

ASSESSING TOMATO FARMING AND MARKETING AMONG SMALLHOLDERS IN HIGH POTENTIAL AGRICULTURAL AREAS OF TANZANIA

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Abstract

Smallholder farming and marketing of high value crops can bring about better prospects for smallholder farmers in high potential agricultural areas of Tanzania. This paper sought to assess tomato farming and marketing of tomato smallholder farmers. The study was conducted in selected Morogoro districts where a multi-stage random sampling procedure was employed to select the sample. The data collected included common farming practices, production and marketing challenges, costs and revenues of tomato farming for determination of profitability for each identified marketing channel. It was found that farmers employ various production technologies. In addition, it was found that farmers are facing a number of constraints. It was revealed further that profits differ across marketing channels farmers are using. It can be concluded that Production technology employed suggests the intensive nature of sustained and profitable production of the crop where lack or inadequate availability of inputs could greatly constrain tomato production. With regards to marketing, it can be concluded that since assemblers, retailers and brokers offer low prices and marketing costs are high when farmers sell tomato through them, then the respective profits enjoyed by farmers are little.

Keywords: Tomato farming, smallholders, vegetable production, marketing constraints, Tanzania

INTRODUCTION

The greatest bulk of the vegetables produced by smallholder farmers in Tanzania tomato is the single most dominant vegetable crop (URT, 2012). It is estimated that, the area planted with tomatoes in Tanzania is 26,612 ha. Tomatoes contribute the highest % of harvested quantity (314,986 tons 64%) to the total harvested quantity of fruits and vegetables (Figure 1 and 2).

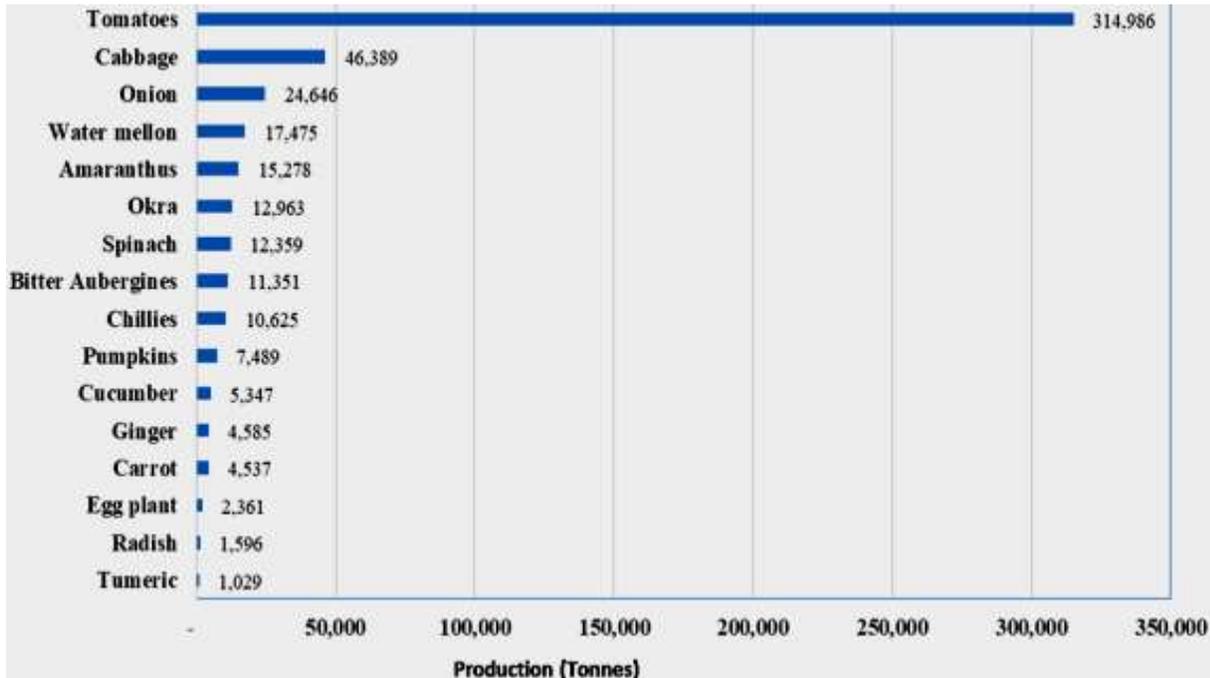


Figure 1: Vegetable production in tonnes
Source: URT, (2012)

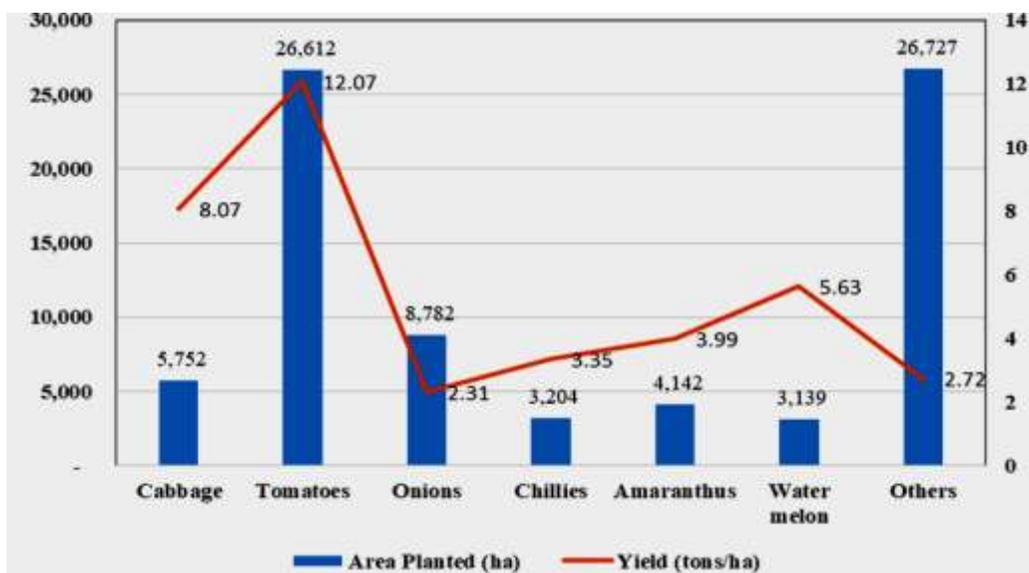


Figure 2: Area Planted (ha) and Yield (tons/ha) for Fruits and Vegetables
Source: URT, (2012)

Vegetable production levels vary greatly by region. For instance for tomatoes, Morogoro region has the largest area (6,519 ha, 19% of the crop area in the country), followed by Iringa (3,274 ha, 10%), Tanga (2,569, 8%) and Zanzibar (2,370 ha, 7%) (Match Maker Associates (MMA), 2008). This region is one of the potential areas in production of high value crops such as tomatoes.

Thus, given that production of tomato in Tanzania is dominated by small-scale producers, the potential for reducing poverty by enhancing their productivity and incomes is enormous. It is therefore important to assess production and marketing of tomato small-scale producers focusing on production technologies employed, production and marketing challenges farmers are facing as well as their profitability. The extent to which tomato farming is profitable will determine the extent to which smallholders can invest further in their farming activities, which eventually is essential for poverty reduction.

This paper emanated from the study that sought to assess tomato farming and marketing of tomato smallholder farmers. It is believed that the growing of high value crops such as tomato is likely to contribute more significantly to increased incomes of smallholder farmers in developing countries, including Tanzania. This is because they command higher prices compared to traditional cash crops. Also, given a world-wide increase in demand for high value crops, production of vegetables guarantees that farmers will continue enjoying better prices. The other important factor for significant increased incomes from growing high value crops emanates from its potential for employment creation. Vegetable production is labour-intensive, and it has strong forward and backward linkages; the requirements for organic and inorganic fertilizer, pesticides and seeds in production is huge, as well as the need for further processing for regional markets and supermarkets are opportunities that need to be exploited.

LITERATURE REVIEW

According to FAO data for vegetable production, Tanzania ranked from the twentieth in 2000 to fifteenth position in 2009 (FAOSTAT, 2014). In fact, during this period, Tanzania remained in the top 20 vegetable producers in the world. The greatest bulk of the vegetables produced in Tanzania tomato is the single most dominant vegetable crop (URT, 2012). It is estimated that, the area planted with tomatoes in Tanzania is 26,612 ha. Tomatoes contribute the highest percent of harvested quantity (314,986 tons 64%) to the total harvested quantity of vegetables.

Tanzania's contribution in the global production of tomato shows that between 2002 and 2009, the subsector experienced an increasing growth rate of production (FAOSTAT, 2014). Production of tomatoes was highest in 2009 at 203,909 tonnes. On the other hand, between the same period, tomato exports showed a fluctuating trend. From 2002 to 2003, exports of

tomatoes more than doubled from 1184 tonnes in 2002 to 2624 tonnes in 2003. From 2003, exports of tomatoes declined sharply and remained low before the abrupt rise in 2007.

In recent years, Tanzania has started to export horticultural products, including vegetables such as tomatoes. Mnenwa *et al* (2005) reported that export destinations for vegetables from Tanzania include neighbouring countries (Kenya, DRC Congo, Zambia, Comoro), the Middle East and Europe. However the country is struggling to expand exports in competition with world producers whose production and marketing systems are more efficient and meet standards required by the European consumers. Tanzania has a potential to export these produce with trade liberalization under the regime of World Trade Organization.

The potential for increasing production of vegetable in Tanzania is enormous (URT, 2012). Tanzania is endowed with ideal climatic conditions for growing a variety of vegetables, and does not face labour shortages. In spite of this potential, Tanzania's production and export levels of tomatoes are not stable and fall below other countries.

Vegetables such as tomatoes provide the most input intensive production systems where in most parts of Tanzania with predominantly rainfed tomato production with limited irrigation practices, two cycles in a year are very common. Generally smallholder farmers are so informed about appropriate farming practices and technologies such as weeding, disease management, pest control, harvesting and fertilizer use as well as about the use of improved land preparation and irrigation technologies (Weinberger and Msuya, 2003; Kiros, 2008; and Sabo and Dia, 2009).

Smallholder farmers use different sources of labour as well as different types of fertilizers. For instance, in the study of assessing the major constraints and opportunities to improve vegetable production and marketing, Kiros (2008) observed that farmers use family labour for land preparation, planting, cultivation, weeding, irrigation, fertilizer application, pesticides application, harvesting and transporting of the products to the market. Also farmers in the study area used organic manure to improve the production of vegetables.

Production in Tanzania's agriculture sector is dominated by smallholder farmers. Due to a number of production and marketing constraints facing smallholder farmers, market performance of high value crops appear to be low (URT, 2009, ESRF, 2010 and HODECT, 2010). In Sub-Saharan Africa, Delgado and Siamwala (1997) argued that some of the challenges facing smallholders are lack of markets, poor quality of produce and high transaction costs. Other challenges include inadequate farmer skills and knowledge of production and; attack of pests and diseases (Kiros, 2008). The underlying causes of these challenges can be explained as institutional factors, natural factors and transportation related factors. As a result smallholder farmers become less competitive in the mainstream high value markets. Similarly,

marketing of vegetable in Tanzania which is the focus of this paper has been experiencing similar problems (Weinberger and Msuya, 2003, Palada et al., 2006 and; HODECT, 2010).

Tomato crop is very important in the country's agricultural sector because of its high potential to generate profits to smallholder farmers. The bulk of fresh market tomatoes are produced by small-scale farmers. Farmers are interested in tomato production more than any other vegetables for its multiple harvests, which result in high profit per unit area. The realization of profit depends on market revenues. The realization of profit also requires increased production efficiency using modern inputs and technologies. According to Branson and Norvell (1983), the supply offered by farmers is a function of price of the commodity to be supplied, cost of all the inputs necessary to produce the commodity, net income or profit that could be obtained from alternative crops, state of technology that affects potential yields, total acreage available, expectations about future price change and risk of production.

METHODOLOGY

The study approach and design

This research operated within the survey research design. The cross-sectional data was collected from the selected sample and on more than one case using structured and semi-structured questionnaires for the survey. However, qualitative data were collected to get the inner perspective of the farmers with regards to production technologies involved, main production and marketing constraints as well as costs and revenues for each identified marketing channel of tomato and determination of farmers' profitability. Moreover, observational methods such as participant observation and the use of personal documents were deployed in the collection of data in this study. Other qualitative data was collected through the use of interviews of key informants and Focus Group Discussions.

The study area

Mvomero and Morogoro Rural and Urban districts were purposively selected as study areas to represent diverse agro-ecological zones, socio-economic environment, cultural diversity and varying production systems. For example, Mvomero district is considered as a high potential area growing most of vegetable crops. Morogoro rural district on the other hand grew mainly maize and vegetables while Morogoro Urban is considered to have low crop production since inhabitants mostly do engage in off-farm activities. The three districts were chosen on the basis of their proximity to urban market and degrees of commercialization (URT, 2012). Thus, it was expected that the choice of the districts was designed to present differing levels of crop sales due to varying distances to crop market.

Sampling procedure

A field survey was carried out in three districts (Mvomero and Morogoro Urban and Rural districts) of Morogoro region representing rural, urban and peri-urban settings of high potential agricultural areas of Tanzania. A multi-stage random sampling method was used to select the sample of farmers. Sampling procedure was done in three stages. First, the three districts were purposely selected. Second, in each of the district, villages were randomly identified. A list of all farm households which defines the distribution of vegetable farmers, villages and their vicinity and name of vegetable producers was then drawn with the help of local administration and local agricultural extension officers. Third, market participant and non market participant farmers were then systematically sampled from the lists. The heads of the households were interviewed. In the absence of the household head (husband) or the wife the second member was interviewed. The main respondent would provide most of the information. A total of 204 farmers were interviewed in this study. The data collected included common farming practices, production and marketing challenges, costs and revenues of tomato farming for determination of profitability for each identified marketing channel.

Data collection techniques and analysis

Data collection methods of present study employed multi-methods, using both quantitative and qualitative techniques, in data collection with more emphasis on quantitative approach. It must be noted that the questionnaire survey was used as main data collection instrument for this study. Other methods employed included structured and semi structured interviews, checklists for focus group discussions and field observations.

Descriptive statistics techniques were used to analyse the data. A substantial part of the analysis was based on descriptive statistics such as frequencies. These statistics were used to determine and to assess the following aspects: Tomato production technologies, main production and marketing constraints and challenges as well as costs and revenues of tomato farming for determination of profitability for each identified marketing channel.

FINDINGS

Tomato production technologies

Tomato farming practices

Tomato crop has been planted in pure stand due to their aggressive nature in competing for nutrients and light. As an observation, it was quite unlikely to find farmers intercropped tomato with other crops like maize, cassava and cowpeas. Tomato farming depends on rainfall complemented by irrigation. Irrigation is a common and crucial managerial practice in tomato

farming. Farmers being small as they are, rely on rivers, wells, and streams for irrigation. This is evidenced by observed situation that the majority of tomato fields in the study area were located along the river valleys and streams. Irrigated tomato has enabled its prolonged supply almost throughout the year. During focus group discussion (FGD) it was reported that tomato plant is affected by a number of diseases. They include root rot, stem cut and late blight. Nematodes (causing root rot) and cutworms are the two most important pests. Root rots caused by nematodes (*Funza wa mizizi* in Kiswahili) affect tomato roots that leads to rotting of the plant. Diseases and pests managements practices mentioned include, crop rotation, cleaning the farm, staking with sticks, pruning and use of agrochemicals.

Farm inputs and tools used

Tomato production is relatively input intensive compared to other crops. These include seeds, fertilizers and pesticides, farm implements using tractors, power tillers, oxen ploughs, spray pumps and water pumps. The inputs distribution is carried out by existing agro-dealers in Morogoro Municipality. As shown in Table 1, market participants appeared to use more inputs and tools than non market participants in tomato production. It is apparent that the overall use of inputs among farmers was quite low. This is because farmers consider purchasing them as costly and find another alternative ways of growing the crop. For instance, it was reported that during the FGD some farmers are involved in seed multiplication that are sold at a lower price compared to branded names, the seeds are known as quality declared seeds (QDS). It was informed that QDS qualities are as good as imported seed provided they are multiplied within recommended framework. Farmers use farm yard manure together with fertilizers. Since there was less ownership of ploughing implements, hand hoe remains an important tool for land cultivation. About one-third of market participants were using pesticides and one-tenth own spray pumps used for pesticide application. One-tenth of market participating farmers own water pumps. This is why most tomato is produced during the wet season. Just a few own means of transport. It was informed that the majority of farmers do transport harvested tomato to the selling points in small quantities by hired motorcycles or carry on their heads.

Table 1: Distribution of respondents by farm inputs and tools used

Farm input/tool	Market participants		Non market participants	
	Frequency	Percent	Frequency	Percent
Hybrid seeds	117	57.4	72	35.3
Commercial fertilizers	84	41.2	50	24.5
Farm yard manure	40	19.6	16	7.8

Commercial pesticides	64	31.4	44	21.6
Tractor	7	3.4	3	1.5
Power tiller	14	6.9	5	2.5
Oxen plough	6	2.9	5	2.5
Spray pump (manual/motorized)	20	9.8	16	7.8
Water pump (manual/motorized)	22	10.8	8	3.9
Push cart	30	14.7	19	9.3
Animal cart	8	3.9	6	2.9

Table 1....

Sources of labour

Table 2 shows that more than a third of respondents in the study area use family members as their source of labour while about one quarter used hired labour. Also one fifth of the respondents used both hired and family labour. Some few farmers do exchange labour, at 14.7%. Since family and reciprocal labour are used by most of these farmers in the study area, it implies that the cultivation of tomato becomes more profitable since the farmers pay less for labour. This practice reduces family dependents (Olusola, et al. 2014)

Table 2: Sources of labour used

	Frequency	Percent
Family labour	79	38.7
Hired labour	54	26.5
Both hired and family labour	41	20.1
Reciprocal labour	30	14.7
Total	204	100.0

Varieties of tomato grown and reasons for using those varieties

Simple statistical analysis was used to analyze varieties of tomato grown and reasons for using them. The results obtained from the analysis are presented in Table 3. The findings show that the majority of farmers use short varieties (72.1%). Specifically, the names of short varieties commonly used in the study area are Tanya, CAL J and Roma. The name of one long variety used by few farmers (27.9%) is known as Money maker.

Reasons for growing these varieties as mentioned by farmers are almost equally widespread. Some reasons such as long shelf life, large fruits and fleshy are meant to increase the marketability of the produce. Other reasons are meant to reduce risk of produce loss since smallholder farmers are risk averse (Jaffe, 2005).

Farmer's growing of more than one variety increase the probability to selling their produce as well as quantities sold (Salvucci, 2010). Demand-driven emerging urban consumer preferences offer a huge potential for agricultural produce. Farmers' bargaining power can only be improved if they have access to new varieties in order to adapt production systems to meet market demand (Arlinloye, 2012). Input use is also affected in the rural areas by the use of commercial high-value varieties which are easily available and affordable (Omiti et al., 2009). This result is line with Wilson's (1986) conclusion, who stated that farmers can rely on diversification as a protective measure.

Table 3: Varieties grown and reasons for growing them

Varieties grown:	Frequency	Percent
Short varieties	147	72.1
Long varieties	57	27.9
Total	204	100.0
Reasons for growing those varieties:		
High yielding	20	9.8
Early maturing	28	13.7
Staking is not required	21	10.3
Long shelf life	20	9.8
Uniform ripening	24	11.8
Resistant to pests and diseases	24	11.8
Fleshy	21	10.3
Preferred by processors	24	11.8
Large fruits	22	10.8
Total	204	100.0

Main production and marketing constraints and challenges

The agricultural production and marketing of tomato farmers was assessed in terms of constraints and challenges farmers were facing. There were a number of constraints and challenges that were reported by farmers. These main constraints and challenges were summarized in Tables 4 and 5.

Tomato production constraints and challenges

Limited input supply was mentioned as the most important constraint and challenge in the production of tomato at 27 percent. Input availability is important because as hypothesized and

proved by Donovan (2013) that crop production is determined by a crop-specific production technology which depends on the flow of inputs (e.g. fertilizer, pesticides, seed and labor).

Prevalence of pest and disease such as late blight, nematodes and cutworms were the most important pests and diseases reported by nearly one half of the surveyed farmers. Among the farmers involved, one fifth (20.1%) reported labor shortage and its price as a major constraint as the third important production constraint of tomato. Hiring labor is a common practice in the study area. Production of tomato like most of the vegetable is one of the labour-intensive activities. It demands labor right from land preparation up to packaging.

Weak extension support services as a constraint and challenge for tomato production was mentioned by less than a quarter of the farmers. Although the number of extension agents assigned to work in each village looks adequate to support farmers right from land preparation up to post harvest handling but during the interviews with FGDs it emerged that they are less motivated to support the farmers. The findings observed in this study mirror those of the previous study that assessed agricultural extension services in Tanzania by Daniel (2013). It was found that extension officers were facing challenges of poor working environments including a lack of reliable means of transport to reach the farmers, limited financial support to carrying out demonstrations and field experiments on new technologies, sub-optimal housing, lack of working facilities and low salaries. As a result, extension officers are not motivated to perform their duties well. Lack of production credit providers was indicated as the last constraint by 13.2 percent of tomato smallholder farmers. This was an indication of unavailability of credit on demand.

Table 4: Production constraints and challenges facing smallholder farmers

	Frequency	Percent
Limited input supply	55	27.0
Pests and diseases	49	24.0
Insufficient and high price of labour supply	41	20.1
Weak extension support	32	15.7
Lack of credit facilities	27	13.2
Total	204	100.0

Tomato marketing constraints and challenges

Marketing constraints and challenges faced by smallholder farmers were also assessed and results were presented in Table 5. Farmers in the study area were faced with lack of information, low prices of tomato, fluctuating price, lack of market building structures, lack of

storage facilities, high competition, unreliable markets, long distance to markets and weak farmers' associations. The most cited constraint by farmers was lack of market information followed by low prices, fluctuating prices, high competition and lack of storage facilities. The least cited constraints were lack of market building structures, unreliable markets, long distance to markets and weak farmers association. These results agree with the findings by Olusola et al. (2014) who concluded that these constraints could also discourage those farmers who are ready to involve themselves in market participation since they would have presumed that market conditions were not favourable to them.

Table 5: Marketing constraints and challenges facing smallholder farmers

	Frequency	Percent
Lack of market information	33	16.2
Low prices of tomato	32	15.7
Fluctuating price	26	12.7
Lack of market building structures	19	9.3
Lack of storage facilities	21	10.3
High competition	25	12.3
Unreliable markets	17	8.3
Tomato markets are too far	18	8.8
Weak farmers' associations	13	6.4
Total	204	100.0

Profitability of market participants

In order to analyze the profitability for tomato producers, average marketing costs for each identified channel were computed as presented in Table 6. It was identified that marketing of tomato was done mainly through four channels that indicate the direct flow of tomato from farmers to the immediate marketing agents involving farm-gate prices.

- 1) Farmers who sell their fresh tomato through local assemblers-Channel I
(Farmer → Local assembler).
- 2) Farmers who sell their fresh tomato through retailers- channel-II (Farmers → Retailer)
- 3) Farmers who dispose their fresh tomato through middlemen and brokers-channel-III
(Farmer → Middlemen/Broker)
- 4) Farmers who sell tomato through wholesalers and traders-channel-IV
(Farmers → Wholesaler/Trader)

The average marketing cost incurred for one bucket of tomato ranged from 850 TZS for marketing channels I and IV to 1,250 TZS for channel II. Marketing channel III had average marketing cost of 1150 TZS. As the results indicate, tomato marketing costs was higher in channel II which seems to be longest channel. This could be due to costs of packaging and transport. In all three marketing channels handling, packaging and transport costs covered the great proportion of the total marketing costs. It is important to note that buckets are durable where are just used to carry tomato to the selling point even beyond one growing season. In addition, during the focus group discussion buyers indicated that re-packaging of the goods is customary at each transfer of ownership in order to identify and ascertain that tomato conform to the required quality and quantity the practice that contributes to increased packaging and handling costs. The findings of the current study are consistent with those of Haruna et al. (2012) who found that packaging and transportation costs were the major variable costs incurred in tomato marketing among tomato farmers of Nigeria.

Table 6: Average cost and profitability of marketing of tomato (in TZS)

Cost items per bucket	Channel I		Channel II		Channel III		Channel IV	
	Cost	% cost						
Handling costs	200	17	300	18	250	17	200	17
Packaging costs	200	17	400	24	300	20	200	17
Transport costs	200	17	300	18	300	20	200	17
Loading and off-loading costs	100	9	100	6	100	7	100	9
Taxes/Cess	100	9	100	6	100	7	100	9
Brokerage costs	50	4	50	3	100	7	50	4
Total average costs	850		1,250		1,150		850	
Average selling price	3,600		4,800		4,000		7,000	
Net profit per bucket	2,750		3,550		2,850		6,150	

CONCLUSION

It can be concluded that tomato farming and marketing involve various production technologies. Also, farmers are facing a number of production and marketing constraints. It can also be concluded that profits differ across marketing channels farmers are using. Production technology employed suggests the intensive nature of sustained and profitable production of the crop where lack or inadequate availability of inputs could greatly constrain tomato production.

With regards to marketing, lack of market information, low prices, fluctuating prices, high competition and lack of storage facilities were the major constraints and challenges faced by tomato smallholder farmers. Lack of market building structures, unreliable markets, long distance to markets and weak farmers association are so common in the study area. These marketing constraints raise important questions about the ways to overcome market problems of tomato marketing. Marketing channel choice, which influences the price received by farmers and volume of sales, is also crucial to achieve increased profits. It is expected that farmers usually use channels with the higher returns resulting from quantity sold not unit price.

LIMITATIONS OF THE CURRENT RESEARCH

However, the study was faced with a number of limitations. It is anticipated that farmers and traders alike do not keep records. Therefore, data collection involved a combination of methods, which rely on memory recall for basic information such as producer selling price and marketing costs, retail and wholesale price and quantity handled by traders.

During the survey, collection of data was the most challenging task. Most of the time farmers were busy and time specific during interview. Some farmers also appointed some more days to respond to the questionnaire.

Being the cross-sectional study by design it may lack some details which could have reinforced the understanding of the whole marketing system. The time limit and budget constraint exclude consideration of other high potential agricultural areas that could adequately justify the generalization of the findings.

For each tomato offer for sale in the market, households reported the quantity sold and the market price received. Also, households reported in which markets they sold tomatoes and marketing costs that were incurred. Some households sold tomatoes in more than one market. To get around this data limitation, households were required to provide data for a major market channel only where they had offered to market large proportion of produce.

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