namely, Uba, Hildi and Gaya were purposely selected. In the second stage, four villages with highest concentration of tomato farmers that engage in irrigation farming were chosen from each district. In the third stage, five tomato farmers using organic fertilizers and five tomato farmers using inorganic fertilizers were purposely selected from each village (i.e. 10 farmers from each village), making a total of 120 tomato farmers as sample size for the whole study. Data for this study were generated mainly from the primary sources. These information were collected through the application of structured questionnaire which were supplemented by oral interview and group discussion with the tomato farmers. Information generated were on socio-economic variables, cost and returns, types of fertilizers used, constraints associated with tomato farming in the area, among others.

2.3 Methods of Data Analysis

In order to achieve the objectives of the study, relevant analytical tools were employed. These

were Descriptive Statistics, Gross Margin (GM) and Net Farm Income (NFI) analyses. The descriptive statistics include, mean, frequency distribution and percentages, while the remaining tools are:

GM = TGR – TVC …… (1)

Where:

GM = Gross Margin
TGR = Total Gross Receipts
TVC = Total Variable Cost

NFI = GM – TFC …… (2)

Where:

NFI = Net Farm Income
GM = As earlier defined
TFC = Total Fixed Cost

RONI = FNI/TC …….. (3)

Where:

ROIN = Return on Naira Invested
FNI = Farm Net Income
TC = Total Cost

3. Results and discussion

This section of the study shows the findings in tabular form and highlighting the relevance in tomato farming in the area of survey, and places with similar economic and geographical terrains. In this regard, attempts were made to realise the objectives which deals with the socio-economic variables of the irrigation farmers, profitability of tomato production under application of organic and inorganic fertilizers as sustainable enterprise, and constraints associated with the two methods of farming.

The finding in Table 1 below indicates demographic information of tomato farmers with regard to their age, gender, marital status and household size. It shows that majority (58.33%) of the tomato farmers in both farming groups fell within the age bracket of 31 and 60 years, signifying a fairly middle-aged farming population in the rural study area. Gender wise, a larger chunk (98.33%) of the farmers were males, with a very insignificant portion of them as females. This supports Emana et al. (2017) finding which earlier reported 89.0% of male participated in tomato production in Ethiopia against 11.0% female. This finding in the areas of survey perhaps confirmed a dominance of a particular people with customs which do not favour participation of female forks in outdoor economic activities, and would rather strictly keep them in purdah. On the other hand, as irrigation in Nigeria is still underdeveloped and labour intensive in terms of preparation of tomato transplanting beds, creation of water channels and weeding, among others, females could not simply cope with the rigours of the farming exercise thereby grossly limiting their participation.

The Table 1 also presents findings on marital status and the household size of tomato farmers in the area of study. A total of 75.83% were married, while 48.33% and 42.50% accounted for those farmers with 6-10 and 1-5 members of family in households, respectively. Ogunniyi and Oladejo (2011) affirmed that both marital status and increased number of household size had positive and significant effects on technical efficiency under constant return to scale of tomato growers in Oyo State, Nigeria. In fact, the report clearly stated that efficiency increases with increase in family size.

Table 1. Demographic information of the tomato farmers according to age, gender, marital status and household size in the study area.

Variable	Farmers using organic Inorganic fertilizers	Farmers using fertilizers	Percentage
Age (years)			
Less than 20	08	02	08.33
21-40	13	20	27.51
31-60	35	35	58.33
61 and above	04	03	5.83
Total	60	60	100.00
Gender			
Male	58	60	98.33
Female	02	-	1.67
Total	60	60	100.00
Marital status			
Married	46	45	75.83
Single	09	15	20.00
Others	05	-	4.17
Total	60	60	100.00
Household size			
1 – 5	20	31	42.50
6 – 10	34	24	48.33
11 and above	24	13	9.17
Total	60	60	100.00

Table 2. Demographic information of the tomato farmers based on experience, level of education and farm size in the area surveyed.

Variable	Farmers using organic fertilizer s (n: 60)	Farmers using inorganic fertilizer s (n: 60)	Percentage (n: 120)
Farming experience (yrs.)			
Less than 10	11	13	20.00
11 – 20	34	42	63.33
21 and above	15	05	16.67
Total	60	60	100.00
Level of education			
No formal education	35	-	29.17
Primary school	20	24	36.66
Secondary school	05	30	29.17
Tertiary education	-	06	5.00
Total	60	60	100.00
Farm size (hectares)			
Less than 1 ha	40	34	61.67
1 – 2 ha	15	23	31.67
3 ha and above	05	03	6.66
Total	60	60	100.00

Other socio-economic variables of the tomato growers in the area surveyed are presented in table 2. These are farming experience, standard of education of tomato growers and farm size in hectares. The findings show that 63.33% of the farmers had spent between 11- and 20-years growing tomatoes in the area, and therefore, could be said to be versed in their own ways in the production of the essential vegetable crop. Similarly, majority (70.83%) of these sets of farmers have had one form of western education or the other, ranging from first school leaving certificate to tertiary education, indicating an enlightened farming population, and so adoption of improved farming skills could be done with minimal task when giving the opportunity. However, the remaining 29.17% who could not have had access to formal education had acquired Qur'anic education at home. Maliwichi et al. (2014) earlier reported similar result among smallholder tomato growers in Limpopo Province in South Africa. The authors found out that, of the tomato growers studied, about 95.0% have had primary school to tertiary education, with only 5.0% as illiterates which also confirmed that the tomato growers were largely enlightened farming population.

Access to viable farm land in dry season or irrigation farming is instrumental to a successful vegetable production. A total of 61.67% of the tomato growers in the study area had less than one hectare of farm land for cultivation, while 31.67% were cultivating between one and two hectares. It could still be observed from table 2 below that only an insignificant portion (6.66%) of the tomato growers cultivated three hectares and above. Inferring from these findings, it could be stated conveniently that majority (93.34%) of the tomato farmers in the area of study were smallholder farmers. This result agrees with Kutawa (2016) who documented that all (100%) the tomato contract farmers in Northern Nigeria had between 0.1-2.0 hectares of land for cultivation.

Sources of income, primary occupation of farmers and land ownership are vital parameters in agricultural production in developing economies like Nigeria. These variables are reflected in Table 3. It could be seen from the findings that there were three main sources namely, personal savings, financial institutions, and friends and relatives. Of these sources, personal savings accounted for 65.83%, as against 25.00% and 9.17% for friends and relatives and financial institutions, respectively. This was a clear indication of the tomato growers' inability to access reasonable size of funds for expansion of their enterprises, and by implication limiting their participation in tomato production beyond just smallholder scale. This finding is in tandem with Oladejo's (2015) which stated that about 62.5% of tomato farmers could not find any source but rely on their personal earnings, while only 21.3% accessed funds through Microfinance Banks in Osun State, Nigeria, implying that most of the tomato growers and marketers raised funds for their operations informally thereby impeding productivity.

Findings in Table 3 above show that majority of the tomato growers were full-time farmers that rely solely on tomato production for their livelihoods. While a total of 23.00% and 9.00% % accounted for farmers that were civil servants and traders, respectively, the remaining 10.00% were those who constituted businessmen and politicians,

among others. Although most of the tomato growers were on full-time farming, majority of them had to rent for farmland annually for production purposes which seriously limit their extent of expansion. This issue is said to serve as a huge constraint for smallholder farming in the area surveyed. Those tomato farmers that either inherited or purchased their farmland formed insignificant portion of the farming population. A very negligible group of farmers (4.17%) that include others who constituted those that utilized free or unused family farmland in growing tomato largely fell under those that produced using organic fertilizers. The type of fertilizer applied in growing of tomato is said to be a determining factor on the fruit set of the crop, as well the acceptability by consumers due to the health implications, to a great extent. In recent years, studies (Heeb et al. 2006; Zoran et al. 2014; MWW, 2018) have indicated that tomatoes grown on organic fertilizers provide better yields and seemed healthy for human consumption than those raised on chemical fertilizers. As important as the type of fertilizers employed in production of tomatoes seemed, this study documented a total of eight types of fertilizers used in the area as reflected in table 4 above. Of these types, majority (98.33%) of the small-scale farmers that used organic fertilizers applied cow dung in growing tomatoes in the study area. Those that applied small ruminant droppings accounted for 61.67%. While the 41.47% of the organic tomato growers used compost and 40.00% strictly applied poultry droppings, only a few applied treated humans excretes on their irrigated tomato farms. In the category of farmers who used inorganic fertilizers , most (91.67%) of them applied a combination of Nitrogen 15: Phosphorus 15: Potaasium15 (NPK) as against a population of farmers (18.33%) that got involved with the utilization of Nitrogen (N) on their irrigated farms for tomato production. Only a minor segment (1.67%) of these small-scale tomato producers used Single Super Phosphate (SSP) fertilizer on their farms.

Table 3. Frequency distribution of tomato farmers by sources of finance, primary occupation and land ownership in the area of study

Variable	Farmers using organic fertilizers (n: 60)	Farmers using inorganic fertilizers (n: 60)	Percentage (n: 120)
Source of finance			
Personal savings	37	42	65.83
Loan from banks	-	11	9.17
Friends and relatives	23	07	25.00
Total	60	60	100.00
Primary occupation			
Full-time farming	35	36	58.00
Civil service	15	14	23.00
Trading	06	05	9.00
Others	04	05	10.00
Total	60	60	100.00
Land ownership			
Renting	30	33	52.50
Inheritance	20	14	28.33
Purchase	05	13	15.00
Others	05	-	4.17
Total	60	60	100.00

Table 4. Frequency distribution of tomato farmers based on types of organic and inorganic fertilizers used in the study area.

Type of Fertilizers	Frequency of Farmers	Percentage
Organic Fertilizers	Organic Farmers (n: 60)	(%)
Cow dung	59	98.33
Small ruminant droppings	37	61.67
Poultry droppings	24	40.00
Human excretes	15	25.00
Compost	25	41.47
Inorganic Fertilizers	Inorganic Farmers (n: 60)	(%)
Nitrogen-Phosphorous-Potassium (NPK)	55	91.67
Nitrogen (N)	11	18.33
Single Super Phosphate (SSP)	02	1.67

Note: Multiple responses were observed.

Table 5. Analysis of cost and returns per/hectare of irrigated tomato farms using organic and inorganic fertilizers in Hong LGA, Adamawa State, Nigeria.

Item	Irrigated farms using organic fertilizers	Irrigated farms using inorganic fertilizers
Variable Costs (VC)		
Fertilizers /Organic	7508.8 (6.22)	18234.0 (14.55)
Pesticides	6679.0 (5.53)	922.0 (0.74)
Herbicides	3636.0 (3.01)	11876.0 (9.48)
Seeds	2000.0 (1.66)	3000.0 (2,39)
Labour	57500.0 (47.62)	50000.0 (39.90)
Fuel	9310.0 (7.71)	7384.0 (5.89)
Transportation	18004.0 (14.91)	16783.0 (13.39)
Total Variable Costs (TVC)	104637.8 (86.67)	108199.0 (86.34)
Fixed Costs (FC)		
Land (rent)	8000.0 (6.63)	7240.0 (5.78)
Depreciation on FC		
Water pump	6908.0 (5.72)	9080.0 (7.25)
Hoes	819.0 (0.68)	302.0 (0.24)
Cutlasses	372.0 (0.31)	503.0 (0.40)
Total Fixed Costs (TFC)	16099.0 (13.33)	17125.0 (13.66)
Total Cost	120736.8 (100.0)	125324.0 (100.0)
Total Revenue (TR)	423800.0	216657.0
Gross Margin (GM)	319163.0	108456.0
Net Farm Income (NFI)	303063.0	91331.0
Returns on ₦1 invested (RONI)	2.5	0.73

Note: US$1 = ₦362, Values in parentheses are percentage of the total cost

Table 6. Major constraints associated with the use of organic and inorganic fertilizers in the study area.

Constraint inorganic	(n: 60) Frequency of farmers using organic fertilizers	(n: 60) Frequency of farmers using fertilizers	(n:120) Total	Ranking
Inadequate Extension Services	60	-	60(50.0%)	4th
High Labour Requirement	47	-	47(39.2%)	7th
Inadequacy of Fertilizers	45	55	100(83.3%)	1st
Increased Weeds Infestation	50	-	50(41.7%)	6th
Slow Action of Fertilizers	43	-	43(35.8%)	8th
Difficulty in Transportation	29	54	83(69.2%)	2nd
High Cost of Fertiliser	-	59	59(49.2%)	5th
Financial Problems	45	16	61(50.8%)	3rd

Note: Multiple responses were recorded; Values in parentheses are percentage of the total farmers.

The implication of the findings from types of fertilizers used in the study area could largely be hinged on two issues. For one, livestock especially small and large ruminants and poultry which have been found to play an elevated prestige for ownership status and economic roles for most rural dwellers in the communities, are already a way of life for the majority of the farming population. Therefore, collection of dung and droppings that accrued from these animals which were hitherto not found to be useful are now dumped on farmlands as fertilizer or sold-off. The second aspect relates to the current prices of inorganic fertilizers which are considered absolutely exorbitant, and therefore, out-of-reach for most farmers. This made the majority of farmers to rely heavily on organic fertilizers.

The result in Table 5 shows analysis of cost and returns per hectare of irrigated tomato farms using organic and inorganic fertilizers in the area studied. Of the TC (₦120,736.80) of the irrigated farms using organic fertilizers, a major chunk (86.67%) was accounted for by TVC and only 13.33% formed the TFC, implying that the tomato farmers used mainly traditional implements in production. In addition to these, the GM, NFI and RONI were all positive; indicating that the organic

tomato enterprises for the farmers in the area were profitable. Specifically, the RONI of 2.5 simply imply that for every invested by farmers using organic fertilizers in the study area, 2.5 was realized as return to business indicating that a total of 150% profit was made. From this analysis, it could be seen that organic tomato farming was highly profitable in Hong LGA, Adamawa State, Nigeria.

Similarly, the finding on Table 5 indicates that the TVC of the irrigated farms using inorganic fertilizers accounted for a major (86.34%) part of the TC, whereas the TFC was only 13.66%. While the GM, NFI and RONI were all positive for the farms, the value (0.73) for the latter was low. What this information means is that for every ₦1 invested by tomato farmers using inorganic fertilizers, a total of 73k was obtained as return to investment, also implying a profitable enterprise. However, on a comparative basis, although all the two categories of the enterprises were found to be profitable in the study area, the irrigated farms using organic fertilizers were discovered to be more profitable with a margin of ₦1.77 (₦2.5-₦0.73) returns on every ₦1 invested into tomato production enterprise.

As with all agricultural enterprises in the developing economies, several problems or constraints abound due mainly to the economic and educational reasons, among others. Table 6 shows the major obstacles associated with the use of organic and inorganic fertilizers in the area studied. Of the total (120) combined categories of farmers, a problem of inadequacy of fertilizers (83.3%) was the prominent. While the farmers found it expensive to buy inorganic fertilizers, they also experienced difficulties in collection of adequate animal dung and droppings and human excretes for the purpose of meaningful farming, thereby constituting a barrier in cultivating large hectares of land for tomato production.

The tomato farmers also experienced difficulty of transportation, financial problems and inadequacy of extension services in descending order. Particularly, the issue of extension services was largely reported by the farmers that engaged in production of tomatoes using organic fertilizers. As this group of farmers mostly constituted those with less western education in the area, it might be the possible explanation of this finding. Another constraint reported by specifically the organic tomato farmers (41.7%) was the increased weeds infestation on the farms. Also, this possibly explained the problem of high labour requirement among the same set of farmers. A total of 35.8% whom were mainly the organic farmers complained of slow action of fertilizers. In other words, it used to take long duration for the crops (tomato) to start responding to fertilizer action.

4. Conclusions and recommendations

Based on the findings of this study, it can be stated categorically that married middle aged male farmers formed the majority of the tomato farming population in the areas surveyed. The growers were slightly experienced and fairly enlightened with small plots of land. Most of the farmers applied cow-dung and NPK among categories using organic and inorganic fertilizers, respectively. Although both production methods were said to be profitable, tomato farming using organic fertilizer was far more economically viable in the areas studied. Prominent challenges of the tomato growers include inadequacy of fertilizers, difficulty in transportation, inadequacy of finance and low extension services. Recommendation as follow:

Drawing from the aforementioned, it could be suggested for policymaking as follows:

Policymakers should intensify efforts toward making fertilizers available for tomato growers in the areas at very subsidized rates, so that it can be affordable; massive rural roads construction should be given priority so as to make way for easy conveyance of tomatoes to consuming areas in order to minimize wastage in terms of spoilage; government and non-government organizations should find a way of making financial assistance available to the tomato farmers at very minimal cost to pave way for more output; and there should be increased competent extension services contact with the tomato growers so as to enhance production methods for more yield.

References:

1. Akibu, Y. (2014). Tomato Production in Nigeria: Prospect of Bright Future. Retrieved on 27th February, 2019, from http://www.belvynaglobal.com/tomato-production-in-nigeria-prospects-of-a-bright-future

2. Anonymous. (2019). History of Tomatoes. Retrieved on 22nd February, 2019 from http://www.vegetablefacts.net/vegetable-history/history-of-tomatoes/

3. Cox, B. (2015). Field Production of Organic Tomatoes. Retrieved on 2nd March, 2019 from https://articles.extension.org/pages/18653/field-production-of-organic-tomatoes

4. Emana, B., Afari-Sefa, V., Nenguwo, N., Ayana, A., Kebede, D. and Mohammed, H. (2017). Characterisation of Pre- and Postharvest Losses of Tomato Supply Chain in Ethiopia. Agriculture and Food Security, 63, 1-11.

5. Ghorbani, R., Jahan, M., and Asadi, G. A. (2006). Effects of Organic Fertilisers and Compost Extracts on Organic Tomato Production. Aspects of Applied Biology, 79, 113-116.

6. Giovannucci, E. (1999). Tomatoes, Tomato-Based Products, Lycopene, and Cancer: Review of the Epidemiologic Literature. Journal of the National Cancer Institute, 91(4), 317-331.

7. Heeb, A., Lundegardh, B., Savage, G. P. and Ericsson, T. (2006). Impact of organic and inorganic fertilizers on yield, taste, and nutritional quality of tomatoes. Journal of Plant Nutrition and Soil Science, 169(4), 535 – 541 DOI: 10.1002/jpln.200520553.

8. Iwuoha, J. P. (2017). Tomato Millionaires in the Making: How these 4 Smart Entrepreneurs are Making Money from Africa's Tomato Problems. Retrieved on 6th March, 2019, from http://www.smallstarter.com/get-inspired/how-these-4-smart-entrepreneurs-are-making-money-from-africas-tomato-problems/

9. Jones, J. B. (2015). Growing Tomatoes. Retrieved on 12th February 2019 from www.growtomatoes.com/tomato-world-production-statistics.

10. Kutawa, I. I. (2016). Empirical Evidence on Contract Farming in Northern Nigeria: Case Study of Tomato Production. Asian Economic and Social Society, 6(12), 240-253.

11. Magee, E. (2019). Health Properties of Tomatoes. Retrieved on 27th February, 2019, from https://www.webmd.com/food-ecipes/features/health-properties-tomatoes#1

12. Makinde, A., Jokanola, O. O., Adedeji, J. A., Awogbade, A. L. and Adekunle, A. F. (2016). Impact of Organic and Inorganic Fertilisers on the Yield, Lycopene and Some Minerals in Tomato (Lycopersicum Esculentum Mill) Fruit. European Journal of Agriculture and Forestry Research, 4(1), 18-26.

13. Maliwichi, L. L.; Pfumayaramba, T.K. and Katlego, T. (2014). An Analysis of Constraints that Affect Smallholder Farmers in the Production of Tomatoes in Ga-Mphahlele, Lepellenkumbi Municipality, Limpopo Province, South Africa. Journal Human Ecology, 47(3), 269-274

14. Monroe Works Worldwide, MWW. (2018). Organic Fertiliser Vs Chemical Fertiliser – Does it Matter? https://www.monroeworks.com/contact.html. Retrieved on 25th March 2019.

15. Ogundare, S. K.; Babalola, T. S.; Hinmikaiye, A. S. and Oloniruha, J. A. (2015). Growth and Fruit Yield of Tomato as Influenced by Combined Use of Organic and Inorganic Fertilisers in Kabba, Nigeria. European Journal of Agriculture and Forestry Research, 3(3), 48-56.

16. Ogunniyi, L.T and Oladejo, J.A. (2011). Technical Efficiency of Tomato Production in Oyo State, Nigeria. Agricultural Science Research Journal, 1(4), 84 – 91.

17. Oladejo, Joana Adefemi (2015). Effects of Credit Accessibility on Performance of Tomato Market in Osun State, Nigeria. Journal of Emerging Trends in Economics and Management Sciences, 6(7), 277-283.

18. Tsado, E. K. (2016). The Best Source of Compost for Tomato Production: A Study of Tomato in Niger State, Nigeria. European Journal of Agriculture and Forestry Research, 4(2), 50-59.

19. United States Department of Agriculture, USDA (2018). Tomatoes. Retrieved on 5th March, 2019, from https://www.agmrc.org/commodities-products/vegetables/tomatoes

20. Zhengzhou First Industries, ZFI (2018). The Biggest Tomato Exporter is Netherlands. Retrieved from https://fruitprocess.com/fruitprocess-news/the-biggest-tomato-exporter-is-netherlands/ on 6th March, 2019.

21. Zoran, Ilic S.; Nikolaos, Kapoulas and Ljubomir, Sunic (2014). Tomato Fruit Quality from Organic and Conventional Production. Organic Agriculture towards Sustainability, 7, 147-169 http://dx.doi.org/10.5772/58239.