

Understanding the Magnitude of the Risk Factors Affecting Small Scale Horticulture Farming in Southern Highlands: Experience from Kilolo District

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Abstract

This study was undertaken to understand the magnitude of the risk factors affecting small-scale horticulture farming in southern highlands. The study was determined to investigate the magnitude of the risk factors that affect the effective utilization of horticulture production potentials in the Kilolo District. Mixed method analysis was applied such that quantitative data were summarized using summary statistics (frequencies and percentages) with the aid of Microsoft excel software system and the Statistical Package for Social Sciences (SPSS) version 20. The qualitative data was analysed using content analysis. Results revealed major four factors impeding the fast growth of the horticulture sub-sector. These factors include marketing-related factors ranked high (31%) followed by production risk factors (27%), transport and products handling factors (22%) and the fourth impediment was processing risk factors where 18% of overall surveyed respondents disclosed this constraint. The study concluded that the persistence of horticulture production risk factors in the study area appear to threaten the efforts made by small-scale horticulture producers in their struggle to alleviate poverty through the intensification of horticulture crop production. Given this conclusion, it is thus recommended that further scientific studies should be directed towards investigating the appropriate responses to such risk factors hampering horticulture production in major producing zones in Tanzania.

Keywords: Horticulture production, Horticulture production risk factors, the magnitude of the risk factors, Southern Highland of Tanzania.

Introduction

Horticulture production and consumption had increasingly drawn greater attention in many parts of the world, particularly in recent years. Such attention has been attributed to two major reasons. First, is the increasing awareness of the health benefits of horticulture crops. For instance, Tyler et al. (1999) pointed out that many horticulture crops are rich in vitamins, minerals, and proteins which are necessary for human life. Horticulture crops particularly vegetables and fruits offer several vitamins, namely A, B, C, D, E, and K which are necessary for the best performance of the human body (Martine & Robert, 2011). In addition, some horticulture crops have medicinal importance. For example, onion and garlic have been found to possess anti-bacterial and anti-parasitic properties (Walker, 2008). Due to their nutritional importance, health scientists recommend a daily of 75-125 grams of vegetables, 85 grams of roots and tubers, and 85 grams of fruits per capita per

day (Hyson, 2002). Second, many horticulture crops take short time to mature, thus they can be grown several times within a year provided water is available. Being in that nature, horticulture crops provide high yields per unit of land compared to other crops such as cereals. In this regard, horticulture crop farmers have a high chance of generating more income than non-horticulture farmers.

Despite the impressive status of horticulture production at the global level, however, there is a greater variation across regions and countries. For instance, the leading country for horticulture production in the world was China with 158,390,000 metric tonnes of horticulture production in 2011 (Hodan et al., 2012). It was followed by India, Vietnam, and the Philippines (Hodan et al 2012). In the case of Africa, horticulture production has shown little progress compared with other regions of the world (Adebooye

and Opabode, 2004; NRC, 2006). For instance, during the year 2011, Africa as a whole was able to produce only 18,036,443 metric tonnes of horticulture produce (FAO, 2013). Similarly, in East Africa, horticulture production has shown little progress whereby only 5,674,294 metric tonnes of horticulture crops were produced (FAO, 2013).

At the national level (Tanzania), production of some horticulture crops are reported to stagnate while others are reported to increase but with fluctuating trends (Denise, 2010). Scant data available shows that between the years 1990 and 2008, the annual average production growth rate was 0.14% (ESRF, 2010). In 1990 production of horticulture crops in Tanzania was highest reaching about 1 million tonnes, but two years later it dropped to 0.8 million tonnes, which is equal to a 20% decline per annum (ESRF, 2010). Between 1994 and 2001, production showed an increase but with fluctuating trend. From 2011 to 2015, horticulture production in Tanzania shows little progress (ESRF, *ibid*). More recent production data are not available, however, no major changes are said to have happened between 2015 and 2018 (MEAKN, 2018).

Mountain regions are potential sites for horticulture production, thus the major suppliers of horticulture crops in Tanzania. For instance, Kilolo District has been one of the major suppliers of horticulture to nearby towns and Dar es Salaam City (Sokoni & Shechambo, 2005). However, in recent years the area has been experiencing different dynamics in horticulture production such as stagnation for some horticulture crops and insignificant increases with fluctuation trends of some horticulture (Teija, 2018). Such a scenario poses a challenge to rural poverty alleviation efforts in the southern highland and threatens per capita horticulture consumption in the local communities and the nearby urban areas of Dar es Salaam (Sokoni & Shechambo, 2015).

Several risk factors have been reported to cause the dynamics of horticulture crop production in Tanzania. Pests and diseases have been reported to limit horticulture production expansion, particularly in mountainous regions (Steven et al., 2007; Nyambo et al., 2006). Another factor is rainfall seasonal variability (Bezabih et al., 2010; Mbilinyi et al., 2013; Blignuat et al., 2009) which affects water availability that is highly used for horticulture crops production in low lands. Moreover, a decline in irrigation water supply, a decline in soil fertility as well as post-harvest losses are listed to be among the challenges to horticulture production (Evaraast et al., 2011; Byamungu et al., 2006; Shao et al., 2002; MMA, 2008a).

Despite the identification of risk factors affecting horticulture production in various agro-ecological zones, the magnitude of each factor to general horticulture production in a particular area or region is not adequately covered. Further, the interdependence of identifying factors is not well investigated. Therefore, this paper dared to identify the risk factors that affect the effective utilization of horticulture production potentials in major production zones in Tanzania, represented by the Kilolo District. Knowing individual risk factors and their effects on the effective utilization of horticulture production potentials could help producers to manage and control their farms and enhance production over time. This in turn will ensure a healthy population in Tanzania that would boost

strong economic production manpower in the nation and alleviate poverty among horticulture producers.

Materials and Methods

Study Area and Justification: The research was carried out in the Kilolo district. The district has an area of 7,874km² and is one of the four districts in the Iringa region. The district lies between Latitude 7.0⁰ and 8.3⁰ south of the equator and between Longitude 34⁰ and 37⁰ east of the Greenwich. Kilolo district borders Mpwapwa and Kilosa districts to the north, Kilombero District to the east, Iringa District council to the west, and Mufindi District to the south. Administratively, the district is divided into three divisions namely Kilolo, Mahenge, and Mazombe, with 24 wards, 106 villages, and 555 hamlets with 46,002 households. According to the 2012 census the district had a population of 218,130 out of whom 105,856 were males and 112,272 were females.

The district has three agro-ecological zones classified based on the altitude. The first zone is a highland zone that includes the extension of the Udzungwa Mountains, with altitudes of 1,600 to 2,700m above sea level, annual precipitation of 1,000-1,600mm, and the temperatures below 15⁰C. The mild conditions and volcanic soils favour the cultivation of maize, peas, bananas, wheat, potatoes, horticulture crops, and tea. The second agro-ecological zone is the midland zone which crosses the Mazombe Plains at 1,200-1,600m above sea level. Temperatures range from 15⁰ to 20⁰C with annual rainfall greater than 500mm but less than 1000mm. Soils are clay and sandy which allow the production of crops such as maize, sunflower, onions, sweet potatoes, tomatoes, cowpeas, beans, and fruits. The third agro-ecological zone is the lowland zone which covers the Mahenge Plains at 900-1,200m above sea level. Temperatures range from 15⁰ to 29⁰C while rainfall is unreliable and averaged 500-600mm. Soils are red and sandy. Due to unreliable rainfall, the zone is famous for drought-tolerant crops such as sorghum, millet, and cassava as well as irrigated paddy, leafy vegetables, tomatoes, onions, and tropical fruits.

Kilolo District was selected due to its potential for horticulture production with a conducive climate that permits the growth of multiple ranges of horticulture crops. The most horticulture crops grown in the study area are tomatoes, onions, cabbages, carrots, and other types of fruits and vegetables. Moreover, Kilolo is famous for the production of multiple ranges of fruits such as watermelon, pears, guava, and pawpaw. The horticulture farming system has been practiced in the study for a long time as one of the sources of livelihood. In recent years, the horticulture farming system has been increasing due to the commercialization of horticulture crops. Therefore, the horticulture farming system has become a main source of livelihood among households in the study area.

Study design, techniques, and tools: This is a descriptive cross-sectional study in which quantitative and qualitative methods were applied. A self-administered structured close-ended questionnaire survey, Observation checklist, and semi-structured in-depth interviews were used to collect data. All these tools were tested and revised accordingly before being administered to the study. The

questionnaire was prepared in English, and then translated into Kiswahili since the target population used Swahili as their main language. Similarly, interview guides were administered in Kiswahili to ensure that adequate information is collected. In-depth interviews were recorded with a digital audio recording device under the permission of the respondents.

Sampling Techniques and Sample Size: The sampling process involved three main procedures; the first step was purposive sampling which was used in the selection of wards in accordance with agro-ecological zones. Three wards were selected namely Ilula, Ruaha Mbuyuni, and Bomalang’ombe located in the highland zone, midland zone, and lowland zone respectively. The selection of wards based on agroecological zone was done purposefully to gain insights into the risk factors facing horticulture crop production for each agro-ecological zone. The second step was the selection of study villages where purposeful sampling was also applied. One village was selected from each ward due to the intensity and the level of commercialization of the horticulture farming system. Three villages were selected namely Ilula, Ruaha Mbuyuni, and Bomalang’ombe.

After the selection of study wards and villages, the next step was to identify specific individuals to be surveyed and interviewed as respondents and key informants respectively. The surveyed respondents were farmers who were edinvolved in horticulture farming systems growing either vegetables, fruits or both. The list of farmers was obtained from the village authorities, and their total sum was obtained and used to calculate the total sample size. The total number of households from three selected villages was 1,453 with a slight variation where Ilula had (564) households, RuahaMbuyuni (418), and Bomalang’ombe(418). The statistical analysis requirements approach was used where the formula for calculating sample size as developed by Cohen (2014) was used to calculate the sample size as follows.

$$S = \frac{X^2.NP(1-P)}{d^2(N-1)+X^2P(1-P)} \dots\dots\dots \text{Equation 1}$$

Where X = Z-score (1.96 for 95% confidence level)
 P = population portion (50% for maximum sample)
 d = degree of accuracy (0.05 for 95% confidence level)
 N = population size

$$S = \frac{(1.96)^2(1,454)0.15(1-0.15)}{0.05^2(1,454-1)+(1.96)^2 0.15(1-0.15)} = 172 \dots\dots\dots \text{Equation 2}$$

Therefore, the sample size used in the study was 172 households which were 12% of the total population under study, thus, it was sufficient enough to yield adequate information. After obtaining the sample size as stipulated in equations 1 and 2, the next step was to compute the number of households for each village which was done through the following formula.

$$n_h = \frac{N_h}{N} n \dots\dots\dots \text{Equation 3}$$

Whereby n_h = proportional sample of each village
 N_h = the number of households of each village, and

N = the total number of households in all villages and n is the total sample size of the study population.

Therefore, the sample size for each village was as follows.

$$\text{Ilula} = \frac{564}{1,454} 172 = 67 \text{ Households}$$

$$\text{RuahaMbuyuni} = \frac{472}{1,454} 172 = 56 \text{ Households}$$

$$\text{Bomalang’ombe} = \frac{418}{1,454} 172 = 49 \text{ Households}$$

After obtaining the sample sizes for each village which were 67, 56, and 46 households for Ilula, RuahaMbuyuni, and Bomalang’ome respectively, the next step was to obtain the specific heads of households. This was done through simple random sampling where farmers were selected from the list of farmers provided. their farms. Additionally, four key informants were purposefully selected based on their expertise in horticulture production. There were three ward agriculture extension officers each from study wards and one district agriculture extension officer from Kilolo District Council who specialized in horticulture farming. Therefore, the overall sample size for this study was 175 respondents.

Data collection, analysis, and presentation: Data collection process was carried out in three contexts. The first context involved surveying household heads who were visited in their fields where farming activities were taking place in study villages. During the survey, household heads were given questionnaires to fill in by responding to the questions. At the same time, the researchers also observed the conditions of horticulture in the fields. The second context involved consultation with horticulture specialists at the wards level where three extension officers were interviewed at different times. The third context involved an interview with a district agriculture extension officer from Kilolo District Council who specialized in horticulture farming. Information concerning the risk factors affecting small-scale horticulture farming in the study area was collected. Also, information on the extent to which the identified factors limit the productivity of horticulture crop production was gathered. To ensure a deep understanding of the limiting factors towards horticulture crop production, four major produced horticulture crops were investigated. These crops are tomatoes, onions, watermelon, and pears.

Quantitative data from the survey were analyzed quantitatively using SPSS version 20 software. Analysis was done with descriptive statistics mode which computed frequencies, crosstabs, tables, and graphs were presented. Data from in-depth interviews were transcribed from the audio records in Kiswahili and translated into English. The data were then analyzed manually based on repeated themes and patterns. Quantitative results have been presented in the forms of tables, graphs, and charts, while

qualitative data have been presented and supported by quotations as narrated by the informant.

Results and Discussion

Characteristics of the Respondents: A sample of 172 respondents filled in a household questionnaire. All respondents were horticulture farmers, growing horticulture crops for both commercial purposes and subsistence. There was a variation in farm sizes where 24% owned small-sized plots ranging from 0.25 to 0.5 hectares, 43% owned 0.5 to 1 hectare, and 33% owned relatively large-sized plots ranging from 1 to 4 hectares. This small-sized ownership of land suggests that the area is experiencing severe land fragmentation caused by high population density. Most of the surveyed households were aged between 30 to 48 years old

reaching 64% (Figure 1). Seventy-one (71%) of the respondents were males while 39% of respondents were females.

Education level of farmers was generally low. Only 37% had attained the secondary level formal education and 73% had completed primary education. Understanding characteristics of respondents such as age, sex, and education level is important in this study since such attributes have either direct or indirect influence on horticulture production. For instance, age can influence agriculture by determining the nature of labour involved in the production, sex can determine land ownership and land tenure, and education level can determine farmers' behaviour in accepting new farming practices.

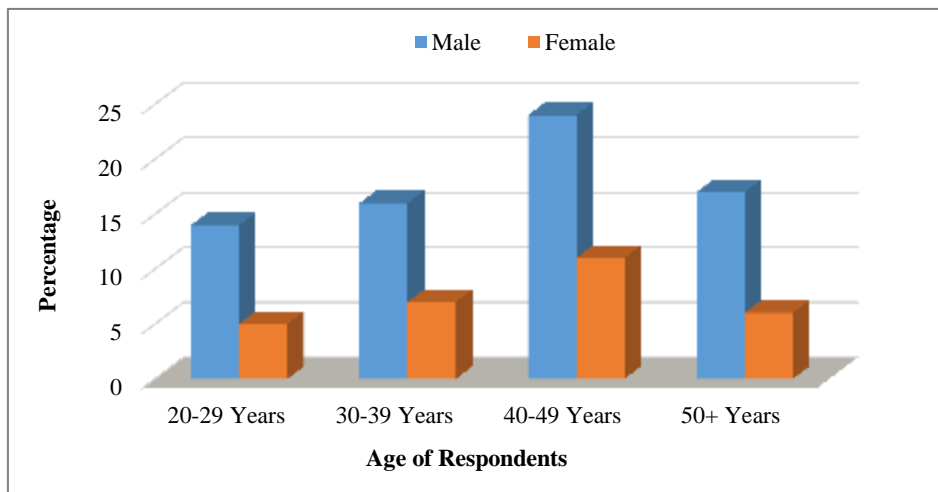


Figure 1: Age and Sex of the Respondents

Source: Field Survey (2021)

The Magnitude of Risk factors Affecting Small Scale Horticulture Farming in the Study Area: The study noted that there were huge potentials for horticulture production in the study area which were not fully utilized. Such potentials included favourable climate conditions that permit the growth of a range of horticulture crops. Rainfall was relatively high (500mm to 2,700mm) during seasons which allows stream flow and moisture retention in the valley bottoms even during the off rain seasons. It was observed that horticulture crop production in the study area was carried out in the valley bottoms where moisture was retained for some months after the rain season. Likewise, the temperature was relatively moderate ranging from 15°C to 29°C. Apart from

climate conditions, and the growing demands for horticulture crops particularly in the international markets were also a greater potential for a horticulture farming system.

Despite the existence of horticulture production potentials in the study area, there was inadequate utilization of such potentials. The results revealed that several key factors were responsible for the ineffective utilization of such potentials. Among the identified key factors, marketing-related factors were ranked high (31%), followed by production risk factors (27%), transport, and product handling factors (22%). The fourth impediment was processing risk factors where 18% of overall surveyed respondents disclosed this as a constraint (Table 2). Also, the study revealed that there was almost a similar pattern of the magnitude of the risk factors that affect horticulture crop production across the villages.

Table 1: The Magnitude of the Risk Factors Affecting Horticulture Production in the Study Area

Risk Factors	Villages						Total (N=102)	
	Ilula (N=37)		RuahaMbuyuni (N=35)		Bomalang'ombe (N=30)			
	N	%	N	%	N	%	N	%
Marketing Factors	22	33%	18	32%	16	33%	56	33%
Production Factors	16	24%	16	29%	15	31%	47	27%
Transport and Product Handling Factors	15	22%	12	22%	11	22%	38	22%

Processing Factors	14	21%	10	17%	7	14%	31	18%
Total	67	100%	56	100%	49	100%	172	100%

Source: Field Survey (2021)

The findings of this study coincide with the study of Mwombela (2021) who conducted a policy brief on enhancing the competitiveness of the horticulture industry in Tanzania. The policy brief analysed recent trends in horticultural production in Tanzania. The policy brief cited risk factors affecting horticultural development in Tanzania. Such factors include a lack of reliable and effective transport networks from the farm gates to the export gates (airports and ports), ineffective trade logistics of horticultural products from the farms to the point of exit (ports and airports), and horticultural farmers have limited linkage with financial institutions. Other identified constraints are limited access to input supplies such as fertilizers, improved seeds, post-harvest loss, and limited marketing strategy and information gap.

The policy brief made by Mwombela (2021) focused on all horticulture crops including fruits, vegetables, species, herbs, and flowers which makes it difficult to gain a deep insight into risk factors affecting the production of each type of horticulture crop. Also, the policy brief did not show the magnitude through which each factor affects horticulture crop production. As a response to Mwombela (2021), the present study paid special attention to vegetables and fruits which are major sub-sectors of horticulture leaving aside other horticulture crops to gain a deep understanding

of the magnitude of the factors that effect major sub-sectors of horticulture production in the study area.

Marketing Risk Factors: Marketing risk factors have been identified as a major factor that affect horticulture crops production in the study area. Findings reveal that 33% of the surveyed respondents in the study area pointed out that the shortage of reliable market systems major impediment in the horticulture sub-sector. The magnitude of this limiting factor was almost equally noticeable in all study villages such that 33%, 33%, and 32% of respondents reported this impediment at Ilula and Bomalang’ombeand RuahaMbuyunivillages respectively as shown in Table 2. This factor was equally reported in all study villages since all villages depend on nearby markets within the district, in the region and Dar es Salaam market.

Concerning marketing risk factors the study revealed multiple constraints that were directly related to the selling of horticulture crops vegetables and fruits in particular. The identified factors were high market price fluctuations due to high seasonality of supply of horticulture crops (24%), stiff competition in the Dar es Salaam urban market (20%), lack of adequate and reliable horticulture production and trade statistics (17%), lack of effective marketing farmer organisations (15%), lack of export market information (14%) and lack of expertise in product sorting and packing (10%) (Figure 2).

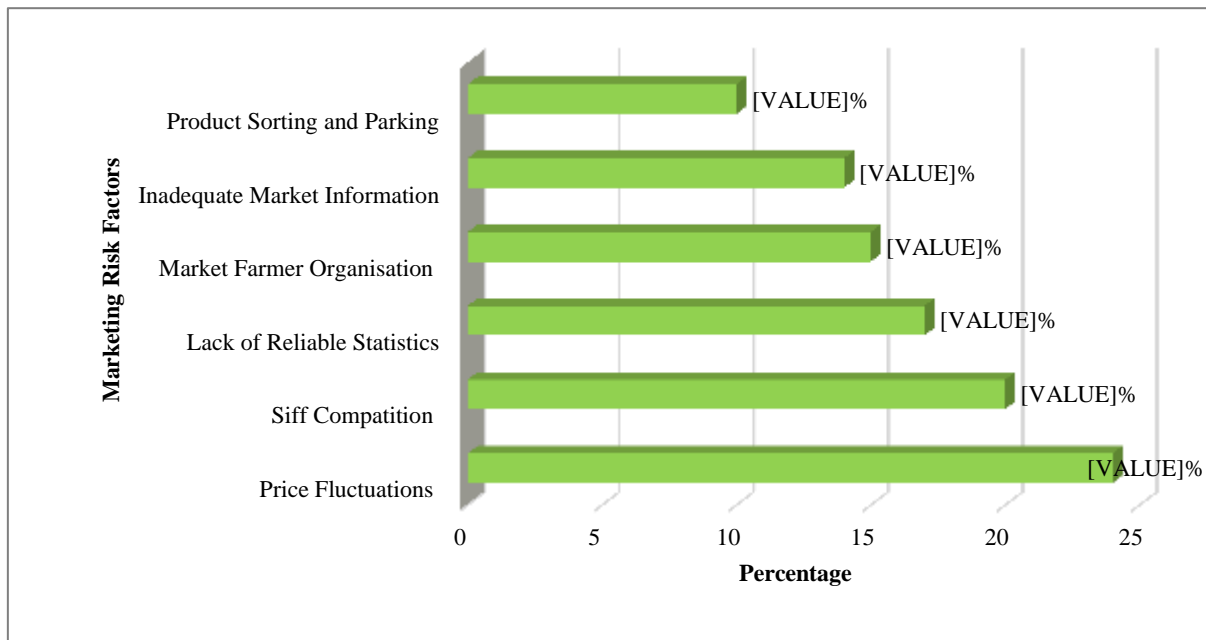


Figure 2:Marketing Related Factors Affecting Horticulture Sub-Sector in the Study Area.

Source: Field Survey (2021)

As revealed by the findings, among identified marketing risk factors affecting the horticulture sub-sector in the study area is high market price fluctuations due to the high seasonality of supply of horticulture crops. Among the surveyed respondents, 24% admitted the prevalence of this impediment. High market fluctuations of

horticulture crops are largely influenced by the production patterns of horticulture crops. It was revealed that most of the horticulture crops are grown soon after the rainy season through ditches irrigation in the valley bottoms. The planting starts in early May and the harvest of the most horticulture crops starts three months later around August. The bumper harvest continues up to early

November. With these production patterns of horticulture crops due to seasonal patterns, the effect is harvest takes place at the same time. The resulting consequence is the saturation of horticulture crops in the market which in turn results in a severe decline in the price of horticulture crops in the markets. This situation results in the decline of profit accrued from horticulture production. It was revealed that some farmers reduce their investments in horticulture production due to a decline in profits caused by a severe fall in prices.

Moreover, the findings revealed that prices for horticulture crops were showing an increasing pattern during the rainy season around December to April. During this season most of the farmers diversified the crops grown and the fields are used for the growth of staple food crops particularly maize and potatoes. Some of the few farmers continued to grow horticulture crops during the rainy season despite the harsh condition for horticulture crops. It was revealed that during the rainy season the production of horticulture crops was difficult since the season is featured by incidences of diseases particularly fungi. Also in this season, it becomes difficult to control the amount of water in the field due to excessive moisture in the valley bottoms where production is taking place. Despite the higher prices of horticulture during the rainy season, the profit was still low due to the higher costs of maintaining horticulture crop production.

Stiff competition in nearby and distant markets was ranked the second among identified marketing-related factors impeding the prosperity of the horticulture sub-sector. As revealed by the analysis, 20% of all surveyed respondents unveiled the prevalence of this impediment. During the survey, it was revealed that only a small percent of horticulture crops produced in the study are consumed at the village level. Some of the horticulture crops produced in the study area were consumed in the region. However, the market of the Iringa region was also competitive due to the presence of nearby horticulture production districts within the region. Being located in the southern highlands of Tanzania, the Kilolo district faces competition from the nearby regions such as Njombe and Mbeya which are among horticulture production hotspots in Tanzania.

Additionally, the findings of the study revealed that stiff competition for the market of horticulture crops was also reported in the large urban market of Dar es Salaam. It was reported that horticulture crops from Kilolo District face stiff competition in the Dar es Salaam urban market. The competition is posed from northern and eastern horticulture production hotspots in the country, particularly in Morogoro, Tanga, Arusha, and Kilimanjaro regions. The competition was attributed to two major reasons. First, is the similarity of the horticulture production seasons among the two major horticulture producing zones in the country. The two major production hotspots of Tanzania namely the southern highlands and north-eastern highlands experience a similar season at the same time. The second reason contributing to stiff competition is the improvement of transport networks in the northern and eastern zone than the southern highlands. This in turn increased transport cost from southern highlands including Kilolo and hence reduce profit to horticulture farmers.

The lack of adequate and reliable horticulture production and trade statistics was ranked the third among marketing-related factors that affect the prosperity of the horticulture sub-sector in the study area. The analysis revealed that 17% of all surveyed farmers reported this impediment. The inadequacy and unreliable statistics have significant impacts on horticulture crop production as they limit the analysis and planning towards the development of the sub-sector. This is due to the fact that for effective planning in any business venture agriculture in particular there must be adequate information. The findings of this study revealed that there was a lack of statistics regarding production and trading of horticulture produce. This situation was associated with the nature of production which was organised in small plots making the difficulty to quantify the actual amount produced. Also, the lack of statistics resulted from poor record-keeping from the level of individual farmers to ward and district levels. Moreover, the absence of clear units of measurement of horticulture crops contributed to inadequate statistics regarding production and trade of horticulture crops. During the field survey, the researcher observed that different mechanisms such as buckets, iron tin, sacks, locally made baskets which were locally known as “tenga” and even the collected mound of horticulture crops were used in measuring horticulture crops.



Plate 1: Farmers waiting for the Track along the Road with their Tomato Baskets locally known as “Tenga” in Bomalang’ombe Village.

Source: Field Survey (2021)

The absence of strong farmer organisations was ranked the fourth impediment among marketing-related factors that affect the prosperity of the horticulture sub-sector in the study area. The analysis revealed that 15% of the surveyed respondents affirmed this impediment. It was found that most of the farmers were selling their horticulture crops individually. Only a few farmers were selling their crops collectively through their organisations. The absence of marketing farmer organisations in the study area was reported to reduce the power of horticulture producers in the market, particularly in the Dar es Salaam urban market which in turn traders dominate the market and thus dictate the prices for horticulture crops. The study revealed that the large market of Dar es Salaam had a long chain with many actors who gain more from the expenses of horticulture producers. The presence of many actors in the horticulture market chain ranges from the village level brokers, district brokers, brokers at Dar es Salaam markets, and the

retailers to small vendors. These findings from the questionnaire survey correspond with the findings through an in-depth interview as one experienced farmer reported:

".....The trade of horticulture crops is complex due to the presence of many brokers in the market chain. These brokers have very strong power in deciding the price. For instance, it was two years past when I tried to organise with my three friends and we hired the track to carry our produce to Mabibo market in Dar es Salaam. When we reached the market all brokers were escaping us. After two days one broker agreed with us to buy our produce at a very low price. Because we had no option we agreed though the profit was small....." (A man aged 41 years old at Bomalang'ombe village.)

The fifth marketing risk factor that affects horticulture performance is inadequate market information. The findings revealed that 14% of the surveyed farmers reported having inadequate information regarding market. Two important market information were missing among horticulture farmers in the study area. First, is the price information regarding the range of horticulture crops particularly in major urban markets of Dar es Salaam. Since the prices for horticulture produce are determined by the forces of demand and supply, thus it is subjected to changes over time. The findings revealed that farmers in the study area were lacking information regarding changes in prices for horticulture crops over time and thus increasing the chance of getting low profits and sometimes even losses. Second, information about quality specifications was also missing among horticulture producers in the study area. Uncontrolled use of chemicals such as insecticide and industrial fertilizers in horticulture production in the study area reduced the competitiveness of the produce from the study area, particularly in the export market. Horticulture crops from the study area were reported to have an excessive amount of chemicals as farmers were not aware of the minimum residue limits.

Lack of expertise in product sorting and packing was ranked the sixth among marketing-related factors that affect horticulture performance in the study area. The findings revealed that 10% of all surveyed households mentioned this impediment. It was observed that horticulture produce from the study area was transported to the market without sorting. This reduced the competitiveness of the horticulture crops from Kilolo, particularly in the international market. Also, it was revealed that parking of horticulture crops was poorly done using local parking materials which are not sufficient enough to maintain the quality of the produce. The use of poor packing materials resulted in damage to horticulture crops during transportation to market centers.

Therefore, a lack of expertise in product sorting and packing reduced the competitiveness of the horticulture produce from the study area in potential markets, particularly the international market.

About marketing-related factors the findings of the present study, to some extent are in the same line with the policy brief of Mwombela (2021) on enhancing the competitiveness of the horticultural industry in Tanzania. The policy brief pointed out that limited marketing strategy and information gap hinder horticultural productivity and trade which involves branding of potential horticultural products in the world market, seeking potential market sources for horticultural products, and a clear understanding of the international standard requirements for horticultural products. Despite the role played by different horticulture actors such as TAHA in linking various farmers to different market channels, farmers and traders, in general, have limited market techniques and information essential in sustaining production and trade competitiveness of the horticulture sub-sector. Nonetheless, unlike the present study, the policy brief did not show the magnitude through which each factor affects horticulture crop production.

Production Risk Factors: Production risk factors were ranked second among the risk factors affecting horticulture production in the study area. The analysis revealed that 27% of the surveyed farmers reported that production risk factors are among the major limiting factors that affect the performance of horticulture crops. The magnitude of these limiting factors was also reported differently across the study villages. Results revealed that 31% of all respondents from Bomalang'ombe villages reported these limiting factors while 29% and 24% of respondents from RuahaMbuyuni and Ilula villages respectively (Table 2). The variation of the magnitude of production risk factors was attributed to the locations of study villages with reference to specific agro-ecological zones.

The findings revealed major four production risk factors that are related to the inputs, processes, and outputs in horticulture production. These factors range from climatic variability to human factors. The identified production risk factors were inappropriate post-harvest handling (32%), rainfall variability (28%), pests and diseases incidences (24%), and unspecialized horticulture extension services (16%) (Figure 3). Some of these factors are nature-related incidences such as rainfall variability and diseases and pests and thus they are difficult to be resolved. Other production risk factors such as inappropriate post-harvest handling and unspecialized horticulture extension services are human-related incidences and thus they are within human control.

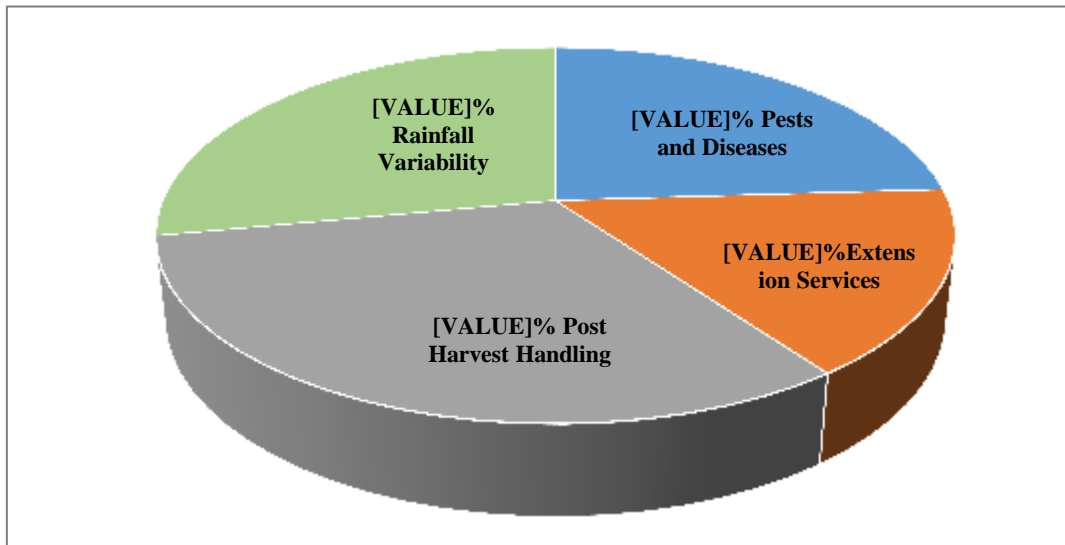


Figure 3: Production Risk Factors affect Horticulture Production in the Study Area.

Source: Field Survey (2021)

Post-harvest handling includes a range of activities from harvesting, loading, and unloading, transportation and transport facilities, storage facilities, and storage facilities. Findings from the present study show that inappropriate post-harvest handling is among the major production limiting factors for the progress of horticulture production in the study area. Analysis shows that 32% of the households identified that, inappropriate post-harvest handling is a serious impediment (Figure 4). Due to the perishable nature of most of the horticulture produce, inappropriate post-harvest handling leads to severe losses of the produce. The findings revealed that inappropriate post-harvest handling has been associated with other factors. Among them are a shortage of appropriate storage facilities and inadequate transport infrastructures. Therefore, there is an interdependence of factors affecting horticulture production in the study area. Since the presence of one factor may accelerate the other factors as it has been seen, a shortage of appropriate storage facilities and inadequate transport infrastructures may lead to severe losses.

Rainfall variability was ranked the second among identified production risk factors limiting horticulture production in the study area. The analysis revealed that 28% of all surveyed horticulture farmers reported rainfall variability as one of the obstructions in production. Most horticulture crops particularly vegetables and fruits need a substantial amount of water though under controlled conditions. Although horticulture production in the study area takes place during off rain season the preceding scant rain season results in less moisture in the fields located in the valley bottoms locally known as “vinyungu” where production is taking place. During the survey, farmers reported that in recent years there is an increase in incidences of scant rains which resulted in moisture deficiency in horticulture fields. Additionally, scant rains reduce the amount of water in the rivers which are also used for irrigating horticulture fields. Nonetheless, it was reported that though rarely, some of the years experience severe rains which in turn resulted in

excessive moisture in the valley bottoms hence poor performance of horticulture production.

Pests and disease incidences were ranked the third among production risk factors that hamper the good performance of the horticulture sub-sector. The findings revealed that 24% of all surveyed farmers unveiled that pests and disease incidence is among the major limiting factors. It was reported that the high incidence of pests and diseases has increased in recent years, particularly during the wet season. The prevalence of pests and diseases that affects horticulture crops in the study area resulted in a multitude of consequences. First, decrease on both the quantity and quality of the produce. Second, excessive use of insecticides and pesticides in turn increases the cost of production and thus reduces the number of profits. Additionally, excessive use of chemicals to control pests and diseases affects horticulture crops in the study area and has resulted in low competitiveness in the international markets due to high chemical contents.

Unspecialized horticulture extension services were ranked the fourth among identified production risk factors impeding the successful performance of the horticulture sub-sector. The analysis shows that 16% of all surveyed respondents disclosed the prevalence of this impediment. During the field survey, it was noticed that most of the farmers were not able to excess extension services. This situation was attributed to the absence of specialized horticulture extension experts in the study area. Although all study wards had agriculture extension officers none of them specialised in horticulture crops. The only horticulture specialised extension officer was found at the level of the district. It was not easy for one horticulture specialist who was stationed in the district to visit all farmers at the village level and provide technical assistance. Therefore, horticulture farmers were operating through their own experiences without technical assistance a situation which increased the chance of getting lost as one farmer narrated.

“..... I have been growing tomatoes in this area for more than 15 years but I have never received any

technical assistance from the extension officer. What I'm using is my own experience gained over several years. But sometimes I face new challenges particularly some diseases which were not common in the past years. If that happens, I usually seek advice from the sellers of agrochemicals....." (A man aged 50 years old at RuahaMbuyuni village.)

Due to a shortage of unspecialized horticulture extension experts, it was found that there is inadequate extension services provided to the horticulture farmers in the study area. Farmers were lacking important techniques including selection of appropriate types of seeds to be grown, which season is better for what type of horticulture crop, what should be the space between one plant and the other, which types of fertilizers and agrochemicals should be applied, and when, and what are the marketing techniques. Such techniques are usually provided to farmers by the horticulture extension workers with good horticultural knowledge.

The findings of this study on the production risk factors to some extent correlate with the findings of SAII (2015) on Tanzania's horticulture sector outlook: "opportunities and challenges". In their study, it was reported that horticulture production is obstructed by several production risk factors such as lack of skilled workforce, low productivity of workers, and complexities in land ownership. However, the study of SAII (2015) focused much on providing up to date information on information on developments and opportunities for Dutch companies in the horticultural sector in Tanzania as well as indicating bottlenecks and limitations trading companies and/or investors face and will face when starting up

activities in Tanzania. Meanwhile, the present study confines itself to understanding the magnitude of the risk factors affecting small-scale horticulture farming in the southern highlands of Tanzania. Therefore, unlike the former study, the present study intends to unveil the extent to which different factors hamper the prosperity of horticulture produced by drawing examples from small-scale horticulture producers in the Kilolo District.

Inadequate Transport and Product Handling Factors: Inadequate transport and product handling factors have been pointed out as one of the major limiting factors affect horticulture performance in the study area. The analysis shows that 22% of all surveyed horticulture producers in the study area declared the prevalence of this stumbling block (Table 2). The magnitude of this limiting factor was equally reported in all three study villages where 22% of surveyed respondents from each study village mentioned transport and product handling factors as one of the major limiting factors affecting the horticulture sub-sector. The nature of the transport in the study area has implication for the handling of horticulture produce as it is associated with the losses caused by damaging the produce.

The analysis reveals major four factors limiting the prosperity of the horticulture sub-sector that are related to inadequate transport and product handling. These factors include inadequate feeder roads (36%), unsatisfactory track conditions (26%), lack of insurance from losses (25%), and corruption along highways (13%) (Figure 4). These transport-related factors impede the performance of horticulture by increasing the cost of production and marketing which in turn reduces profits.

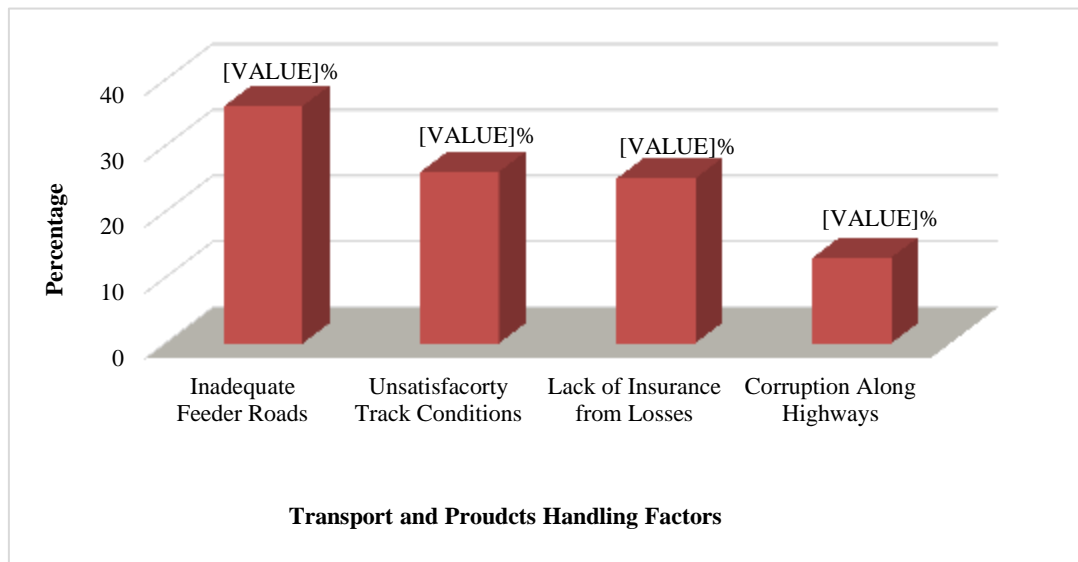


Figure 4: Inadequate Transport and Product Handling Factors affect Horticulture Production in the Study Area.

Source: Field Survey (2021)

Transport networks, road transport in particular involve the interconnections of roadways that links different places ranging from remote areas to peri-urban and urban areas. Through roadways interconnections, feeder roads play a significant role in linking remote areas with the urban area. Findings from this study show that inadequate feeder roads were a major transport-related

factor that limits the good performance of horticulture production in the study area. Analysis reveals that 36% of all surveyed horticulture producers asserted this obstacle (Figure 4). During the field survey, it was observed that there were few feeder roads and they were in a bad condition. Farmers reported that during the wet season some of these feeder roads are not passable. Inadequate feeder roads in the study area shad two major impacts on

horticulture farming. First, high cost of transporting farm inputs which are manufactured in industries mostly located in urban areas thus a high price for such inputs. Second, increase in the cost of transporting horticulture produce to market areas which are mostly found in distant urban areas. This in turn reduces and competitiveness of the products from other horticulture producing areas hence lowering profit.

The unsatisfactory track condition was ranked the second among identified transport and product handling factors limiting horticulture production in the study area. The analysis reveals that 26% of all surveyed horticulture producers reported this impediment. Due to the unattractive conditions of the feeder roads, many track owners were not willing to allow tracks in good condition to penetrate the production sites. They allowed old and unsatisfactory tracks to excess remote areas where horticulture production is taking place. The use of unsatisfactory old trucks resulted to delaying in horticulture production to the market ercenters due to frequent breakdowns. This situation resulted in losses as most horticulture crops have a short shelf life.

Agriculture activities are one of the high-risk economic activities due number of uncertainties that are beyond the farmer's control. Such risks range from climatic factors to market-related factors. The extent of risk is even more in horticulture crop production due to the delicate nature of most horticulture crops. During the field survey it was revealed that farmers were not ensuring their business venture in any stages of production and transportation. Results reveal that lack of insurance from losses was ranked the third among identified transport and product handling factors limiting horticulture production in the study area. The analysis revealed that 25% of all surveyed horticulture producers pointed to this impediment. This situation exposes farmers to a high risk of getting losses.

Corruption along highways is a frequently reported incidence in Tanzania. This practice involves illegal payments of bribes to the traffic police to get favour due to unlawful use of the road. This impediment was ranked the fourth among identified transport-related factors. The analysis shows that 13% of all surveyed horticulture producers reported this impediment. Corruption along highways was associated with two major reasons. First, unsatisfactory track conditions, and second excessive loading of horticulture produce beyond the track capacity. During a field survey, it was reported that corruption along highways is associated with low prices paid to horticulture producers. This is because traders pay corruption along highways at the expense of the farmers in form of low prices for the horticulture produce.

About inadequate transport and product handling factors, the findings of this study coincide to some degree with the findings of MMA (2017) on horticulture study phase 1: Mapping of production of fruits and vegetables in Tanzania. In their study, it was revealed that one of the main constraints for the growth and competitiveness of horticulture in Tanzania is the inefficiency of business development infrastructures such as appropriate transportation systems especially the cold and preservation infrastructure. The findings of MMA (2017) further revealed that the cost of transport particularly for export is higher compared to other neighboring countries. For instance, the transport costs in Tanzania constitute 46% of the total value of export consignments while in Zambia they are just 17%. However, the study of MMA (2017) covered the production of horticulture all over the country without showing regional or zonal variation in horticulture production. The present study confined itself to major horticulture producing zone particularly mountainous regions represented by the Kilolo district with a high concentration in horticulture production.

Processing Factors: Significant development of any agriculture system depends on the development of the agro-processing industry. These industries are essential in increasing the value of agricultural produce as well as increasing the long shelf life of agriculture crops. The development of agro-processing industries particularly in horticulture production is significance due to the short shelf life of most horticulture produce. The findings of this study reveal that there are scant agro-processing industries for horticulture crops in the study area. The analysis shows that 18% of all surveyed respondents admitted the prevalence of this limitation (Table 2). The magnitude of these limiting factors was experienced almost equally across the study villages. Results revealed that 21% of all respondents from Ilula village reported these limiting factors while 17% and 14% of respondents from RuahaMbuyuni and Bomalang'ombe villages respectively (Table 2).

Further analysis reveals major three factors limiting the prosperity of the horticulture sub-sector that is related to processing constraints. These factors include underutilization of existing horticulture processing industries (40%), substandard small-scale horticulture processing firms (35%), and inaccessibility of affordable horticulture processing technologies (25%). (Figure 5). These processing limiting factors result in severe post-harvest losses for horticulture crops, especially during bumper harvest.

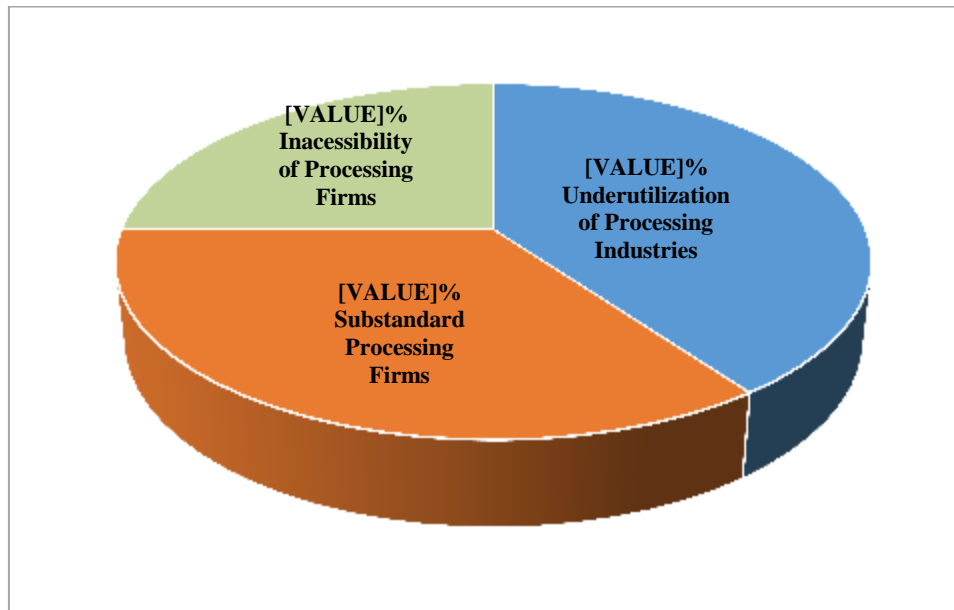


Figure 5: Inadequate Transport and Product Handling Factors affect Horticulture Production in the Study Area.

Source: Field Survey (2021)

Underutilization of existing horticulture processing industries was ranked the first among identified processing limiting factors affecting the horticulture sub-sector in the study area. The analysis revealed that 40% of all surveyed respondents reported this impediment. During the field survey, it was noticed that there was no horticulture processing industry in the study area. However, surveyed horticulture producers reported the presence of horticulture crops processing industries within the region around 40 kilometers away. The two mentioned horticulture processing industries found in the Iringa regions were Dabaga and Ivory factories which were dealing with tomato processing. The researcher dared to visit the two mentioned industries to investigate the reasons why the industries failed to create huge markets for tomatoes in the study area and nearby areas. The findings revealed that both industries were underutilized by 60% to 50%. Three major factors were responsible for this situation. Those factors are low local product demand, stiff unfair competition from imports, and unfavourable tax policies. Therefore, despite the existence of some horticulture processing industries nearby the study areas, the problem of marketing horticulture produce was reported to be one of the major limiting factors toward horticulture sub-sector development.

The presence of substandard small-scale horticulture processing firms was ranked the second among identified processing limiting factors affecting the prosperity of the horticulture farming system in the study area. The analysis revealed that 35% of all surveyed horticulture producers mentioned this hurdle. During the field survey, it was unveiled that there was the existence of some small-scale agro-processing firms. These firms were faced with multiple challenges such as a shortage of markets of their produce due to poor product quality particularly packaging and labeling lack of quality, and safety marks. These challenges were associated with bureaucratic and costly government business licensing and product standards certification procedures, lack of computerized

and accessible production database, and lack of transparency in export trading. This situation results in low utilization of horticulture produces as raw materials hence insufficient markets for horticulture produce.

Inaccessibility of affordable horticulture processing technologies was ranked the third among identified processing limiting factors affecting the horticulture farming system in the study area. The analysis reveals that 25% of all surveyed horticulture producers admitted the prevalence of this impediment. The establishment of any processing firm needs technology, initial capital, and fund for daily operations in production processes. Most of these new technologies are expensive thus depriving newly emerging entrepreneurs to get into a business venture. Difficulty access to affordable agro-processing technologies was associated with the inaccessibility of finance among horticulture producers in the study area. During the survey, it was revealed that farmers and newly emerging agro-processing entrepreneurs were not beneficiaries of loans from financial institutions, particularly banks. This situation resulted from unfavourable conditions created by financial institutions in providing loans to borrowers. Therefore, most horticulture crop producers and newly emerging entrepreneurs lacked the securities needed for accessing loans from financial institutions.

The findings of the present study concerning processing risk factors hampering the horticulture sub-sector to some extent correlate with the finding of Mashindano et al., (2013) who conducted a study on tapping export opportunities for horticulture products in Tanzania: do we have supporting policies and institutional frameworks? The findings of the study of Mashindano et al., (2013) revealed that there is a weak base for horticulture produce processing firms in Tanzania. This in turn makes it difficult value addition for horticulture crops hence low competitive levels in the world markets. Nevertheless, the study of Mashindano et al., (2013) paid more attention to tapping

opportunities for export markets leaving aside opportunities that exist in domestic markets. The present study dared to pay attention to both domestic and export markets to gain a deep understanding of the magnitude of the risk factors affecting small scale horticulture farming in the southern highland of Tanzania represented by the Kilolo District

Conclusion

The study was conducted in the Kilolo district, one of four districts of the Iringa region. It attempted to investigate the magnitude of the risk factors affecting small-scale horticulture farming in the study area. The results reveal that marketing-related factors were ranked high among factors that affect horticulture crops production in the study area. It was followed by production risk factors, transport, and product handling factors. Either it was observed that there was greater interdependence of these risk factors meaning that the presence of one factor triggered the occurrence of another. For instance, transport and products handling factors trigger the occurrence of marketing-related factors. Similarly, processing risk factors were also pointed out as one of the key factors that affect horticulture production and deprived most of the farmers of accessing substantial profit from horticulture produce. Additionally, it was observed that there is an insignificant variation in the magnitude of these risk factors that affect horticulture production across the study villages. This means that identified risk factors were almost equally reported across study villages.

For all respondents, horticulture production is a major source of cash income as well as food. It is thus recommended that the scientific investigation should be directed towards investigating the appropriate intervention measures that will focus on addressing these key factors that affect horticulture production. With such intervention measures, there will be an increase in horticulture crop production which in turn will help to ensure adequate nutrients obtained from horticulture crops as well as generate more cash income. This will help in improving living conditions among the farmers and eventually contributes toward rural poverty alleviation.

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