ASSESSMENT OF SOCIO-ECONOMIC AND INSTITUTIONAL FACTORS INFLUENCING TOMATO PRODUCTIVITY AMONGST SMALLHOLDER FARMERS: A CASE STUDY OF MUSOMA MUNICIPALITY, TANZANIA

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ABSTRACT

In sub-saharan Africa tomato is an important vegetable crop. In order to promote tomato production in Tanzania, the government has undertaken several measures. This study sought to assess socio-economic and institutional factors that influence productivity among smallholder farmers in Musoma Municipality. Specifically the study aimed at assessing productivity of tomato; determining socio-economic factors influencing tomato productivity, and determining institutional factors that influence tomato productivity. The study adopted multistage sampling technique in the selection of wards, *mitaa* and the respondents. Purposive selection of six wards was done. Second stage involved the selection of two *Mitaa* from each Ward. Finally, ten to twelve respondents were randomly selected from each *Mtaa*, making a total of 135 respondents. The data were collected by using structured questionnaire. Focused group discussion and key informant interview were used to collect qualitative information related to tomato production, input availability and marketing. The findings show that tomato productivity in Musoma Municipality is higher than the estimated productivity in Tanzania but lower than the estimated productivity in Africa and very low than the estimated productivity globally. Factors such as age, marital status, labour availability, farm size, income, household size, education level and farming experience were found to highly influence tomato productivity. Moreover, extension service, access to credit and access to market show statistical significance with tomato productivity. The study suggests that there should be specific training programmes through agricultural extension services; inputs subsidization scheme should be extended to tomato farmers; credit institutions should be established; loans should be soft and mode of repayment attractive to farmers. There should be organized market networks and process capital investment credits and the government should facilitate tomato farmers on value addition to increase their incomes.

DECLARATION

I, ANGELINA WENCESLAUS MASUNGA do hereby declare to the Senate of Sokoine University of Agriculture that this is my original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

Angelina Wenceslaus Masunga **Date**

(MSc. AEE candidate)

The above declaration is confirmed

Prof. D.L. Mwaseba **Date**

(Supervisor)

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I dedicate this work to Almighty God who guided me in my study; nothing could make my academic dream come true without God wishes.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ASDP	Agricultural Sector Development Programme
AVRDC	Asian Vegetable Research and Development Centre
DADPs	District Agriculture Development Plans
DBSA	Development Bank of South Africa
FAO	Food and Agriculture Organization of United Nations
FAOSTAT	Food and Agriculture Organization Statistics
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GoK	Government of Kenya
Ha	Hectare
IFPRI	International Food Policy Research Institute
Km	Kilometre
MAICO	Municipal Agricultural Irrigation and Cooperative Officer
MALDO	Municipal Agriculture and Livestock Development Officer
MD	Municipal Director
MMC	Musoma Municipal Council
SMS	Subject Matter Specialist
SPSS	Statistical Package for Social Science
URT	United Republic of Tanzania
USAID	United State Agency for International Development
WAEO	Ward Agricultural Extension Officer

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Tomato (*Lycopers*icon *esculentum*) is the next most important vegetable crop after potato in the world (FAO, 2005). It is a relatively short duration crop which gives high yields, and it is therefore economically attractive. This crop belongs to the *Solanaceae* family, and which includes other well-known species such as round potato, tobacco, peppers and eggplant (Naika *et al*., 2005).

Tomato has its origin in the South American Andes. The cultivated tomato was brought to Europe by the Spanish conquistadors in the sixteenth century and later introduced from Europe to southern and eastern Asia, Africa and the Middle East. More recently, wild tomato has been distributed into other parts of South America and Mexico and thence to many parts of the world (Atherton and Rees, 2005; Naika *et al*., 2005; Mbonihankuye, 2010; Suárez *et al.*, 2011).

According to Naika *et al*. (2005), tomato is variously known in the world, for example other common names for the tomato are: tomate (Spain, France), tomat (Indonesia), faan ke'e (China), tomati (West Africa), tomatl (Nahuatl), jitomate (Mexico), pomodoro (Italy), nyanya (Swahili). It is grown as a cash as well as commercial crop worldwide. Also, it is processed into industrial products such as tomato sauce and tomato paste. Its nutritional value in terms of vitamins A, B and C has made the crop one of the most popular items on menus.

Globally, the production of tomato is estimated at 161 793 834 tons per year with productivity of 33.6 tons per hectare (FAO, 2012), implying that the crop has the potential

for development to high value crop. Nutritive and economic values of tomato has made the crop become the world agenda in the international horticultural forums (Ayandiji and Adeniyi, 2011; Passam *et al.*, 2007). It is asserted that the global production of tomato has increased by about 300 % in the last four decades (Atherton and Rees, 2005). About 130 million tons of tomatoes were produced in the world in 2008 with China being the largest producer, accounting for about one quarter of the global output, followed by the United States and Turkey (Ogbomo, 2011; Atherton and Rees, 2005).

According to literature the world tomato production in 2001 was about 105 million tons of fresh fruit from an estimated 3.9 million ha (Naika *et al.*, 2005). Moreover, in 2005 the global tomato production was estimated at 125 million tons out of which 107.6 million tons were produced from Sub-Saharan Africa (FAO, 2005). Tomato is the world's important crop which is also produced in Africa. However, its production and productivity have been below the potential levels in most African countries due to multiple reasons. According to FAO (2003), tomato productivity in Nigeria was below Africa's average of 20.51t ha^{-1}. According to FAO (2012), tomato production in Tanzania was estimated at about 255 000 tons per year with yields of 8.5 tons per hectare.

In sub-Saharan Africa including Tanz*ania, tomato* is an important vegetable crop as it greatly contributes to the incomes of smallholder farmers (FAO, 2005; Fischer, 2003). In 2002, tomato crop contributed 3.0% of the total agricultural GDP in Tanzania (Fischer, 2003). In Tanzania, tomato is grown in many Municipalities including Tanga, Mbeya, Iringa, Arusha, Morogoro, Musoma, Mwanza, Temeke and Kinondoni.

1.2 Tomato Production in Musoma Municipality

Musoma Municipality being the study area grows many vegetables including tomato crop, which is among the most important vegetables which play a great role in most of the

household economies within the Municipal. The crop contributes to the household income and food security. Musoma Municipality has huge potential for tomato production due to availability of ample irrigable farmland and the presence of relatively better market opportunities as compared to other areas in Mara Region.

At present, there are more than 203 smallholder farmers who are engaged in tomato production (MALDO, 2012). Although tomato is the leading cash crop, municipal statistics on productivity of tomato in Musoma stand at eight tons per hectare (DADPs, 2012). Most of the crop is produced by smallholder farmers in land holdings ranging from 0.1-1.2 ha. Important markets for the crop include Musoma Municipality and Mwanza City. Tomato production depends on both rain-fed and irrigated water. Apart from increasing smallholder farmers' incomes, the crop contributes significantly as a source of revenue for Musoma Municipal Council (MMC) through levies.

In order to promote tomato production, the government has undertaken several measures to ensure an increase of tomato yields per unit area as a strategy of improving agriculture production as a whole. Among the measures undertaken is creation of awareness among tomato farmers and training under several programs such as Agricultural Sector Development Programme (ASDP, 2006) through District Agriculture Development Plans (DADPs).

1.2 Problem Statement and Justification of the Study

1.2.1 Problem statement

The livelihood of farmers depends on the cash they gain from crop production. When productivity is lower than the cost of production, the land area used, and the time consumed in production, it becomes less likely for farmers, the community, and the

nation as a whole to attain any developments because they (farmers) use more effort and money to invest while not realizing good returns for the inputs invested and efforts made, Productivity of tomato depends on so many factors such as soil type, altitude, climate, policy issues, extension services, markets, and economic situation of the area. To increase productivity, profitability, and sustainability of tomato farms, farmers , need greater access to affordable yield-enhancing inputs, including well-adapted seeds and new methods for integrated soil fertility management, as well as output markets where they (farmers) can convert surplus production into cash (Toenniessen *et al.,* 2008).

However, socio –economic and institutional factors are known to influence agricultural productivity, particularly among smallholder farmers in terms of quantity and quality of agricultural produce (Al-Shadiadeh, 2012; Rogers, 1995). These factors include age, gender, level of education, sizes of farms, farmers' income, sizes of households, sources of information, extension services, markets, farmers' organizations and financial services. These factors and their degree of influence depend on the type of crop and its associated production technologies (Altarawneh *et al.,* 2012). Although farmers in Musoma municipality have been growing tomato for a number of years little is known about their level of productivity and the extent to which farmers' socio-economic characteristics and other factors inherent among farmers and surrounding them have been influencing the level productivity of tomato crop among the municipal smallholder farmers. Understanding how these factors influence a specific crop in a given farmers' community is critical in developing specific strategies to improve productivity of that crop. Therefore, this study documented levels of tomato productivity among farmers in Musoma municipality and the extent to which socio-economic and institutional factors influenced tomato productivity among farmers in Musoma municipality.

1.2.2 Justification for the study

Tomato is one of the vegetable crops that play an important role in contributing to farmers' incomes and household food security in Musoma Municipality. Musoma Municipality has huge potentials for tomato production due to availability of ample irrigable farmland and the presence of relatively better market opportunities as compared to other areas in Mara region. Current statistics indicate that 203 smallholder farmers are engaged in the tomato enterprise in the municipality (MALDO, 2012). In addition to the above, this crop generates employment opportunities for the poor households.

In view of the above reasons, the Musoma Municipal Council has prioritized tomato production in its DADPs with the aim of improving incomes of a significant segment of its population while improving its own sources of revenue base through crop cess. The findings from this study will contribute to the designing of appropriate extension programmes to boost tomato productivity in the study area and other areas with similar situation.

1.3 Research Objectives

1.3.1 Overall objective

The overall objective of the study was to assess socio-economic and institutional factors affecting tomato productivity among smallholder farmers in Musoma Municipality.

1.3.2 Specific objectives

i. To assess the productivity of tomato amongst smallholder tomato farmers in the study area.
ii. To determine the socio-economic factors that influence tomato productivity amongst smallholder tomato farmers in the study area.

iii. To determine institutional factors that influence tomato productivity amongst smallholder tomato farmers in the study area.

1.4 Research Questions

i. What is the productivity of tomato amongst smallholder farmers in the study area**?**
ii. What are the socio-economic factors that influence tomato productivity amongst smallholder farmers in the study area?
iii. What are the institutional factors that influence tomato productivity amongst smallholder farmers in the study area?

1.5 Conceptual Framework

In the conceptual framework (Figure 1) in this study, the independent variables are constituted by socio-economic characteristics and institutional factors while the dependent variable was tomato productivity. The socio-economic characteristics of farmers include, gender, age, and income, level of education, labour availability, farm size, marital status, source of income and size of the family. Also, institutional factors play a major role in influencing tomato productivity in Musoma Municipal. These include extension services, access to markets, farmer organizations, access to credit, and exposure to mass media.

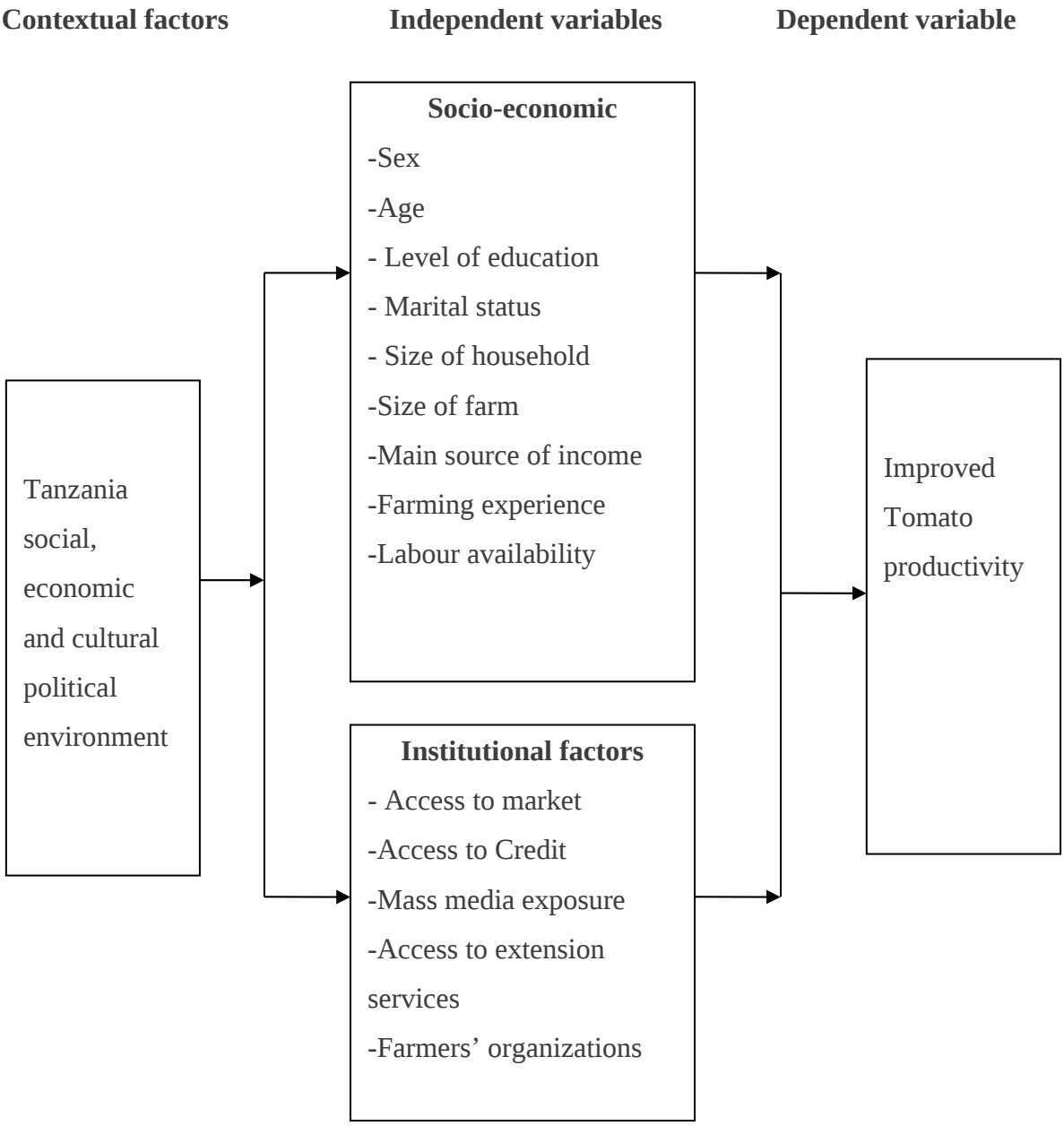

Figure 1: Conceptual Framework

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Productivity of Vegetables and Importance of Growing Vegetables

2.1.1 Productivity

Productivity is defined as an output per unit of input (Fulginiti *et al*., 2004). Productivity refers to the ratio of output to its inputs (Chavas *et al.*, 2005). Empirical studies have shown that productivity arises from improvement in efficiency brought about by advancement in technology. Advancement in agricultural productivity has led to abundant and affordable food and fibre throughout most of the developed world (Hughes, 1998). Farmers in Musoma municipality have been growing tomatoes for a number of years but their levels of productivity which could reflect the output levels from what is being invested in producing tomatoes is not well known, hence farmers will not be able to determine whether their production ventures are worth undertaking.

2.1.2 Importance of tomato crop

Tomatoes contribute to a healthy, well-balanced diet. They are rich in minerals, vitamins, essential amino acids, sugars and dietary fibres. Tomato contains much of the vitamins A, B and C, and minerals such as iron and phosphorus. Tomato fruits are consumed fresh in salads or cooked in sauces, soup and meat or fish dishes. They can be processed into purées, juices and ketchup. Canned and dried tomatoes are economically important processed products (Naika *et al*., 2005; Tshiala and Olwoch, 2010). In amplifying its importance, Tshiala and Olwoch (2010) observe that tomato is a major vegetable crop and commonly grown by both poor and rich farmers in South Africa. It is used worldwide as a fresh vegetable or as a spice in food preparation. Currently, it is one of the main vegetables used for hawking by small-scale entrepreneurs in the informal sector. In

Tanzania, according to Maerere *et al*. (2006) tomato is the most important vegetable crop in terms of production and use.

Vegetables, especially tomatoes, are the best resource for overcoming micronutrient deficiencies and provide smallholder farmers with much higher income and more jobs per hectare than staple crops (AVRDC, 2006). Vegetables generally include sweet pepper, cauliflower, carrot, cabbage, lettuce, spinach, tomato, potato, reddish, onions and cucumbers, which are fresh and edible portions of herbaceous plants. Vegetables are important source of food and highly beneficial for the maintenance of health and prevention of diseases. They contain valuable food ingredients which can be successfully utilized to build up and repair the body (Hanif *et al.*, 2006). *Tomato* is the next most important vegetable crop after potato in the world (FAO, 2005). It is used as a cash crop as well as food crop worldwide. Tomato is eaten in various cuisine recipes; it can either be eaten raw or industrially processed into products such as tomato sauce and tomato paste.

2.2 Challenges of Tomato Production and Strategies for Increasing Tomato Productivity

2.2.1 Challenges facing tomato production

Like other vegetables, tomato production and productivity are faced with a number of constraints; as a horticultural crop, tomato is faced by biotic factors such as lack of improved seeds, pests and diseases and abiotic factors which include drought, markets, input supply and soil nutrients (FAO, 2005; GoK, 2010; Peña and Hughes, 2007; Ambecha, *et al*., 2007 ; Anang *et al*., 2013). Pests and diseases are one of the critical challenges in tomato production systems (James *et al.,* 2010; Maerere *et al*., 2006). As Nouhoheflin *et al.* (2007) point out that pests and diseases caused by bacteria, nematodes, fungi and viruses cause significant losses of tomato in West Africa. It is argued that the

main disease reported by most farmers is tomato leaf curl viruses transmitted by whitefly (*Bemissia tabaci*) (ibid). Furthermore, in Kenya, Masinde *et al,* (2011) points out that the most ubiquitous and devastating pathogen that infects tomatoes in the North Rift Kenya is *Phytophthora infestans* that causes late blight and *Alternaria solani* that causes early blight. In Tanzania, bacterial speck and bacterial spot diseases of tomato caused by *Pseudomonas syringae* and *Xanthomonas vesicatoria respectively* are considered to be the most important foliar diseases of tomato in most production areas (Shenge *et al.,* 2007*).*

Tomato is also particularly sensitive to pest pressure and is therefore subject to intensive application of chemical pesticides including toxic ones. Resistance to pests, low awareness about risks, and availability of cheap but high toxic pesticides has increased the risks in tomato production. The misuse of pesticides has raised concerns about health hazards linked to intoxications resulting in morbidity, deaths and environmental pollution (Coulibaly *et al*., 2006; Sibuga *et al*., 2010). Again, Nouhoheflin *et al.* (2007) assert that key factors affecting farmers' pest management decision making are gender; share of tomato income from household income and the level of farm income. Men are more involved in tomato production due to access to pesticide and effective demand for pesticides because of incomes differentials (purchasing power).

Similarly, it is also argued that tomato productivity, like the productivity of most other vegetables is severely affected by poor weather conditions and the inherent low capacity of most smallholder farmers in tackling moisture stress making them failing to capitalize on the production and market potentials for vegetables (Tshiala and Olwoch, 2010). Apart from excessive insects and disease damage, other constraints that prevent farmers from achieving potential yields are unavailability of quality seed, the use of unadapted varieties,

low soil fertility, postharvest losses and the lack of appropriate cultural practices (Mbonihankuye, 2010; Ogbomo, 2011; Ayandiji and Adeniyi, 2011).

2.2.2 Increasing tomato productivity

Just like in other crops, tomato productivity is of prime concern to farmers and professionals in an attempt to improve community livelihoods particularly in agrarian economies found in most developing countries. In Tanzania in general and Musoma Municipality in particular, various efforts have been made to improve production and productivity of tomato, alongside other crops (MD, 2013).

2.3 Socio-economic and Institutional Factors Influencing Tomato Productivity

2.3.1 Socio-economic factors

Many studies that have been conducted show that a relative contribution of each socio-economic factor depends on the type of the enterprises and their associated innovations (Al-Shadiadeh, 2012; Rogers, 1995; Altarawneh, 2012). The socio-economic factors of farmers include gender, age, income, and level of education, labour availability, farm size, marital status, and household size. Also, it is observed that institutional factors do influence agricultural productivity in a variety of ways in conjunction with socio-economic factors (Chapoto *et al*., 2012; Parajuli, 2011).

Household size is among the important socio economic characteristics which influence crop productivity because a fairly large family size implies more family labour available for the household farm activities (Ozor and Cynthia, 2010; Ogundari, 2008). This was also reported by Igben (1988) that household size is an obvious possible advantage in terms of farm labour supply when it is relatively large.

Education level is a socio economic characteristic of great importance as it determines one's ability to comprehend and analyze issues before taking any action. Thus, education level is very useful in technology adoption for improved crop productivity. As Ozor and Cynthia (2010) assert, an increase in educational status of farmers positively influence the adoption of improved technologies and practices. Furthermore as Opara (2010) argues, farmers with basic education are better equipped for making more informed decision for lives and for their communities as well as becoming active participants in economic, social, and cultural dimensions of development. Likewise, the study by Adenuga *et al*. (2013) found that education, unlike other socio-economic factors like age, labour, gender and farm size, significantly influenced production and productivity of tomato. Evidence on the efficiency of small-scale tomato farmers' production from a study by Abu *et al*. (2011) shows that socio economic variables of farm size, and labour size significantly influenced tomato output. Moreover, education, and farmers' experience have significant impact on tomato output (*ibid).*

Main source of income is also among the socio-economic characteristics that is said to influence farming decisions by the farmer because farm practices depend on capital investment especially when the capital is dependent on the existing sources of income (Mathenge and Tschirley, 2008). Under such circumstances, it is plausible that earnings from off the farm may often be used to compensate for the missing and imperfect credit markets by providing ready cash for input purchases as well as other household needs. In addition, off and on farm earnings could be used to spread the risk of using these modern farm inputs to the extent that farmers choose traditional over modern inputs in order to lower their risk. Thus, any mechanism that allows farmers to smoothen consumption will raise the use of modern inputs and increase farm productivity.

2.2.3 Institutional factors

Institutional factors influencing crop productivity include farmers' access to extension services, credit, market, farmers' organization and mass media (Wachira, 2012; Bonabana-Wabbi, 2002). Access to credit is regarded as one of the key elements in raising agricultural productivity (Anyiro and Oriaku, 2011; DBSA, 2005). Micro credit is the name given to extremely small loans made to poor borrowers whose role is to enhance the production capacity of the poor resource farmers through financial investment in their human and physical capital (Okurut *et al*., 2004). Thus, households with access to credit may be of help to farmers in obtaining the capital required for adopting the higher profit production technologies and therefore increase productivity (Wachira, 2012). According to Oladeebo (2008), availability of adequate and timely credit help farmers in expanding the scope of operation and adoption of new technology as well as enhancing the purchase and use of some improved inputs which are not available on the farm.

Extension services reflected by the number of extension contacts either through farm visits made or training sessions received prior to and during production season influence crop productivity (Anyiro and Oriaku, 2011). This is because farmers who get in touch with the extension agent are likely to get the right information not only on a technology but also its profitability. Access to market and availability of market are bound to reduce marketing costs on matters such as transport and other transaction costs and offer favourable price for tomatoes (Wachira, 2012; Anyiro and Oriaku, 2011). Access to market may be analyzed in terms of the distance in kilometres to the market reflecting the marketing costs that one incurs in the course of accessing the market and thus thought to have a negative effect on productivity as it reduces the profits which might be obtained from marketing farm outputs (Wachira, 2012).

Farmers' organization help them to participate in group activities, as they may tend to share ideas on profitable enterprises and adopt them as well as engage in market activities of inputs acquisition or selling of produce and thereby improve their profits. Consequently, organized farmer groups are promoted as useful avenues for increasing farmer productivity and for the implementation of food security and other development projects (Lenis, 2012).

This chapter has generally reviewed literature on productivity of tomato and importance of growing tomatoes; challenges of tomato production and strategies for increasing tomato productivity; and socio-economic and institutional factors influencing tomato productivity. However, little is known on socio-economic and institutional factors influencing tomato productivity amongst smallholder farmers in Musoma Municipal. There was therefore a need to assess socio-economic and institutional factors influencing tomato productivity amongst smallholder farmers in Musoma Municipality, in order to contribute in designing appropriate extension programmes that would boost tomato productivity in the study area and other areas with similar situation.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Study Area

The study was carried out in Musoma Municipality, Mara Region in Tanzania. Geographically, Musoma Municipality lies between latitude 1 30’ south of equator and 28 48’ East of Greenwich. Moreover the area slopes towards Lake Victoria. It lies between altitudes 1140 and 1320 meters above the sea level. This area is located on the peninsula East of Lake Victoria. This feature creates a suitable environment for horticultural crop production. Musoma Municipality has a total area of 21 027 ha for agricultural activities, and this is 16.3 % of the total area. Administratively, Musoma has 1 Division, 13 Wards and 57 *mitaa, (Mtaa (singular)=A small governmental administrative unit). According to the* National population census 2012 there were 178 356 people in the municipality (Geohive, 2012).

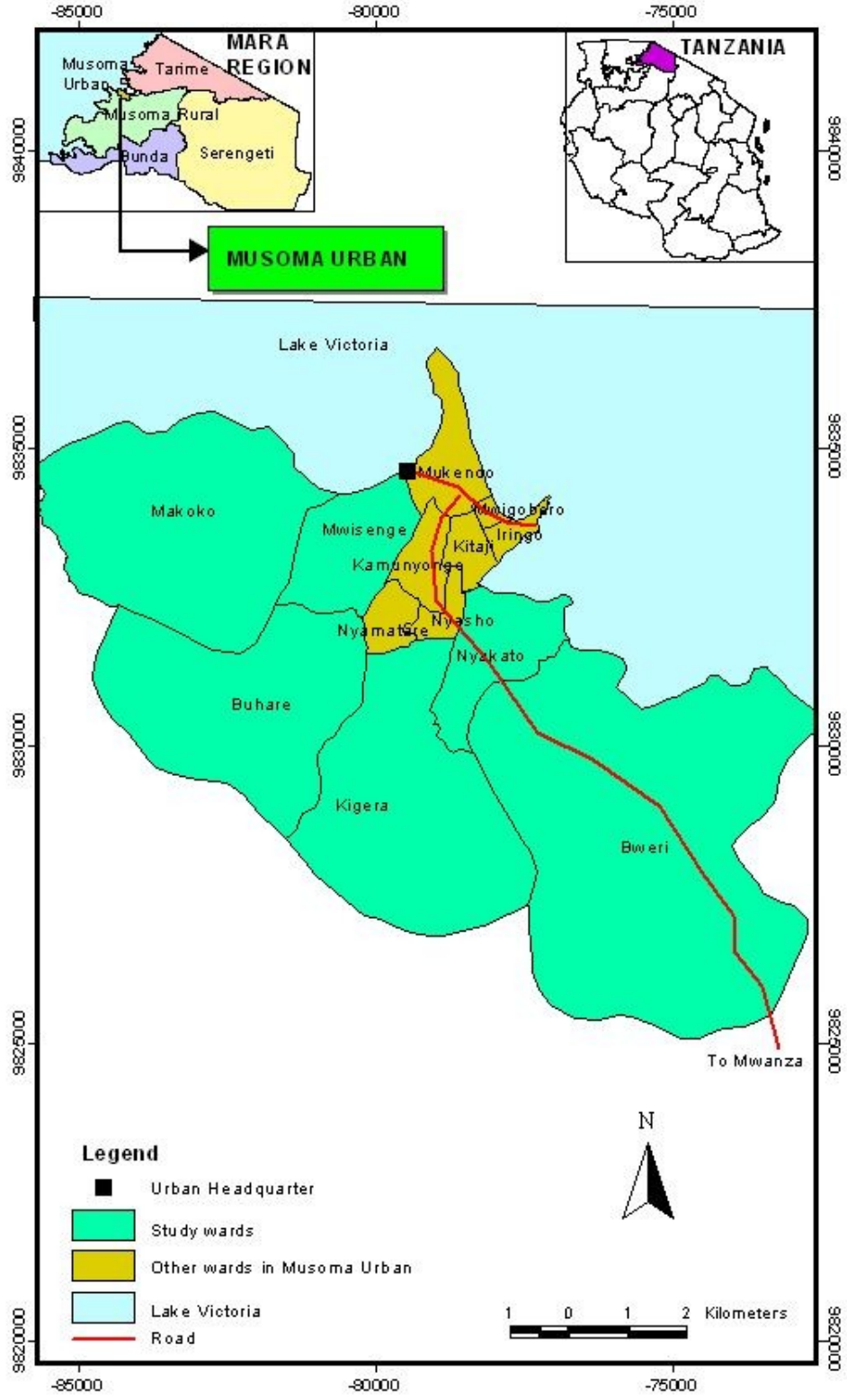

Figure 2: Map of Musoma Municipality showing the study area

3.2 Research Design

A research design entails the arrangement of conditions for the collection and analysis of data in a manner that aims at combining relevance of the research purpose with the economy of procedure (Saunders *et al*., 2007). This study employed a cross-sectional survey design that allows sufficient data to be collected at one point in time from a sample which t is selected to describe a larger population (Babbie and Mouton, 2005). It has high degree of accuracy and precision, it also saves time and resources.

3.3 Population of the Study

Population is any precisely defined set of people or collection of items which are being studied (Babbie and Mouton, 2005). In the context of this study, population consisted of farmers engaged in tomato production in Musoma Municipality.

3.4 Sample Size and Sampling Procedure

According to Yamane (1967) a sample size could be calculated after having known the number of the respondents affected by the issue being studied. According to the Municipal Agricultural and Livestock Development Officer (MALDO, 2012), the number of tomato growers in Musoma municipality was 203. This study used the Yamane formula which specifies that $n= N/1 + N.e^2$ where, n=sample size, N = population size, e= sampling error to determine the sample size. Based on the available data, number of the tomato growers in Musoma Municipality is = 203, e=0.05. Therefore applying the Yamane formula $n=203/1+203\times0.05^2$= I34.66 ≈ 135, the sample size was 135 farmers. These farmers were selected among tomato growers on the selected wards and *mitaa* by using simple random techniques.

Multistage sampling technique was employed in the selection of wards, *mitaa* and respondents. The first stage involved purposive selection of six (6) tomatos growing

Wards namely Makoko, Mwisenge, Bweri, Nyakato, Buhare and Kigera. The second stage involved the selection of two *Mitaa* from each Ward. These wards and their mitaa in brackets are as follows Makoko (Nyarigamba, Nyangwena), Mwisenge (Pwani, Mtakuja)Bweri (Nyabisare, Bweri), Nyakato (Maziwa, Baruti), Buhare (Mgaranjabo, Buhare) Kigera (Kwangwa and Mwiyare) Finally ten to twelve (10-12) growing tomato respondents were randomly selected from each *Mtaa*, making a total number of 135 respondents.

3.5 Data Collection

A combination of methods was used to collect primary data for this study, and the combination included smallholder tomato farmers interviews using structured questionnaire, focused group discussion and key informant interview. Questionnaire based interview collected data related to socio- economic variables such as age, sex, education level, marital status, farm size, the size of the household, and labour availability. Focused group discussion and key informant interviews were used to collect qualitative information related to tomato production, input availability and marketing. The key informants used in this study included Municipal Agricultural Irrigation and Cooperatives Officers (MAICO), Subject Matter Specialists (SMS) and Ward Agricultural Extension Officers (WAEO). Regarding Focused Group Discussions (FGD), three meetings were conducted each with ten members mainly tomato farmers who were not involved in the household interview exercise.

3.6 Data Processing and Analysis

Data on socio- economic variables such as age, sex, education level, marital status, farm size, size of household, labour availability and levels of tomato production were reviewed, cleaned, summarized, organized, coded and analyzed using Statistical Package for Social

Sciences (SPSS) version 16.0 to obtain descriptive statistics such as mean production levels among different groups of farmers and frequencies explaining the different characteristics of the studied respondents. Chi-square test and cross tabulations were carried out to compare productivity levels of various categories of respondents and were used to obtain inferential statistics to determine if there were significant differences among the different categories of farmers in terms of tomato productivity and to determine the influence of different socio-economic factors in tomato productivity among farmers in Musoma municipality.

Quantitative data on household and respondents' information such as education level, marital status, labour availability, experience in farming, and other institutional factors like exposure to mass media, access to credit and farmers' organisation were summarised and organised into categories. The data collected through Focus group Discussions and from key informants were summarized and tallied to explain the required phenomenon among farmers in Musoma municipality in relation to tomato productivity.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Overview

This Chapter presents the findings of the study on the socio-economic and institutional factors influencing tomato productivity amongst smallholder farmers in Musoma Municipality. The Chapter describes tomato farmer socio-economic variables, tomato productivity, identified socio-economic factors influencing tomato productivity amongst smallholder tomato farmers, as well as institutional factors influencing tomato productivity amongst smallholder tomato farmers in the study area.

4.2 Socio-Economic Characteristics of Respondents

The findings presented in Table 1 show the respondents' socio-economic characteristics. These socio economic variables include sex, age, education level, and marital status.

4.2.1 Distribution of respondents by sex

The findings presented in Table 1 show that the highest proportion (90 or 66.7%) of the respondents were males, while females were only 45 (33.3%) of the total number of respondents in the study area. According to Anang *et al*. (2013), most men tend to dominate high paying commodities than is otherwise the case with non cash crops. In their study, it was found that tomato production was dominated (78 %) by male farmers. This implies that tomato production is mostly dominated by males because of its relative profitability and high labour demand that is ill-afforded by females. Moreover, tomato in the study area was considered the most important cash crop.

Table 1: Distribution of respondents by socio economic characteristics (n=135)

Variable	Categories	Frequency	Percent
Sex	Male	90	66.7
	Female	45	33.3
	Total	135	100.0
Age (years)	Below 30	30	22.2
	31-41	27	20.0
	42-52	60	44.4
	53-63	17	12.6
	Above 63	1	0.7
	Total	135	100.0
Education level	Not attended any formal education	3	2.2
	Primary school	108	80.0
	Secondary school	22	16.3
	Tertiary education	2	1.5
	Total	135	100.0
Marital status	Single	20	14.8
	Married	93	68.9
	Divorced	4	3.0
	Widowed	18	13.3
	Total	135	100.0
Household size	2-4	28	20.7
	5-7	61	45.2
	8-10	39	28.9
	> 10	1	0.7
	<2	6	4.4

4.2.2 Distribution of respondents by age

According to the findings in (Table 1), the highest proportion (44.4%) of the respondents interviewed was aged between 42-52 years old, whereas very few (0.7%) tomato farmers were aged above 63 years old. Young individuals were those with the age between 31-41 years old and who accounted for 20% of the total respondents.

Having very few people in age group of above 63 years implies that most old people were not involved in tomato production. Again, there were fewer, (20%) of the young people aged 31-42 years and relatively large numbers (44.4%) of middle aged people (42-52) years implying that the middle age people who probably had much responsibility for their families were the ones more involved in the production of tomato as it seemed to be a viable venture in Musoma municipality. However, these findings differ from those

reported by Anang *et, al*. (2013) which show that majority (80%) of the farmers were in the youthful age of 21 to 40 years.

4.2.3 Distribution of respondents by level of education

The findings presented in Table 1 show that majority (80.0%) of the respondents in the study area have attained primary level of education, while a few (0.7%) did not attend any formal education. This indicates that majority of primary school leavers who could not continue with further education, joined farming as a source for their livelihood (URT, 2014).

4.2.4 Marital status

The findings show that majority (68.9%) of the respondents are married while a few (3.0%) are divorced (Table 1). This implies that tomato production is more attractive to married couples who are engaged in various social and economic commitments. Such commitments include ensuring food availability for family members, better housing, education for children, clothing and acquisition of better health services.

4.2.5 Household size

The findings show that 61 (45.2%) of the households have between 5-7members, while only one (0.7%) household has above 10 members. Other household sizes are as presented in Table 1. Higher family size implies that farm labour is available; however, the amount of labour capable of executing farm labour depends on the age. Most households with large sizes are forced to look into more sources of income which include tomato production.

4.3 Productivity of Tomato

Following the analysis three productivity levels have been established based on the amount of tomato yield per acre from the tomato farmer field. These levels are as follows; low level, which refers to the tomato yield of less than 4.5 tons/ha; medium level, which

refers to tomato yield between 4.5-9 tons/ha; and high level, which refers to tomato yield of above 9 tons/ha. The findings and description on the influence of each factor are presented in the subsequent subsections.

4.3.1 Tomato yield

The findings on the yields of tomato (Table 2) among the respondents show that, 73 (54.1%) have tomato yields of above 9tons/ha; and 61 (45.2%) of the respondents had tomato yield of between 4.5 and 9 tons/ha and only one (0.7%) tomato farmer produced below 4.5 tons/ha. This indicates that tomato crop is an important crop grown by the farmers although the yields are not high as compared with optimum yield which is 45-50 tons/ha (Holticulture vegetables, 2010).

Table 2: Tomato yield levels in year 2012/13 production seasons (n=135)

Respondent's Tomato productivity levels	Frequency	Percent
Low	1	0.7
Medium	61	45.2
High	73	54.1
Total	**135**	**100.0**

4.4 Socio-economic Factors that Influence Tomato Productivity amongst Smallholder Tomato Farmers

Identified socio-economic factors that influence tomato productivity amongst smallholder tomato farmers in the study area are, sex, age, level of education, marital status, size of the household, farm size, main source of income, farming experience and labour availability.

4.4.1 Tomato productivity by farmer's sex

Sex of the farmer was among the hypothesized socio-economic variables which might have influenced tomato productivity. The findings in Table 3 show that male respondents 49 (36.3%) produced above 9 tons/ha, while female respondents at the same level of

production were 24 (17.8%). This shows that both female and male respondents were able to produce at the same level approximately at equal proportion. This supports the Chi -square test results of no statistical significant difference in productivity among farmers across sex (Table 3). This is in line with what was reported by FAO, (2012), that in some rural societies, commercial agricultural production is mainly a male responsibility. Men usually prepare land, irrigate crops, and harvest and transport the produce to the market.

Table 3: Relationship between sex of respondent and tomato productivity (n=135)

Sex of respondent	**level of productivity**					
	Low		**Medium**		**High**	
	n	**%**	**n**	**%**	**n**	**%**
Male	1	0.7	40	29.6	49	36.3
Female	0	0.0	21	15.6	24	17.8
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Pearson Chi-Square value= 2.16; df; 2; Assymp.Sign. (2sided)=0.34

4.4.2 Tomato productivity by farmer's age

Farmers' age was among the hypothesized socio-economic variables which could influence productivity of tomato. The findings show that among the farmer age groups, farmers with ages of between 42-52 years (25.9%) produced over 9 tons/ha, while only one (0.7%) of farmers above 63 years did so. Majority of the respondents aged between 31 and 52 years, and who were energetic were found to produce at medium and high productivity levels and the relationship between age and tomato productivity was found to be statistically significant at p=0.0001 with a Chi-square value of 44.66 (Table 4).

Table 4: Relationship between age of respondent and tomato productivity (n=135)

Age of respondent	**Level of productivity**					
	Low		**Medium**		**High**	
	n	**%**	**n**	**%**	**n**	**%**
below 30 years	0	0.0	18	13.3	12	8.9

31-41 years	0	0.0	10	7.4	17	12.6
42-52 years	0	0.0	25	18.5	35	25.9
53-63 years	1	0.7	8	5.9	8	5.9
above 63 years	0	0.0	0	0.0	1	0.7
Total	1	0.7	61	45.2	73	54.1

Chi-Square Tests value =46.66, df=8; p.=0.0001

4.4.3 Tomato productivity by level of education

Education is an important aspect in individual's life, because it empowers the person in decision making. Having this in mind it was important to analyse the relationship between farmers' education level and productivity. The findings show that, farmers who did not have any formal education were lagging behind other farmers who had formal education. For example, the yield level of more than 9 tons/ha of tomato were produced by only 2.2 % of the farmers who had no formal education, while the same level of production was attained by majority 44.4 % of those who had primary education. Interestingly, as education level changed from primary school to higher level (secondary and tertiary levels of education) the yield levels decreased to below 4.5tons/ha (Table 5). The implications from these findings are: having lower productivity among farmers with no formal education is due to limited access to information on improved tomato production practices.

Table 5: Relationship between productivity and education level among tomato producers

Level of education	**Level of productivity**					
	Low		**Medium**		**High**	
	n	**%**	**n**	**%**	**n**	**%**
Non-formal	0	0.00	0	0.00	3	2.22
Primary	1	0.74	47	34.81	6	44.44
Secondary	0	0.00	14	10.37	8	5.93
Tertiary	0	0.00	0	0.00	2	1.49

Total	**1**	**0.00**	**61**	**45.19**	**73**	**54.07**

χ^2=30.01, df=6, p=0.0001

However, by having primary level education, farmers became knowledgeable on the production practices that increased tomato productivity. Moreover with primary education farmers become easy to comprehend what they get from extension services and therefore increase productivity. However, the higher education they reach the more they move away from agricultural activities to non agricultural enterprises including salaried work and therefore produce only for home consumption. This is the case of secondary and tertiary level of education that in the study area some were teachers and others had other enterprises which reduced their time of involving in agricultural production. The relationship between education levels and tomato productivity was found to be statistically significant at p=0.0001. These findings are similar to what was reported by Opara (2010) that farmers with basic education are better equipped for making more informed decision for lives and for their communities and to be active participants in economic, social and cultural dimension of development.

4.4.4 Tomato productivity by marital status

Marital status was among the identified socio-economic variables that were thought to influence productivity of tomato amongst farmers in the study area. The findings show that 38.5% of the farmers who produced tomatoes above 9 tons/ha were the married people while very few (1.5%) farmers who produced the same amount were divorced farmers (Table 6).

Table 6: Relationship between marital status and productivity of tomato (n=135)

Marital status of respondent	**Level of productivity**					
	Low		**Medium**		**High**	
	n	**%**	**n**	**%**	**n**	**%**

Single	0	0.0	13	9.6	7	5.2
Married	1	0.7	40	29.6	52	38.5
Divorced	0	0.0	2	1.5	2	1.5
Widowed	0	0.0	6	4.4	12	8.9
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Chi-square value=19.24, df=6; Sign= 0.004

Moreover, 9.6% of the single farmers produced tomato between 4.5-9 tons/ha. These findings imply that, married farmers were more involved in tomato production and thus produced higher than other marital categories. This could be due to family responsibilities which forced them to engage in production of tomatoes to subsidize income obtained from other enterprises. Relationship between marital status of the respondent and tomato productivity was found to be statistically significant at p=0.004. These findings concur with what was reported by Igben (1988) that married farmers are likely to be under pressure to produce more, not only for family consumption but also for sale.

4.4.5 Tomato productivity by household size

An analysis conducted on the influence of household size as one of the socio economic variables of tomato farmers and whose findings are presented in Table 7 show that, productivity was related to household size. The relationship was statistically significant at 5% level of significance (χ^2=15.056, df = 8, p= 0.05). These findings show that, 23.7% of the farmers who produced more than 9 tons/ha were those who belonged to household sizes ranging from 5-7 followed by 14.8% of the farmers who belonged to household sizes ranging from 8-10 members. The smallest household size category was that which had below two household members, and which accounts for 2.2% of the total respondents and was capable of producing the same yield level These findings imply that, the smaller the household size the less the amount of yield produced and the vice versa is true. However, the maximum productivity was at household size of from 5-7, beyond which productivity

declines. The relationship between household size and tomato productivity was found to be statistically significant at p=0.05. These results agree with what was reported by Al-Shadiadeh *et al.* (2012) that one of the most important factors influencing the level of production and productivity of small-scale farmers is the size of the family. Hence, families with relatively large sizes have obvious advantage which enables the farmer to have enough required family labour force for the farming production activities.

Table 7: Household size and tomato productivity.(n=135)

Household size category	Level of productivity					
	Low		Medium		High	
	n	%	n	%	n	%
Less than 2 family members	0	0.0	3	2.2	3	2.2
2-4	0	0.0	10	7.4	18	13.3
5-7	1	0.7	28	20.7	32	23.7
8-10	0	0.0	19	14.1	20	14.8
Greater than 10	0	0.0	1	0.7	0	0.0
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Pearson Chi-Square=15.056, df =8, Assympt. Sign.(2-sided)= 0.05

4.4.6 Tomato productivity by labour availability

Labour availability determines productivity; hence it is an important socio-economic factor as it is through this that the farmer makes most of the farm operations required in crop production. The findings show that 24.4% of the farmers who reported of having adequate labour produced above 9 tons/ha, while the same level of production was reached by very few (13.3%) of the farmers whose labour availability was moderately adequate. This implies that the more labour the farmer has the higher is the productivity of tomato; and the relationship between labour availability and tomato productivity was found to be statistically significant at p= 0.001 (Table 8).

These findings are similar to those reported by Sarig *et al.*, (2000) who observed that, declining labour availability and increasing labour costs are reducing competitiveness of US growers with foreign suppliers. Harvest mechanization and improved production technologies show promise for keeping U.S. growers in business. The findings by Tripathi *et al*. (2008) show that besides an improvement in labour, capital and land productivity need to be improved to enhance agricultural productivity.

Table 8: Tomato yield by availability of labour (n=135)

Availability of labour force	Level of productivity					
	Low		Medium		High	
	n	%	n	%	n	%
Very adequate	0	0.0	23	17.1	33	24.4
Moderately adequate	0	0.0	25	18.5	18	13.3
Inadequately	1	0.7	13	9.6	22	16.3
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Pearson Chi-Square value = 19.166; df=4 ; Asymp. Sig. (2-sided)= 0.001

4.4.7 Tomato productivity by farm (plot) size

Farm size (plot size) was another factor that was hypothesized to influence productivity; hence a cross tabulation was performed to examine its relationship with tomato productivity within study area. The findings presented in Table 9 show that 29.6% of the farmers who had smaller farm size below 0.4 ha were producing more than 9 tons/ha, while only 1.5% of the farmers who had plot size of above 1.2 ha, managed to get the same level of production (more than 9 tons/ha). These findings imply that, small farm size is manageable compared to larger farm. This is because tomato productivity needs proper management in terms of agronomic practices like weeding, watering, desuckering, staking, pest management and fertilizer application. Farmers with larger farm size failed to manage their farms properly. The relationship between productivity and farm size, was statistically significant at p=0.001(Table 9).

Table 9: Tomato yield (tons/ha) by tomato farm size (n=135)

Tomato farm size	Level of productivity					
	Low		Medium		High	
	n	%	n	%	n	%
< 0.4 ha	0	0.0	34	25.2	40	29.6
0.4 ha	1	0.7	13	9.6	24	17.8
0.8 ha	0	0.0	7	5.2	4	3.0
1.2 ha	0	0.0	4	3.0	3	2.2
> 1.2 ha	0	0.0	3	2.2	2	1.5
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Chi-square value=55.561, df=6 Assympt. Sgn.=0.001

These findings are not consistent with findings of Angula (2010), who asserted that an increase in cultivated land size boosted production of horticultural crops and invigorate government political will of promoting and delivering technology package to smallholder farmers.

4.4.8 Relationship between tomato productivity and farmer experience

Experience of doing any activity is important because it determines the efficiency of performing a particular task to get the intended results. Experience in this regard was examined on the length of time during which the farmer had been in tomato production. The findings between tomato productivity and farmer experience show that the low level of productivity of less than 4.5 tons/ha was only observed from one respondent (0.7%) who had 6-10 years of experience in tomato production. However in the similar years of experience, 36.3% of the respondents produced more than 9 tons/ha (Table 10). Moreover overall, the findings show that 60% of farmers had long experience of 6-10 years in tomato production while only a few (4.4 %) had few years in tomato production; and the relationship between farmers' experience in producing tomatoes and productivity was found to be statistically significant at p=0.004.

Table 10: Tomato productivity by farmer experience (n=135)

Years of farmers experience	Level of productivity					
	Low		Medium		High	
	n	%	n	%	n	%
< a year	0	0.0	4	3.0	2	1.5
1-5 years	0	0.0	25	18.5	21	15.6
6-10 years	1	0.7	31	23.0	49	36.3
> 10 years	0	0.0	1	0.0	1	0.7
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Chi square=18.822, df=4, p=0.004

These findings imply that, farmers in the study area were experienced in tomato production. Hence low levels of productivity could be accounted for other factors. This is why Chi- square test showed that though there were relationships, it was statistically significant at p= 0.004 (Table 10). These findings agree with what was asserted by Al-Shadiadeh *et al. (*2012) that majority of farmers with long period of farming experience would be conversant with constraints to increase tomato production.

4.4.9 Relationship between productivity and main source of income

Income and its source are other factors that may influence productivity as they determine farmer's ability to access important resources such as inputs and land which are necessary in crop production. According to the findings presented in Table 11, tomato production was the source of income for 53.3% of the farmers in the study area, but very few farmers (3.7%) were also engaged as civil servants and in non-farm businesses. Across income sources, 29.6% of the farmers who produced tomato as their main source of income, were able to get more than 9 tons/ha, whereas only 3.7% of the farmers who had other income sources managed to get the same level of tomato yield. Although tomato productivity was related to income source, statistically the relationship was found to be significant at p=0.004 (Table 11). This implies that, tomato production was the main activity to those who entirely depended on the crop, while considered minor to others who had other non-

farm businesses. Thus in order to promote tomato productivity in the area, one has to bear in mind of the income sources. Horticulture production is an important source of income for smallholder farmers because the demand for its products is raising in both domestic and the international markets, thus increases smallholder farmers participation in the market (Dawit *et al.*, 2004; Bezabih and Hadera, 2007; Yilma, 2009).

Table 11: Main source of income across tomato yield per ha (n=135)

Main source of income	**Level of productivity**					
	Low		**Medium**		**High**	
	n	**%**	**n**	**%**	**n**	**%**
Tomato production	1	0.7	31	23.0	40	29.6
Livestock	0	0.0	14	10.4	13	9.6
Business	0	0.0	7	5.2	5	3.7
Private or civil employment	0	0.0	3	2.2	5	3.7
Tomato, Livestock, Business and employment	0	0.0	0	0.0	5	3.7
Other non-farm activities like carpentry	0	0.0	6	4.4	5	3.7
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Pearson Chi-Square=28.66, df=12, p=0.004

4.5 Institutional Factors that Influence Tomato Productivity

An institution is any structure or a mechanism of governing behaviour of a set of individuals within a given community, which can either be human or a specific animal. Institutions are identified with a social purpose, transcending individuals and intentions by mediating the rules that govern living behaviour. The term "institution is applied to customs and behaviour patterns as well as particular formal organization, which is important to a society (Wikipedia, 2014).

While understanding the importance and role of institutions like marketing systems, markets, extension services, mass media, financial and credit institutions; it was important

to analyse their relationships with tomato productivity. Institutional factors among others, and whose relationship with productivity were analysed include: access to market, access to credit, mass media exposure and farmer organisations.

4.5.1 Relationship between membership in farmer organisation and tomato productivity

Membership in farmer organisation was among the institutional factors hypothesised to influence productivity amongst smallholder tomato farmers in the study area. The findings presented in Table 12 show that 59.5% of the respondents were members of farmer organisations, while 45.5% did not join any farmer organizations. Among those who were members of farmer groups only 33.3% managed to produce above 9tons/ha. However, out of 45.5% who were not members of farmer organisation only 28.6% managed to produce the same level of production as those who were members in farmer organisation. According to these findings, being a group member did not make much difference from not being a member of a farmer organization. This is also proved by Chi- square test results (Table 12) that there was no significant relationship between yield and farmer organisation membership at p=0.597

These findings differ from what was reported by Mapemba *et al.* (2013) that, membership to farmer organization helps to reduce production costs as farmers may use the opportunity to purchase inputs in bulk.

Table 12: Relationship between membership in farmer organisation and tomato productivity

Farmer organization membership	Level of productivity					
	Low		Medium		High	
	n	%	n	%	n	%
Yes	0	0.0	11	26.2	14	33.3
No	0	0.0	5	19.9	12	28.6

Total	**0**	**0.0**	**16**	**38.1**	**26**	**61.9**

Pearson chi-square=1.031, df=2, p=0.597

4.5.2 Relationship between farmer access to credit and tomato productivity

Access to credit was among the institutional factors thought to influence productivity amongst smallholder tomato farmers in the study area. According to the analysis of the findings (Table 13), 84.4% of the farmers did not have any access to credits. Farmers who reported to have access to credits were only 14.8% of the total farmers. The remaining 0.7% did not remember having received any credit. Of the farmers who received credits only 8.1% produced more than 9 tons/ha. However, 45.2% among non credit recipients produced the same level of more 9 tons/ha. Comparing the two groups it shows that credit access had a positive influence on productivity. The Chi- square test results (Table 13) indicate that credit access has a significant influence on tomato productivity at p=0.038. This implies that access to credit would significantly improve tomato productivity and financial incomes to tomato farmers. The findings are in accordance with what was reported by Strasberg (1999), that a review of the credit system in Kenya indicated that formal, non-formal, and informal credit systems can enhance increased agricultural productivity particularly for the majority of low resource base farmers. Also, ADB (2001); Petrick, (2002); Pederso, (2003), and FAO (2006) reveal that provision of credit is known to fuel household and national economic development.

Table 13: Tomato productivity by access to credit (n=135)

Access to credit	**Level of productivity**					
	Low		**Medium**		**High**	
	n	**%**	**n**	**%**	**n**	**%**
Yes	0	0.0	9	6.7	11	8.1
No	1	0.7	52	38.5	62	45.2
Don't remember	0	0.0	0	0.0	1	0.7
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Pearson Chi-Square=4.163, df=4, p=0.038

4.5.3 Relationship between market access and tomato productivity

Another important institutional factor that was thought to influence tomato productivity in the study area was market accessibility. Through cross tabulation a Chi- square test was performed. The findings indicate that market accessibility had a significant influence over productivity at p=0.011. Moreover, the study findings indicate that majority (76.3%) of the farmers were residing 1-5 kilometres away from the market where they sell tomato; while 23.7% were located between 6 and 10Km away from the market (Table 14).

Table 14: Tomato productivity by market access in terms of distance to market (n=135)

Average distance from farm to market	Level of productivity					
	Low		Medium		High	
	n	%	n	%	n	%
1-5km	1	0.7	43	31.9	59	43.7
6km-10km	0	0.0	18	13.3	14	10.4
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Pearson chi square=9.095, df=2, p=0.011

Of those who were close to the market, 43.7% had tomato yield above 9tons/ha, while only 10.4% of those who were very far away from the market managed to produce tomato above 9tons/ha (Table 14). This shows that distance was negatively related to productivity, thus reducing farmers' access to market and consequently reduced tomato yields (productivity). However its influence was statistically significant. These findings agree with what was reported by World Bank (2008) that smallholder access to markets for higher value agricultural products is recognized as a vital opportunity to enhance and diversify the livelihoods of lower income farm households and reduce rural poverty more generally.

4.5.4 Relationship between exposure to mass media and tomato productivity

Exposure to mass media was also one of main institutional factors that were thought to influence tomato productivity. Hence, cross tabulation was performed and whose results indicate that mass media exposure was related to productivity although not statistically significant at p=0.48 (Table 15). This implies that there were other factors known to the farmer which influence tomato production than exposure to mass media.

Table 15: Tomato productivity by exposure to mass media (n=135)

Exposure to mass media	**Level of productivity**					
	Low		**Medium**		**High**	
	n	**%**	**n**	**%**	**n**	**%**
Yes	1	0.7	50	37.0	54	40.0
No	0	0.0	11	8.1	19	14.1
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

Chi square=6.067, df=2, p=0.48

Furthermore, the findings indicate that majority (77.8%) of the farmers had been exposed to mass media and that 40% of these farmers produced above 9 tons/ha, and only a few 22.2% were not exposed to mass media, and out of who only 19 (14.1%) managed to produce tomato above 9 tons/ha. The findings of this study agree with what was found by Singh *et al*. (2013) that radio, which was utilized by 73.1% of the respondents, was the most used mass media for the dissemination of tomato technology.

4.5.5 Relationship between farmers' access to extension services and tomato productivity

An efficient extension services system is very important institutional factor that influences crop production as it determines how efficient improved production practices will be delivered to the farmers within their locations and how these practices shall be adopted by

the farming community. Knowing this crucial role of the extension services, the data which were collected from tomato farmers regarding access to extension services were analysed and the results presented in Table 16. According to the findings, 51.1% of the farmers who had access to extension services were able to produce more than 9tons/ha. However, 3.0% of the total sample size, which consisted of farmers who did not have access to extension services, managed to produce at the level of 9 tons/ha. And the relationship between access to extension services and productivity was found to be statistically significant at p=0.027 level of significance. These findings are in contrast with what was reported in IFPRI (2012) that visits by or advice from extension staffs is not significant in all productivity models. In some crop-specific productivity models estimated, it is the perceived quality of extension information, visits and access to mass media like radio that appear to be strongly and positively significant in explaining productivity levels for both female and male farmers.

Table 16: Productivity of tomato by access to extension services (n=135)

Access to extension services	**Level of productivity**					
	Low		**Medium**		**High**	
	n	**%**	**n**	**%**	**n**	**%**
yes	1	0.7	60	44.4	69	51.1
No	0	0.0	1	0.7	4	3.0
Total	**1**	**0.7**	**61**	**45.2**	**73**	**54.1**

$\chi 2 = 10.936$, df =4 , p=0.027

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

The study assessed socio-economic and institutional factors of smallholder tomato farmers in Musoma Municipality. The conclusion and recommendations are based on major issues that emerged from the findings of the study. The whole study is built on three specific objectives which are: assessment of productivity of tomato amongst smallholder tomato

farmers in the study area, identification of socio-economic factors that influence tomato productivity amongst smallholder tomato farmers, and finally identification of institutional factors that influence tomato productivity amongst smallholder tomato farmers in the study area.

5.2 Conclusions

According to the findings, there was statistically significant relationship between socio-economic factors such as age, marital status, labour availability, farm size, source of income, household size, the level of education, and farming experience with tomato productivity.

Moreover, institutional factors such as extension service, access to credit and access to market show statistical significance with tomato productivity. However, other factors such as membership to farmers' organization, and exposure to mass media were not statistically significant to tomato productivity but showed a relationship with tomato productivity.

5.3 Recommendations

In view of the above conclusions, in order to increase tomato productivity this study recommends the following;

i. Extension services for farmers should be strengthened by the extension agents situated within Musoma municipal by making frequent visits to farmers, preparing special training programmes for farmers growing tomato and other vegetables within the municipal so as to encourage farmers to apply good agronomic practices for improving tomato productivity.

ii. Farmers should be mobilized to accesses credit facilities. Loans should be soft and mode of repayment should attract most farmers. Such credit will assist farmers in

meeting some of the production cost variables in respect of inputs such as fertilizers, improved seeds, pesticides and other equipments.

iii. Farmers growing tomato should be mobilized to form groups so that together they could form their own produce markets and collectively be able to establish organized market networks to enable them to access reliable markets.

iv. In order to improve labour availability there is need for extension agents to promote and emphasize the adoption of labour saving technologies and to facilitate tomato farmers through a local government scheme to acquire labour saving technologies by using farming equipment such as solar energy operated water pumps or wind mills, water pumps and power tillers.

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APPENDICES

Appendix 1: Questionnaire for tomato farmers in Musoma Municipality

LOCATION AND ADMINISTRATIVE USSUES

Name of interviewer……

Date ……..

Name of ward…….mtaa…….....

Instructions: *Write a number of the correct answer/response in the parenthesis, unless instructed otherwise.*

SECTION A: SOCIO-ECONOMIC FACTORS OF FARMERS

A1: Sex of respondent

1) Male 2) Female ( )

A2: What is the age interval your age falling?

1) Below 30 years
2) 31-41 years
3) 42-52 years ( )
4) 53-63 years
5) Above 63 years

A3: What is your education level?

1) Not attended any formal education
2) Primary school
3) Secondary school ( )
4) Tertiary education

A4: What is your marital status?

1) Single
2) Married
3) Divorced ( )
4) Widowed
5) Separated

A5: Apart from being a tomato grower, what is your other occupation(s)?

1) Tomato production
2) Livestock keeper (either or combination of cattle, goat, sheep, chicken)
3) Business
4) Privately and civil employment ( )
5) Any combination of tomato , livestock, business and employment
6) Other non-farm activities like carpentry

A6: Apart from tomato, what other crops do you grow?

1) Yes 2 No ( )

A7: What is your total annual income in Tanzanian shillings?…….

A8: What is your family size?(*provide number of persons in your family*)……

A9: What is the source of labour in tomato production?

1) Hired
2) Family
3) Both family& hired ( )
4) Myself

A10: How many people in your household are capable of executing farm operations?

(*provide the number*)……..

A11: How would you describe adequacy of labour force you are having for your farm operations?

1) Very adequate
2) Moderately adequate ( )
3) Inadequate

SECTION B: INSTITUTIONAL FACTORS

B1: Is there an organized tomato marketing system?

1) Yes 2) No ( )

B2:If yes are you able to access too?

1) Yes
2) No ( )

B3: Where do you sell your tomatoes?

1) In the farm
2) Outside the Municipality ( )
3) Urban market
4) In the farm and Urban market
5) Others (specify)……..

B4: What is the average distance in km from your field to the main market? *(provide number of km*)…….

B5: What is the main source of water for the plants in your field?

1) Rainfall only
2) Rainfall supplemented with simple irrigation facilities ( )
3) Irrigation only

B6: List the irrigation facilities do you use .

……

……

B7: How would you describe adequacy of irrigation water in your field?

1) Very adequate
2) Adequate ( )
3) Moderately adequate
4) Not adequate

B8: Is there an extension agent in the ward?

1) Yes 2) No ( )

B9: If YES, how often do you get contact with extension agent?

1) Very frequently (*more than once per month*)
2) Frequently (*once per month*) ( )
3) Less frequently *(once per more than one month*)

B10: Do you have access to any mass media?

1) Yes 2) No ( )

B11: Mention them ……

B12: How would you describe availability of quality inputs that you strongly need for your tomato growing enterprise?

1) Highly available
2) Available ( )
3) Moderately available
4) Not available

B13: Do you get any problem in input acquisition?

1) Yes
2) No ( )

B14: If yes what kind of problem?

1) High cost of input
2) Are not available at proper time
3) Both
4) Others mention…….. ( )

B15: Is there any money lending institution you can access if you wish?

1) Yes 2) No ( )

B16: What are the lending institutions?

B17: Were you able to get it?

2) Yes 2) No ( )

B18: Is there any association that join you as farmers?

1) Yes 2) No ( )

B19: If yes, are you a member.

1) Yes 2)No ( )

C. TOMATO PRODUCTION AND PRODUCTIVITY

C1: How long have you been growing tomato?

1) Less than 1 year
2) 1-5 years
3) 6-10 years ( )

C2: What is the size in (acres) of your tomato plot?

1) Less than 0.4 hectare
2) 0.4 hectare
3) 0.8 hectare
4) 1.2 hectares
5) More than 1.2 hectares ( )

C3: How did you get the plot you use for tomato production?

1) Own land
2) Part is owned and part is hired
3) Part is owned and part is borrowed (from friends, relatives and neighbours).
4) Part is hired and part is borrowed
5) All borrowed
6) All hired ( )

C4: Do you have any official land title deed.?

1) Yes 2) No ( )

C5: For what purpose do you grow tomato?

1) Home consumption only
2) Commercial/ cash crop
3) Home consumption and commercial/cash crop ( )

C6: What kind of tools do you use in land preparation?

1) Hand hoe
2) Animal power
3) Power tiller
4) Tractors
5) Others (specify)…….. ( )

C7: What type of variety did you use?

1) Improved varieties
2) Local varieties ( )

Mention them…….

C8: What spacing did you use for tomato production?

1) 50cm x 30cm
2) 60cm x 40 cm
3) Approximately
4) Others (specify) ( )

C9: Which type of organic fertilizers do you use and application amount per tomato plant?

1) Type……amount in kgs…….per plant
2) Type…….amount in kgs……per plant

3) Others (specify) ( )

C10: Which type of inorganic fertilizers do you use and application amount per tomato plant?

1) Type……..amount in gms……per plant

2) Type……amount in gms……per plant

3) Others (specify) ( )

C11: What is the common disease affecting your tomatoes?

1) Fusariaum wilt [ ]

2) Early and late wilt [ ]

3) Bacteria wilt [ ]

C12: What is the serious pest attack your tomatoes in the field?

1) Nematodes [ ]

2) Bollworm [ ]

3) White fly [ ]

4) Leaf grasshopper [ ]

5) others (specify) [ ]

C13: Which method do you use for pest and diseases control in tomato? (Tick all that apply).

1) Cultural control [ ]

2) Chemical control [ ]

3) Biological control [ ]

4) All above [ ]

C14: Are you practicing crop rotation?

1) Yes

2) No

3) I haven't enough land [ ]

C15: What was your tomato yield/hectare during the last season? (20 liters bucket=18kg tomatoes) …….

C16: What are the major problems do you face in the production of tomato?(*list if any*)

…….

……

C17: In your opinion what should be done so as to rectify the difficulties/problems occurring in your area concerning tomato production?

……

THANK YOU FOR YOUR COOPERATION

Appendix 2: Checklist for Agricultural staff of Musoma Municipality

1. What is the distribution of staff in the municipality?

2. How many wards are an extension officer is serving?

3. How do you offset the gap of shortage of staffs?

4. How do you facilitate the extension staff?

5. Is there any organization which supports your extension staff?

6. How have you established supervision system?

7. Do you provide reading materials to farmers through extension staffs?

8. What is the municipality tomato productivity per unit area?

9. What support and motivations do give tomato farmers in Municipality?

10. What is the situation of land tenure in agriculture production in Musoma Municipality?

11. What is situation of in puts in tomato production?

12. What is situation of Marketing in tomato production?

13. What is your opinion in order to improve tomato productivity?

THANK YOU FOR YOUR COOPERATION

Appendix 3: Checklist for ward extension officers

1. What tomato technologies have you disseminated to farmers? (Mention)

2. Which technologies in tomato are mostly applied? (Mention)

3. How many exchange visits do you perform and what farmers share amongst them?

4. If you conducted exchange visit, what farmers share amongst them?

5. How many field days do you perform in one crop cycle?

6. What did participants learn during those occasions?

7. What other support and motivations do you get from the Municipal council/NGOs?

8. What are the benefit do farmers get from tomato production?

9. What are the constraints facing tomato production?

10. Do you suggest on ways to improve tomato production?

THANK YOU FOR YOUR COOPERATION

Appendix 4: Checklist for Focus Group Discussion

1. When did you start producing tomato?
2. What are the constraints facing you in tomato production?
3. Did you get any extension service in tomato production?
4. If yes, which service did you get?
5. Do you think tomato yield is enough compared to input used during production?
6. How do you access tomato market?
7. What are your opinions on tomato marketing?
8. What is the situation of agricultural inputs in your area?
9. Are you (farmers) afford to buy it?
10. What are the benefits of tomato production?
11. Do you get advisory services from extension agents on tomato production?
12. If yes, how frequent the extension agents visit you during the production season?
13. What support and motivations do get from Municipal council?
14. What is your opinion in order to improve tomato productivity?

THANK YOU FOR YOUR COOPERATION