

**CONTRIBUTION OF SPICE FARMING TO HOUSEHOLD'S INCOME ON
THE SLOPES OF ULUGURU MOUNTAINS, MOROGORO TANZANIA**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN PROJECT
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EXTENDED ABSTRACT

The current study aimed at assessing how spice farming contributes to household's income of smallholder farmers on slopes of Uluguru Mountains. Specifically, the study intended to identify types of spices cultivated in the study area, examining the contribution of spices to household's income, determining farmers' attitude towards organic spice farming and assess challenges facing spice farming households in the study area. The study adopted the cross-sectional research design whereby data was collected from 120 respondents randomly selected from four purposively selected wards of Morogoro District. The wards covered were Kinole, Mkuyuni, Mtombozi and Tawa. Primary data from respondents were collected through a pre- structured questionnaire with both open and closed-ended questions. In addition, primary data were collected from 11 key informants. Quantitative data collected through questionnaire were analysed using SPSS software version 20 whereby descriptive and inferential (Chi-square test and Paired sample t-test) were determined. Generally, study findings show that black pepper, cinnamon are the most cultivated spices in the study area. Study findings also, show that income generated from spices especially vanilla, black pepper and cinnamon were higher compared to income generated from other crops ($p < 0.007$, $t = 2.727$). Findings further show that the surveyed farmers have a favourable attitude towards organic spice farming that they have understood the importance of organic practice in conservation of the environment. Also, findings show that fungi disease affecting black pepper is the major problem followed by poor market arrangement. Study concludes, that both sales from spices and from other crops were the sources of household's income. However, spices sales generated larger portion of income compared to sales from other crops. Also, respondents have understood the relationship between organic practices and environmental conservation. Furthermore, the prosperity of spice production in Uluguru Mountains is threatened by fungi disease and poor market arrangements.

Therefore, the study recommends that farmers should increase the production of black pepper, cinnamon and vanilla because there is a reliable market for them. Also, spice stakeholders such as SAT and Spice Up Project should introduce hybrid varieties of spices which are resistant to diseases and pests. Furthermore, the Ministry of agriculture should enact law which will regulate middle person conduct when buying spices direct from farmers.

DECLARATION

I, Ainessy Ngolle, do hereby declare to the senate of Sokoine University of agriculture that this dissertation is my original work and that it has neither been submitted nor concurrently being submitted in any other institute for the purpose of an academic award.

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Date

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Date

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LIST OF ABBREVIATION AND ACRONYMS

ASDP	Agricultural Sector Development Programme
BET	Board of External Trade
CBI	Centre for Promoting Imports from Developing Countries
DED	District Executive Officer
EAMCEF	Eastern Arc Mountains Conservation Endowment Fund
EO	Extension Officer
ITC	International Trade Centre
IFOAM	International Federation for Organic Agriculture Movement
KG	Kilogram
NEI	Natural Extract Industry
NEMC	National Environmental Management Council
SAT	Sustainable Agriculture Tanzania
TZS	Tanzania Shillings
TDV	Tanzania Development Vision
SDGs	Sustainable Development Goals
SNV	Stichting Nederlandse Vrijwilligers (Foundation of Netherlands Volunteers)
SPSS	Statistical Package for Social Sciences
SUA	Sokoine University of Agriculture
URT	United Republic of Tanzania
UN	United Nation
WEO	Ward executive officer
USA	United States of America

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Spice production is among economic activities performed by many smallholder farmers in Africa, Asia and Latin America (Kinyau, 2018). The origin of spices production can be traced back to the south Asia spice trade with the Mediterranean region (Gilboa and Namdar, 2015). Globally, the production of spice is dominated by Asian countries whereas India is the largest producer contributing (86%) of the total production followed by China (3%), Bangladesh (3%), Sri-Lanka (2%), Pakistan (2%), Turkey (2%), Nepal (1%) and few countries of Africa such as Ethiopia, Egypt, Nigeria, Uganda and Tanzania. The demand for spices in Europe and North America (USA) rose by 6.6% from 300 Tons in the year 2013 to 380 Tons in the year 2017 and it is expected to grow by 5.1% in the year 2021 this is according to Centre for promoting imports from developing countries (CBI, 2018).

The spice industry is widely dominated by smallholder farmers (Muyengi, 2012). In Tanzania spices are cultivated largely in Zanzibar, followed by Tanga (Muheza) and Morogoro (slopes of Uluguru Mountains). The history of spices in Tanzania can be traced back to the Portuguese traders' invasion along the coast (Zanzibar) in the 16th century (Hassan, 2015). Spices such as black pepper, cloves, and ginger are used in the flavouring different foodstuff and beverages (Severine, 2016). Spices like garlic, turmeric, rosemary, cinnamon and thyme have been used for decades as traditional medicine (Gupta 2010). Almost all spices have medicinal value either to be directly or indirectly used in pharmaceutical industries as raw material for various medicine and cosmetic industry (Garu, 2017). Spice production improves livelihood of small-scale farmers through income generation, whereby households cultivating spices have been reported to have high

incomes (Sieber *et al.*, 2015; Tesfa *et al.*, 2017). Also, organic spices fetch premium prices in the market (Abdelrad and Abdelshafi, 2017). According to International Federation for Organic Agriculture Movement (IFOAM), organic farming is believed to produce safe foods as it does not allow the use of industrial fertilizer or pesticides (IFOAM, 2007).

The agro-climatic condition of the Uluguru mountains favour the production of spices such as lemongrass, cloves, chilies, black pepper, cinnamon, turmeric, ginger, and vanilla (BET, 2002).

Sustainable Agriculture Tanzania (SAT) is implementing Uluguru Spice Project (USP) to improve the local spice value chain through the provision of training that intends to equip farmers with organic practices and processing thus increasing productivity and revenue (SAT, 2019).

1.2 Problem Statement

Despite favourable agro-climatic conditions of the Uluguru Mountains, majority of smallholder's farmers are poor (Kinyua, 2018). The traditional cropping in the Uluguru Mountains is dominated largely by bananas, maize, and vegetables which provides little income to households. (Rutatora and Mattee, 2001). There is a high level of poverty in Morogoro as 28.2% of rural households have been reported to fail to meet their basic consumption needs (URT, 2014).

Previous studies (Hassan, 2015; Severine, 2016; Garu, 2017) have focused on the importance and exportation of spices. However, the contribution of income from spice production and farmers attitude towards organic spice farming is not well documented. Therefore, the purpose of this study was to investigate the contribution of spice production on household's income and farmers attitude towards organic spice farming.

1.3 Justification of the Study

Crop diversification to high-value crops like spice, may improve their income and help to reduce poverty (Hassan, 2015). The cultivation of spices has drawn the attention of many farmers because of the good price. Spice improves the livelihood of smallholder farmers through income generated from selling spice and spice products (Abdelrad and Abdelshafi, 2017).

The empirical findings from the study also contributes to the reflection of Agricultural Sector Development Programme Phase II (ASDP II) that focus to support farmers to graduates from subsistence farming to commercial status thus practicing farming as business, Tanzania Development Vision 2025 (TDV) which emphasizes growth and reduction of income poverty (URT, 2000) and Sustainable Development Goals-goal number one which address poverty reduction (UN, 2015). The study findings could help policy makers and other stakeholders interested in promoting spice production in the Uluguru Mountains

1.4 Objectives of the Study

1.4.1 Broad Objective

The overall objective of the study was to assess how spice farming contributes to households' incomes of smallholder farmers on the slopes of Uluguru Mountains.

1.4.2 Specific objectives

Specifically, the study aimed at:

- i. Identifying types of spices cultivated in the study area.
- ii. Examining the contribution of spices to household's income
- iii. Assessing challenges facing spice farming households in the study area
- iv. Determining farmers' attitude towards organic spice farming

1.5 Research questions

- i. What are the popular spices produced in the study area?
- ii. To what extent does spice farming contribute to household income in the study area?
- iii. How receptive are farmers to organic spice production in the study area?
- iv. What challenges do spice producing households encounter in the study area?

1.6 Conceptual Framework

The study's conceptual framework Fig 1. is based on the assumption that demographic factors: age, sex, educational level and marital status can influence smallholder farmers' choice of types of spices (black pepper, cinnamon, cardamom, cloves, ginger, turmeric and vanilla) to cultivate, choice of storage facilities and what price to sell and search for markets that will lead to high revenue. Also, institution factors such as training is expected to guide spice farmers on the best farming practice that can increase spices yield and quality. Furthermore, presence of market with premium price affects total household income. In addition, the sale of other crops such as bananas, coconuts, cassava, vegetables and fruits have the potential of increasing household income. Therefore, earnings from spice and other crops are the major source of household income.

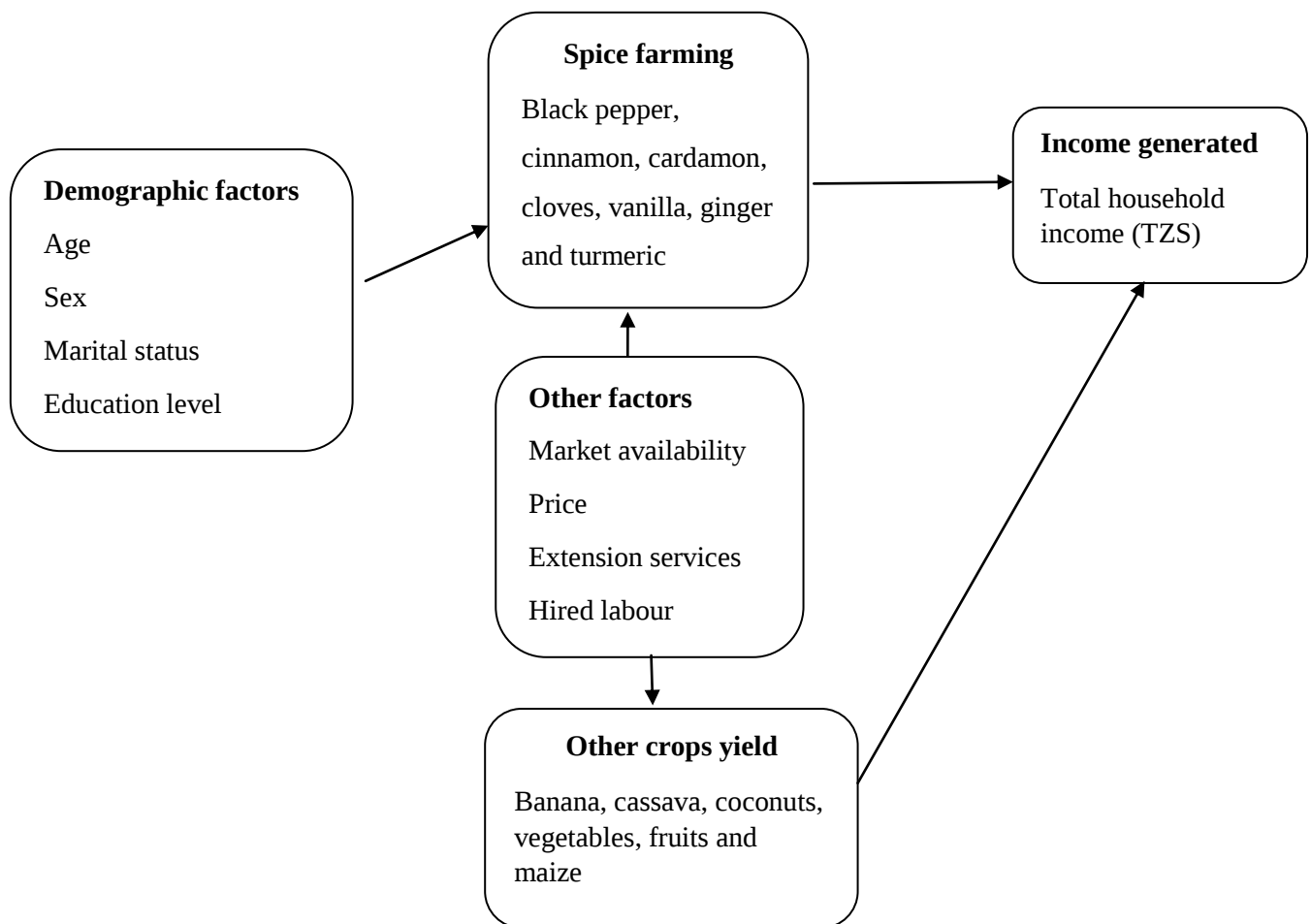


Figure 1.1: Conceptual framework on the contribution of spice farming on household's income to smallholder farmers

Source: Author's own construct

1.7 Organization of the Dissertation

This dissertation is organized into four chapters; chapter one presents background information of the study, problem statement, study justification, objectives, research questions, the conceptual framework and limitation of the study. Chapter two presenting manuscript one which dealt with spices cultivated and its contribution to household's income on the slopes of Uluguru Mountains. Manuscript two which is presented in chapter three, explores farmers attitudes towards organic spice production and challenges facing spice farming households. Chapter four presents conclusions and recommendations.

1.8 Limitation of the Study

During the study, it was noted that farmers do not keep trend data on income sales from various sources. Thus, it was difficult to collect trend data that would allow the researcher to compare income from spices and other crops.

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CHAPTER TWO

2.0 CONTRIBUTION OF SPICE FARMING TO HOUSEHOLD'S INCOME ON THE SLOPES OF ULUGURU MOUNTAINS MOROGORO REGION, TANZANIA

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2.1 Abstract

Spice production is important source of income to smallholder farmers on the slopes of the Uluguru Mountains. However, there is few information on the extent to which spice contributes to these household's income. Generally, the paper determines the contribution of spice farming to household's income. Specifically, the paper identifies the main types of spices produced on the Uluguru Mountains, determines income from spices and its importance to the smallholders' farmers household compared to income from other sources. The study adopted the cross-sectional research design whereby, probability and non-probability sampling methods were used to select wards, villages, key informants and respondents. A questionnaire household survey, key informant interviews and observation method were used to collect data from 120 respondents. Descriptive statistics and a paired-samples t-test using Statistical Package for Social Sciences (SPSS version 20) were employed during data analysis. Study findings shows that black pepper, cinnamon and vanilla are highly produced. Although production of spices and food crops were the source of respondents' income, a large portion of incomes were generated from spice production. It is concluded that agro-climatic condition of the study area supports production of varieties of spice hence it is recommended that farmers should invest more in these spices. Also, local government authorities through extension officers should motivate and educate farmers to use good farming practices that can increase spice production.

Keywords: Spices farming, Household income, Uluguru Mountains, Morogoro, Tanzania

2.2 Background Information

Spice is part of plant that has a pungent flavour that is used to enhance appetite, add test, flavour, aroma and color to our foodstuff and can be used as a preservative agent (Hirasa and Takemasa, 1998). Spice can be in the form of a bud, fruits, seed, flower, bark, rhizome and bulb. Spices have become popular due to the increasing demand for ethnic tests (CBI, 2018). However, most individuals consume spices like turmeric and coriander because of their health benefits as described by the Ayurveda system of medication (Rathore and Shekhawat, 2008). Furthermore, spices have medicinal properties to be used in the production of medicine and beauty products (Gupta, 2010).

Spice production is a part of the horticultural industry that has a significant contribution to the livelihood of smallholder farmers in developing countries. (Garu, 2017). According to FAO (2019), spices have been identified as a niche product, and farmers are advised to produce them as a means of increasing their sources of income. Globally, the production of spices is dominated by Asian countries whereby India is the largest producer contributing (86%) of the total production followed by China (3%), Bangladesh (3%), Sri-Lanka (2%), Pakistan (2%), Turkey (2%), Nepal (1%) and other continents such as Africa (Garu, 2017). In Africa, spices are produced in Ethiopia, Nigeria, Uganda, Egypt and Tanzania (Muyengi, 2012). Tanzania exported 5,500 tons of spices from the year 2006 to the year 2011 valued at 38 200 000 USD (ITC, 2014). In Tanzania, spice farming is common in Zanzibar, Tanga, Morogoro, Kagera, Mbeya, Iringa, Kilimanjaro and Coast (BET, 2002).

Morogoro region's favourable agro-climatic conditions favour production of varieties of spices such as lemongrass, chilies, black pepper, cloves, cinnamon, cardamom, ginger, turmeric and vanilla. However, in Morogoro, there is specialization whereby Mtombozi

ward is dominant in turmeric production, Mkuyuni ward ginger production, while Kinole and Tawa wards produce all seven types of spices with high intensity of cinnamon and black pepper. The most important spices produced for both local consumption and exports are black pepper, cloves, cinnamon, cardamom, ginger, turmeric and vanilla which are mostly for export (ITC, 2014). Thus, income from high-value cash crops continues to be important for households in Tawa and Kibogwa wards in Morogoro District because agriculture is the main economic activity (Gwasa, 2007).

Several studies have been conducted on the importance of spice farming to farmers' livelihoods in East Africa (Senko *et al.* 2005; Hassan 2014; Garu, 2017). Furthermore, a study conducted by Zhu (2018) in Madagascar found that spices have the potential of alleviating smallholder farmers' poverty by increasing their revenue from sales of vanilla. Kinyau (2018) conducted a study on the contribution of spice production to the livelihood of smallholder farmers by determining the profitability of spice production, opportunities and investment challenges in spice production in Matombo and Mkuyuni Divisions in Morogoro District. However, the study did not investigate the importance of spice production to household income. Therefore, the contribution of spice production on household income on the slopes of Uluguru Mountains is not documented. Hence the purpose of this study is: to identify types of spices produced, determined income accrued from spices selling and its importance to the smallholders farmers' households compared to income from other sources.

2.3 Theoretical review

2.3.1 Subjective equilibrium theory of the farm household

This study based on the Subjective equilibrium theory of the farm household (Nakajima, 1986). The theory described household as a unit of decision making of all matters related to

farm; yield maximization technology to be used as well as where to sell farm products. In addition, the theory explains types of farms: *type I farms*, *type II farms* and *type III farms* that smallholder farmers can operate. Type I Farms are those that allow hired labour to participate in the farm while households' members are engaged in non-farm activities. Type II farms are self-sufficient in labour do not allow hired labour to participate in the cultivation of crops. Type III farms are those that hire in labour. Hired labour can be on a seasonal basis when labour requirements are high. Furthermore, the theory documented that today's total household income depend on a collection from different source of income. Including income from farm, non-farm, dividends, salary, pension and other forms of passive income.

It is important to understand how smallholder farmers operates (types of farm) in our context and source of household income. Spice Farm uses household's labour and hired labour during harvesting season. Since the study was carried out in typical farming households, income from spices and from the other crops were found to main sources of household income. However, some of the sources of income described by the subjective equilibrium theory of the farm household: passive income, dividend, non-farm income and pension were contrary to sources of income found in this study. The above mentioned sources of income reflected household status from developed countries. Therefore, for a household to generate higher income from agriculture and crops diversification is very important (Yamane *et al.*, 2018).

2.4 Methodology

2.4.1 Description of the study area

The study was conducted in the Morogoro District located in Morogoro Region. Morogoro District was selected because; varieties of spices are produced (BET, 2002) and Sustainable Agriculture Tanzania (SAT) is implementing a three-year program of supporting organic farming with a focus on spices. SAT trains farmers to process their

produced spices, through good agricultural practices, processing (grading based on size and quality), and value addition. The mean annual rainfall in the study area ranges from 1065mm to 2450mm which support spice cultivation. The rainfall distribution pattern is seasonal starting from December to May and the peak rainfall occurring in April in most of the study area (Msanya *et al.*, 2001). The communities in the study area mainly depend on agriculture as a source of income and means of livelihood (Yamane *et al.*, 2018).

2.4.2 Research design

The study used a cross-sectional research design in order to capture information based on the previous spice production (year 2020) within a short period (Bryan, 2012). In addition, the design was considered to minimize cost given the fact that the geographical location of selected villages were not easily accessible by bus or motor car.

2.4.3 Sampling procedure and sample size

The study population was farmers who are engaged in Uluguru Spice Project (USP). Multi-stage sampling was used. The first stage of sampling involved a purposive selection of four wards: Kinole, Mkuyuni, Mtombozi, and Tawa which produce varieties of spices according to data from SAT. The second stage involved selection of villages through simple random sampling. The villages selected were Kibwaya, Kisarawe, Mfumbwe, Lungeni and Tandai in which SAT operates. The sampling frame was obtained from SAT register. In addition, spice stakeholders were selected as key informants. The selected key informants were three extension officers, four farmers and four staffs from SAT.

The population of the farmers who are trained by SAT in the study area is 617, and therefore, the sample size for this study was 120 farmers selected from the list of 617 farmers. Based on literature which says that regardless of the population size the minimum sample size for the study in which statistical analysis is to be done should be at least 30 and above (Gray, 2014). Therefore, 120 cases is equal to representation by 19%. The sample was justified on the fact that too small sample diminishes the utility of the results and too large sample implies a waste of resources (Salum, 2017).

Table 2.1: Number of respondents per village

Villages	No of Spice farmers	No of Respondents
Tandai	180	36
Mfumbwe	95	23
Kibwaya	120	27
Lungeni	92	21
Kisarawe	60	15
Total	617	120

Source: SAT, (2020)

2.4.4 Data collection methods

Data were collected through a household survey using pre-structured questionnaire (appendix i), interviews (using checklists Appendix ii, iii and iv) and observation. The questionnaire enabled collection of information related to income obtained from spices sales and the sale of food crops. Also, key Informants provided quotation that were used to elaborate quantitative findings. Similarly, observations were done and some features, for example, production marketing of spices and harvesting of spices in the study areas were documented.

2.4.5 Data analysis

2.4.5.1 Quantitative analysis

Statistical Package for Social Sciences (SPSS version 20.0) was used in data analysis whereby both descriptive statistics (frequencies and percentage) and inferential statistics (paired-samples t-test) were determined.

A paired-sample t-test was used to test the hypothesis that incomes from spice production and production of other crops do not differ significantly. Paired-samples t-test requires variables to have a normal distribution (Wooldridge, 2005). Therefore, before running the paired-samples t-test, the incomes were checked for normality by computing histograms with normal distribution curves. Incomes from both spices and other sources were right-skewed, meaning that few farmers had high incomes compared to others. Therefore, to correct abdnominally transformation was done by using Log_{10} transformation ($\log X_{10}$).

2.4.5.2 Qualitative analysis

Key informants' interviews audios were transcribed, then translated thereafter a summary was created. Quotations obtained from these data were used to further elaborate quantitative findings.

2.5 Results and Discussion

2.5.1 Socio-economic characteristics of the respondents

2.5.1.1 Age of respondents

The respondents' age in the study area ranged between 18 and 73-years table 2.2 whereby less than half of respondents (30% and 26.7%) were in the age category of 44 to 56 years and 31 to 43 years respectively. Spice production is labour intensive as almost all activities in spice farming are done by hand. Furthermore, spice tree such as black pepper

vine tends to cline into other trees and therefore, a farmer needs to climb the tree or to use a ladder when harvesting (Fig.2.1). This finding is in line with the finding by Komarek (2010) who reported that, despite high returns, spice farming is labour intensive. This means that old people need to be supported by the younger generation or use hired labour when engaged in the cultivation and harvesting of spices such as black pepper.



Figure 2.1: A farmer harvesting black pepper

Source: Justus Vicent Nsenga, Department of Development and strategic Studies,
Sokoine University of Agriculture

2.5.1.2 Sex of respondents

Table 2.2 results show that more than half of respondents (69.2%) were male-headed households while female-headed households were (38.2%). Men in the study area

were more involved in spice production because it is a high earning cash crop. This is common in most of the African societies where cash crops such as spices are dominated by men. On the other hand, women are responsible for taking care of food crops and thus, in the end, they are left out when it comes to controlling cash crops (Mhando, 2005). Likewise, since most of the families are male-headed households, men will likely dominate the production of cash crops.

Further, it was reported that men had more access to markets compared to women because some of them owned transport facilities such as bicycles and motor cycles and thus, can send their produce to the market easily compared to women. This finding is in line with a study conducted in Indonesia by Hill and Vigneri (2014) who reported that, men have more access to markets compared to women. Their study revealed that men have network which help them to get right information compared to women. Also, men have access to informal meeting after farm works which women has no access to attends because their supposed to practice household chores.

2.5.1.3 Education level of respondents

The results in Table 2.2 show that more than half of respondents (61.7%) had attained primary education. Also, more than quarter of respondents (29.2%) have informal education. The result further shows that only (9.2) of respondents have attained secondary education. Education is important for the respondent to follow and implement various information passed by extension officers. Education simplify agricultural practices in the societies where complex machines such as combined harvester and tractors are used which led to increase in production, contrary to traditional agricultural setting whereby hand hoe and machette are used (Reimers and Klasen, 2013). This implies that not all spice farmers had the ability to replicate knowledge and thus hindering their adaptability to new

agronomic practices. This finding is in line with a study conducted in Nigeria by Oluwasola (2010) who reported that, the ability to access information and the use of technological innovations were influenced by education.

2.5.1.4 Marital status of respondents

The results in Table 2.2 show that more than three quarters of the respondents (90%) were married. Marital status is crucial in agriculture enterprises because all household's members participate. According to McCulloch and Ota (2002), family labour reduce farm operation cost and supervision as all capable members are fully engaged. There is a division of tasks whereby men perform heavy duties like climbing spices tree to harvest and pickling spices from the farm to home while women perform light duties such as weeding and post-harvest activities such as drying and storage. This result is similar to the results of a study conducted in Ghana by Naamwintome and Bagson (2013) who reported that, households with couples perform better in agriculture due to teamwork. Therefore, household size determines agricultural production.

Table 2.2: Socio-economic characteristics of respondents (n=120)

Variables		Frequency	Percent
Household head's age	18-30	24	20.7
	31-43	32	26.7
	44-56	36	30.0
	57-69	26	21.7
	70 >	2	1.7
Household head's sex	Male	83	69.2
	Female	37	30.8
Household head's education	Informal education	35	29.2
	Primary education	74	61.7
	Secondary education	11	9.2
Household head's marital status	Married	102	90.0
	Unmarried	12	10.0

2.5.2 Types of spices produced in Uluguru Mountains

Results, shown in Table 2.3 show seven types of spices produced in the study area with households producing at least three types. It was further reported that SAT provides training and inputs to encourage spice production. The following section discusses two types of spices produced which are dominant in the study area.

2.5.2.1 Black pepper production

More than a quarter (32.4%) of the respondents were involved in the production of black pepper in the study area (Table 2.3). Black pepper is a dominant spice because it is relatively easy to manage as it does not require close supervision as vanilla. Its cultivation practices are simple that is planting, weeding and harvesting and thus, leaving time for farmers to engage in other income-generating activities. In addition, it is easy to store black pepper as opposed to turmeric and ginger. Similarly, although it was reported that selling price for a Kilogram (Kg) of black pepper was TZS 3 500. It is easy to sell it, and agents collect it from the households, and encourage respondents to cultivate it. A similar observation was made in India by Thangaselvabal *et al.* (2008) who reported that management of black pepper vine is easy. About 5kg-15kg of pepper can be harvested from a well-managed black pepper vine in the study area. Similar findings were reported in India by Ravindran and Kallapurackal (2012) who reported that the quantity of black pepper to be harvested depends on farm management. That well irrigated vine with proper support and moderate shades produced a lot of peppercorn which are big in size.

2.5.2.2 Cinnamon Production

Less than a quarter (15.2%) of the respondents produced cinnamon (Table 2.3) Therefore, cinnamon was the second most spice produced by the surveyed households in the study areas. Cinnamon does not allow intercropping with other spices as it drains all the nutrients from the soil. The same was reported by Gwassa (2017) that cinnamon in

Morogoro is not inter-cropped with other crops such as bananas, coconut and citrus fruits. Therefore, a farmer needs a large piece of land to cultivate cinnamon which suggest for heavy investment.

Cinnamon production is done mostly in Tandai and Kisarawe villages because both areas, have well established markets that are easily accessible (Kinyau, 2018) thus, attracting both agents and traders from Uganda, Kenya and Zanzibar. Cinnamon is widely used in the varieties of spice masala and herbal condiments (Rema *et al.*, 2003). During the time of the research, farmers were chopping cinnamon into small pieces like chips as a value addition technique. This indicates that respondents have the possibility of selling their products in the village.

Table 2.3: Varieties of spices produced in the study area

Spice Name	Frequency	Percent
Black pepper	102	32.4
Cinnamon	48	15.2
Cloves	47	14.9
Ginger	37	11.7
Turmeric	29	9.2
Vanilla	28	8.9
Cardamom	24	7.6

2.5.3 Spices selling price

Among the seven types of spices cultivated in the study area vanilla seems to have the highest selling price as shown in (Table 2.4). Respondents cultivate vanilla because of assurance of the market and it is purchased easily by the Natural Extract Industries LTD (NEI) and other traders. Vanilla plants do not require direct sunlight and it can be intercropped with banana or jatropha trees. It takes three to five years for a farmer to start harvesting vanilla pods depending on the climatic condition and plant management. However, its agronomics

practices are quietly different compared to other spices. Vanilla production in the study area involves the following agronomic practices:

Mulching which helps vanilla plantations to be protected from soil run-off and direct exposure to the sunlight, it generates humus to vanilla plantations, control weed growth and slows down the evaporation process. According to Hernández (2011), mulching enhances adequate water to sustain vanilla plant from drying thought the year.

Irrigation, farmers in the study area water their vanilla plants using cans. Vanilla requires moist soil thought out the year because it has shallow roots thus, demands regular irrigation during the dry season. Sujatha and Bhat (2010), describe that vanilla plant provide high yields when it supplied with moist soil through the year. Artificial pollination by hand as natural pollination by an insect is not possible, vanilla flower must be pollinated by hand that is labor-intensive process (Tin and Chan, 2015). These findings are in line with the study conducted in Uganda by Kamares (2010) who reported that, vanilla production is labour intensive and therefore, farmers commitment is required for higher benefits.

Table 2.4: Spices selling price trend (Year 2017 - Year 2019)

Spice	Price (TZS per Kg)		
	2017	2018	2019
Black pepper	3-000	3-200	3-500
Cinnamon	2-200	2-500	2-700
Cloves	18-000	14-000	14-000
Ginger	1-000	1-000	1-500
Turmeric	400	500	700
Vanilla	80-000	90-000	100-000
Cardamom	16-000	24-000	27-000

As shown in Table 2.4 turmeric has the lowest selling prices in all three years. Turmeric agronomic practices are not complicated as compared to vanilla and it is an annual crop.

Respondents from Lungeni village where turmeric production is dominant reported that few traders were willing to purchase their turmeric and its selling price is declining as compared to other spices. During informal interviews, respondents from this village have started to show interest in cloves and vanilla production because turmeric production is no longer profitable. The quote below emphasizes the above

“turmeric has a low price in the world market and for a turmeric to get market must be free from salmonella bacteria which cause typhoid fever and other food borne-disease.” (Key Informant, SAT, 10th February, 2020)

2.5.4 Main uses of spices produced

This section presents the main uses of the spices produced in the study areas.

Commercial purposes

More than three quarters of respondents (80%) reported to sale their spices to the middlemen who come from Zanzibar and Uganda. Few traders from Uganda have hired houses in Tawe center which have been turned to the warehouse for spices such as cinnamon and black pepper. Since spices are cultivated mainly for sale, this indicates that there is market for products produced by the respondents. Although it was difficult to compare the local prices with those in the world market, the annual volume of spice trading in the World market is estimated at 1,500,000 tons per year while export of spices to Europe and America is estimated at 700,000 tons (ITC, 2014).

Herbs

As shown in Table 2.5 about (15%) of respondents reported to use a mixture of ginger, black pepper and lemon juice as a medicine to cure cough. This medicine is produced almost in every household when someone coughs. Furthermore, respondents reported that black pepper and ginger aid milk production in lactating mothers. These findings are in

line with the study conducted in India by Gupta (2010) who reported that apart from aroma test spices have medicinal properties to be used in the productions of medicine.

Local consumption of spices

Table 2.5 indicates that about (5%) of respondents reported to use spices such as cinnamon, ginger and black pepper on daily basis. Most of the food sold at local restaurants and even those cooked at some of the houses visited by researcher had no spices. The quote below emphasizes the above

“I normally drink tea without spices in a local restaurant” (Key informant, extension officer, Kinole ward, 20th January, 2020)

This indicates that species in the study areas are mainly for sale, and little amount is locally consumed. Therefore, it is not a luguru culture to eat spicy foods. This result is contrary to the findings of a study conducted in India by Kandiannan *et al.* (2017) which reported that India is both largest producer and consumer of spices.

Table 2.5: Uses of spice produced on Uluguru Mountains

Uses	Frequency	Percent
Commercial	105	80
Local consumption	40	15
Herbs	10	5

2.6 Income earned from Spices and other Crops

2.6.1 Other crops produced by respondents

The results in Table 2.5 indicate that more than half (66.7%) of the respondents cultivate bananas, which is the most cultivated food crop in the study area. The importance of bananas emanates from their uses; both as food and cash crop. Apart from bananas,

farmers were also growing cereals such as rice, maize and tubers including cassava. During informal interviews and observations in some of the study area it was observed that banana is produced throughout the year, and thus, farmers can sell and get income as well. Informal interviews with village leaders and extension officers revealed that during the rainy season banana are sold to purchase maize flour, which is a staple food in the study area. These findings are in line with findings of a study conducted in the Uluguru Mountain by Yamane *et al.* (2018), who reported that the villagers are food secure since they grow different types of food crops and banana production which plays a great role in ensuring that households are food secured.

Table 2.6: Other crops cultivated by spice farmer (n=120)

Name of crops	Frequency	Percent	Unit	Price (TZS)
Banana	98	66.7	1 (banana Bunch)	3 500
Cassava	52	43.3	Bag of 20 kg	15 000
Coconut	51	43.0	1	400
Rice Paddy	47	39.2	Kg 100	50 000
Maize	40	33.3	Kg 100	100 000
Vegetable	13	10.8	Bag of 20 kg	15 000
Sweet potatoes	10	8.3	Bag of 20 kg	15 000
Sesame	9	7.5	1kg	5000

2.6.2 Income from spices

Table 2.7 results show that about (45%) of the respondents earned between TZS 400 001 to TZS 600 000 per year from spices. Income from spices seems to be higher than income generated from other crops because spices are sold at a high price compared to food crops as indicated in Tables 2.4 and 2.5. Also, respondents reported that it is easy to remember income obtained from the sales of spices as it is occasionally obtained in lump sum.

2.6.3 Income from other crops

The results in Table 2.7 show that more than half (60%) of the respondents earned below TZS 400 001 per year from the sale of other crops. Respondents mentioned food crops

such as bananas, cassava and vegetables were the major crops that generate income. It was reported that banana is both food and cash crop though the only surplus is sold. Despite high engagement in banana production still, income earned by the respondents from selling banana is little: perishable food crop as they decompose within a short period, and it was sold at a low price as indicated in Table 2.6. These findings are similar to the study conducted in West Africa by John and Alemu (2007) which reported that surplus production of food crops leads to commercialization. Therefore, farmers are encouraged to increase the production of bananas as surplus can be sold to gain income. However, it was reported by the respondents that they gain more money from spices production than other crops (Table 2.8). Therefore, spice production is very important in the study area.

Table 2.7: Income from spices selling and from other crops per season (n=120)

Income from spices			Income from other sources		
Income (TZS)	Frequency	Percent	Income (TZS)	Frequency	Percent
< 400 000	32	26.7	< 400 000	72	60.0
400 001 – 600 000	54	45.0	400 001–600 000	24	20.0
600 001 – 800 000	15	12.5	600 001–800 000	17	14.2
> 800 000	19	15.8	> 800 000	7	5.8

2.6.4 Income gained from spices and other crops in 2019

Table 2.8 result shows that the mean value of income from spices was TZS 568 365 while the mean value of income from other crops was TZS 428 287.50. There is a strong evidence that income from spices was higher compared to income from other sources ($p < 0.007$, $t = 2.727$). Hence, income from spices was higher because spices are high-value cash crops: cash crop with high selling price. This finding is in line with the study conducted in Madagascar by Zhu (2018) who reported that income from spices especially vanilla was higher.

Table 2. 8: Comparison between income from spice selling and other crops (n=120)

Groups compared	n	Mean income TZS	t-value	df	Sig. (2tailed)
Income from spices	120	568 365	2.727	119	0.007
Income from other sources	120	428 287.50	2.727	119	0.007

2.6.5 Income contribution from each spice

Spice income contributes TZS 64 341 300 while other sources contribute TZS 51 394 500 on average in total household income for 120 households. However, results in (Fig 2.2) shows that black pepper which is cultivated by 104 households contributes TZS 25 446 000 of total income earned by spices. Also, cinnamon which is cultivated by 70 households contributes TZS 11 569 900 of income earned from spices. This finding is in line with the study conducted in Bangladesh by Haque *et al.* (2017) who reported that black pepper and cinnamon generated a lot of money. Therefore, effort must be made to maintain cinnamon and black pepper production on the slopes of Uluguru Mountains. Also, vanilla cultivated by few farmers (10) contributes to about TZS 2 240 000 of earnings. Despite high returns only few respondents are involved in vanilla production because it requires high investment in terms of time and management as discussed in section 2.4.3. This implies that farmers who cultivate vanilla have a higher chance of generating a lot of money compared to other spices. This finding is similar to the study conducted in Mexico by Tan and Chin, (2015) who reported that vanilla is the most expensive spices after saffron.

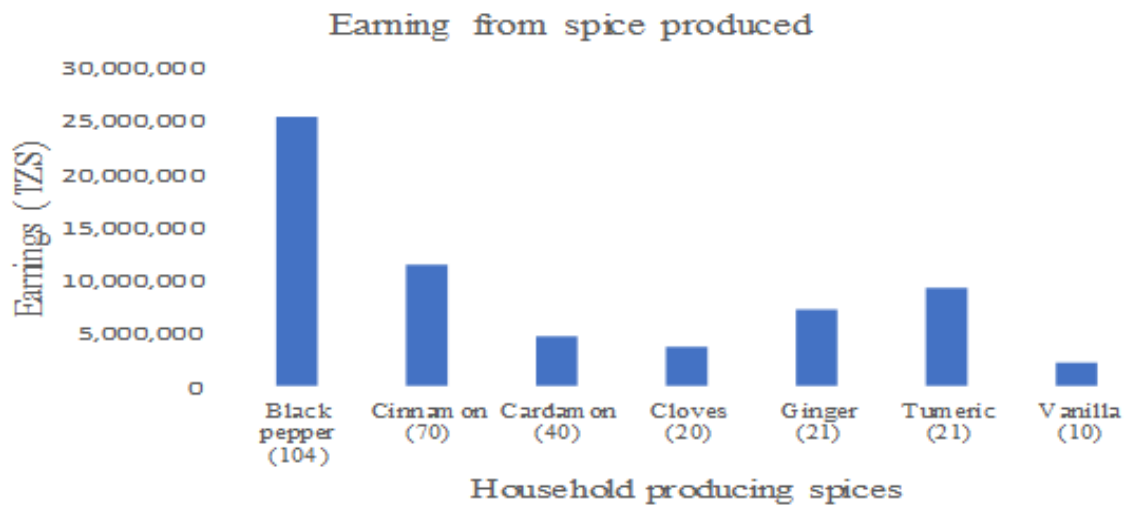


Figure 2.2: Earnings from each spice produced

2.6.6 Uses of income from spices

Table 2.9 findings show that above three quarter (80%) of the respondents use income from spice for domestic consumption. This implies that income from spices is used for basic needs such as food, shelter, school fees and medication. This finding is similar to a study conducted in Zanzibar by Garu (2017) who reported that income generated from spices has a significant contribution to the livelihood of smallholder farmers.

Informal interviews with a key informant's reported that spices generated lump sum of money at once, thus it was easy for a farmer to purchase large items such as iron sheets, motorcycles, build modern house, payment for medical expenses as opposed to other crops which offer a little amount of income. Furthermore, it was evidenced that income obtained from spices was also used to pay school fees for their children. The quotes below emphasises the above:

“After the sale of spices, I used that money to send my son who was selected to join form five in Kigoma Region.” (Key informants, spice farmer, Lungeni village 22nd January, 2020)

Furthermore, it is easy to plan on how to spend income from spices.

“After I get a lump sum from the sale of spices, I bought and installed a solar power” (Key informants, spice farmer, Mfumbwe village 24th January, 2020).

This indicates that income from spices is very crucial in improving livelihoods of a small holder farmers. These findings are in line with the study conducted in Vietnam by SNV (2019) who reported that spices production played a great role in the socio-economic development of Vietnamese.

Table 2. 9: Uses of income from spices (n=120)

Type of use	Frequency	Percent
Domestic use (housing, shelter, school fees, foods, and medication)	96	80.0
Investment on-farm activities (farm expansion and farm nursery)	11	9.2
Investment in non-farm activities (shops and food vending business)	13	10.8

2.7 Conclusion and Recommendations

2.7.1 Conclusion

The paper has identified varieties of spices cultivated and their contribution to household income among smallholder farmers on the slopes of Uluguru Mountains. Based on the findings, it is concluded that agro-climatic condition of the study area supports production of varieties of spice with high density of black pepper and cinnamon. It is also concluded that farmers have started to cultivate vanilla due to its potential on generating household's income. Both spices and food crop production are the sources of income gained by smallholders' farmers. However, a large portion of income was generated from spices such as black pepper, cinnamon and vanilla. Based on the theory used, income from farm was the main source of total household income which is contrary to sources of income

described by the subjective equilibrium theory of the farm household: passive income, dividend, non-farm income and pension.

2.7.2 Recommendations

Based on the study findings and conclusions the following are recommended:

- i. Farmers should increase the production of black pepper, cinnamon and vanilla because there is a reliable market for them.
- ii. Local government authorities, through extension officers, should motivate and educate farmers to use good farming practices that can increase spice production especially black pepper, cinnamon and vanilla.

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CHAPTER THREE

3.0 FARMERS' ATTITUDE TOWARDS ORGANIC SPICE FARMING ON THE SLOPE OF ULUGURU MOUNTAINS, TANZANIA

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3.1 Abstract

Niche market and premium price for organic spices has stimulated its production on the slopes of Uluguru Mountains. Spice farmers have been trained and facilitated to practise organic farming by Sustainable Agriculture Tanzania (SAT). Despite the training on organic farming, their attitude towards organic spices production is unknown. Generally, the paper determines farmers' attitudes towards spice organic farming. Specifically, in assessing agronomic practices for organic spice production and identifies challenges affecting spice production. The study adopted the cross-sectional research design whereby data was collected once from 120 respondents randomly selected from four purposively selected wards of Morogoro District. The wards covered were Kinole, Mkuyuni, Mtombozi and Tawa. Primary data from respondents was collected through a pre-structured questionnaire with both open and closed-ended questions. In addition, primary data was collected from 11 key informants. Quantitative data collected through questionnaire was analysed using SPSS software whereby descriptive and inferential (Chi-square test) were determined. Study findings revealed that farmers have favourable attitude towards organic spice farming. Also, findings show that fungi disease affecting black pepper is the major problem. Conclusively, farmers acknowledge the benefits of organic spice farming as it conserves the environment. Also, farmers do not earn much from spice sales because of challenges associated with spice production such as fungal disease and inadequate storage facilities. Therefore, it is recommended that spice stakeholders such as SAT and Spice UP are advised to assist farmers to have improved varieties of black pepper which are resistant to diseases and pests.

Keywords: Farmers attitude, organic spice farming, Uluguru Mountains.

3.2 Background Information

Organic spice farming is growing rapidly due to increased public awareness of the benefits associated with this production system as it preserves soil fertility (Udin, 2014), produces safe food and attracts premium prices compared to conventional spices. (Abdelrad and Abdelshafi, 2017). Organic spice farming refers to the production of spices without the use of synthetic fertilizers and pesticides. This kind of production relay on inter-cropping, the use of animal manures and crop residues. According to the International Federation of Organic Agriculture Movement (IFOAM), organic farming is the production system that sustains the health of soil, ecosystem and people's life (Paull, 2010). Organic farming can be differentiated from traditional farming by its specific standards and regulations. Because, under traditional farming farmers do not apply industrial fertilizer only while on organic farming farmers relay on the application of organic booster and manure and farmers adhere to recommended time to harvest as a means to maintain fibre and moisture content in the agricultural produce (Costa *et al.*, 2014).

FAO (2005), defines spices as vegetable products used for seasoning, flavouring and impacting aroma in foods. In Tanzania, the Uluguru Mountains range is popular for the production of black pepper, cinnamon, cloves, cardamom, turmeric, ginger and vanilla (exportation).

The trend shows that the demand for organically grown products rose by 6.6% from 300 tons in 2013 to 380 tons in 2017 and is projected to grow by 5.1% in the year 2021 (CBI, 2018). The growth is due to increase awareness of the importance of healthy living and interest in ethnic foods. The rise in demand has led to an increase in prices and a sense of scarcity. Despite high returns, spice farming is labour intensive because most of the activities are done by hand (Komarek, 2010). However, the spices industry is challenged

to meet demand since the growers are often smallholder farmers with limited capacity to expand production. Thus, the need for stimulated NGOs and the private sectors intervention. For example, Export Promotion of Organic Products from Africa (EPOPA) which promotes production and marketing, Tanzania Organic Agriculture Movement (TOAM) which provides a link between organic producers and buyers and Sustainable Agriculture Tanzania (SAT) which support organic farming among small-scale farmers on the slopes of the Uluguru Mountains through provision of knowledge of sustainable cultivation methods as well as marketing strategies with the main focus on spice production and trade. Therefore, SAT is committed to influence organic standards and regulations to above - mentioned spice farmers. Historically, spices found on the slopes of the Uluguru Mountains originated from Zanzibar. These spices were taken from Zanzibar by friends and relatives for domestic use (Kinyua, 2018).

Spice farmers do not meet certain standards including certification and grades because they lack the knowledge and resources to ascertain such requirements (Hassan, 2015; Gulamiwa, 2015). The only way that a farmer can benefit fully from the spice trade is by adopting strict quality control measures and obtaining necessary certification for their products (Baloyi, 2010; Akyoo and Lazaro, 2007). Along Uluguru Mountains, farmers' groups have been trained on grading and certification of spices to fetch premium prices in the market.

This study was carried out to fill the knowledge gap on attitude of farmers towards organic spice farming. Previously, scholars have studied the importance of organic farming to farmers' livelihoods (income and food security) and environmental conservation in developing countries and reported on factors influencing the adoption of organic farming practices (Udin, 2014; Parvathi and Waibel, 2016; Bakewell-Stone *et al.* 2008). Also,

Reyes *et al.* (2010) revealed that poor history of planning, lack of social capital and lack of government assistance were the factors that hinder cardamom farmers in East Usambara Mountains to adopt environmental conservation practices. Nonetheless, farmers in the study area have been trained and motivated to practise organic spice farming by SAT for a long period but, little is known about their attitude on the same. Therefore, the paper assesses agronomic practices for organic spice production, identifies challenges around organic spice production and determines farmers' attitude towards organic spice production. In addition, findings are expected to provide policy makers and other organic stakeholders a good understanding of what needs to be done to promote organic spice farming for increasing farmers productivity and incomes.

3.3 Theoretical review

3.3.1 Theory of attitude

This study was guided by the attitude theory as propagated by (Fishbein and Ajzen, 1975). Attitude is defined as positive or negative evaluation of aides, people or object. Hence individuals can respond towards ideas or number of things (Mwakyambi, 2018). This study examined farmers attitude towards organic spice farming because it was important to document farmers attitude as they were under intervention. Attitude of the People follow thought and consistently from beliefs accessible in memory and then guide corresponding action (Ajzen and Fishbein, 2000). The study assumes that farmers with positive attitude encouraged others spice stakeholder to continue supporting organic practice.

3.4 Methodology

3.4.1 Description of the study area

The study was conducted in the Morogoro District which is among the six districts of Morogoro Region. Villages selected were Kibwaya, Kisarawe, Mfumbwe, Lungeni and Tandai. Villages were selected because variety of spices are produced (BET, 2002) and Sustainable Agriculture Tanzania (SAT) operates. SAT is implementing a three-year program of supporting organic farming with a focus on spices. Under spice project, farmers are trained and encouraged to register their farms and to acquire a certification of organic production. Meanwhile recommended standard practices of organic farming are communicated to farmers especially harvesting time. For instance, the right time to harvest ginger is between 10 to 12 months to maintain fibre contents and minimizing chances for sprout. To get black pepper peppercorn are supposed to be harvested when they are green because if farmers harvest red peppercorn it will end up with white pepper.

The mean annual rainfall in the study area ranges from 1065 mm to 2450 mm. The rainfall distribution pattern is seasonal starting from December to May and the peak rainfall is occurring in April (Msanya *et al.*, 2001). According to Mkonda and He (2017), the slopes of the Uluguru Mountains have many rivers and dark soil which is rich in minerals suitable for agricultural production. The communities in the study produce bananas, maize, cassava, coconuts sweet potatoes, fruits, rearing cattle such goats and cows as a source of income (Yamane *et al.*, 2018).

3.4.2 Research design

The study on which the paper is based used cross-sectional research design whereby data was collected once. The design is favourable for capturing information on farmers' attitudes towards organic spice farming and challenges facing households with spice

production. Also, it was considered because of time limitation, given that the registration for Master degree was 18 months, 12 months was for course work. In addition, the design was considered to minimize cost given the fact that geographical location of selected villages which were not accessible by bus only motorcycle transport.

3.4.3 Sampling procedure and sample size

The study population was farmers who are attached to Uluguru Spice Project (USP) and produce spices organically. Multistage sampling was used; the first stage of sampling involved a purposive selection of four wards which produce varieties of spices according to data from SAT. The second stage involved a selection of villages through simple random sampling. The village selected were Kibwaya, Kisarawe, Mfumbwe, Lungeni and Tandai which SAT operates. The sampling frame was obtained from SAT register. In addition, spice stakeholders were selected as key informants. The selected key informants were three extension officers, four farmers and four staff from SAT.

The population of the farmers who are trained by SAT in the study area is 617, and therefore, the sample size for this study was 120 farmers. Based on literature which says that regardless of the population size the minimum sample size for the study in which is favorable for statistical analysis should be at least 30 and above (Gray, 2014). Therefore, 120 cases is equal to representation by 19%. The sample was justified on the fact that too small sample diminishes the utility of the results and too large sample implies a waste of resources (Salum, 2017).

Table 3.1: Number of respondents per village

Villages	No of Spice farmers	No of Respondents
Tandai	180	36
Mfumbwe	95	23
Kibwaya	120	27
Lungeni	92	21
Kisarawe	60	15
Total	617	120

Source: SAT, (2020)

3.4.4 Data collection methods

Data were collected through a household survey using pre-structured questionnaire (appendix i), interviews (using checklists Appendix ii and iii) and observation. The questionnaire enabled collection of information related to farmers attitudes and challenges facing spice farming households. Also, key Informants provided quotation that were used to elaborate quantitative findings. Furthermore, observations were done to document storage and drying practice.

3.4.5 Data analysis

3.4.5.1 Quantitative analysis

Statistical Package for Social Sciences (SPSS version 20.0) was used in data analysis whereby both descriptive statistics (frequencies and percentage) and inferential statistics (Chi square test) were determined. Descriptive statistics included computation of frequencies and percentages about agronomic practises and challenges facing spice farmers in the study area. Chi-square was used to test the hypothesis that socio-demographic variables are not significantly associated with farmers' attitude towards organic spice farming.

Likert attitudinal scale

In this study, attitudes of respondents towards organic spice farming were sought using a Likert attitudinal scale. The scale had ten statements that carried positive and negative intuitions about organic spice farming practices. Respondents were requested to say whether they strongly agreed, agreed, were neutral, disagreed, or strongly disagreed with each specific statement that was related to organic spice farming practices. The five levels of understanding were developed as follows: Strongly agree = 1; Agree = 2; Neutral = 3; Disagree = 2 and strongly disagree = 1. For analysis purposes, the five levels were reduced to three levels. Level one and two were merged to be level one, level three was named as level two and levels four and five were merged to be level three; thus, making agree, undecided, and disagree levels respectively as indicated in (Table. 3.5). Then, overall score on the Likert scale was used to calculate and determine three categories of farmers' attitudes through percentile. The response variable (attitude) was categorised into 1 = Unfavourable, 2 = Undecided and 3 = Favourable. The explanatory variables were: Sex (1 = Male: 2=Female), Education level (1 = Informal education, 2 = Primary education, 3 = Secondary education), and Marital status (0 = Unmarried: 1= Married).

3.4.5.2 Qualitative Analysis

Key informants' interviews audios were transcribed, then translated thereafter a summary was created. Quotations obtained from these data were used to further elaborate quantitative findings.

3.5 Results and Discussion

3.5.1 Socio-demographic characteristics of the respondents

Table 3.2 results show that the respondents' age ranged between 18 and 73 years, with (30%) being aged 44 to 56 years. This indicates that spice production in the study area was

dominated by adults, who are likely to own land which is the major means of production. About (26.7%) of respondents were youths through informal interviews with respondents, it was argued that recently the number of youths in spice production is increasing. This suggest that youths are interested in cash crop farming. Youth consider spice farming as a venture of getting capital to start non-farm activities. This finding is in line with the study conducted in Njombe and Muheza District by Munishi *et al.* (2017) who found that youth were willing to cultivate tea as capital start-up.

Table 3.2 results indicate that male respondents (69.2%) are highly involved in spice farming than female respondents (30.8%) because spice is a high-value cash crop. In African culture men have the right over land ownership compared to women thus they have plenty of land for spice farming. Meanwhile, females were supposed to cultivate food crops and to take care of the family. Therefore, this minimizes the chances of a female-headed household to engage themselves in spice farming. This finding is similar to the study conducted by FAO (2012) and IFAD (2010) which reported that in Ghana men were more involved in the production of high-value cash crops like cocoa as compared to women.

Study findings (Table 3.2) show that more than half (61.7%) of the respondents had primary education. With aid of education, farmers can receive and apply knowledge accordingly. Also, education arouses farmers' sense of reasoning thus affecting judgment regarding what type of technology to use and when to harvest. A similar result was documented by Mohammed *et al.* (2016) that education influences farmers' decision-making on what types of spices to produce and where to sell them.

Study findings further show that more than three quarter (90%) of the respondents were married. Family provides reliable labour throughout the season. This indicate that family is very important when it comes to agriculture because it supplies sufficient labour at cheap price compered to hired labour (Hassan, 2015).

Table 3.2: Respondents socio-demographic characteristics (n=120)

Variables		Frequency	Percent
Household head's age	18-30	24	20.7
	31-43	32	26.7
	44-56	36	30.0
	57-69	26	21.7
	70 >	2	1.7
Household head's sex	Male	83	69.2
	Female	37	30.8
Household head's education	Informal education	35	29.2
	Primary education	74	61.7
	Secondary education	11	9.2
Household head's marital status	Married	102	90.0
	Unmarried	12	10.0

3.6 Agronomic Practices for Spice Production

Study findings (Table 3.3) shows that more than three quarter (86.7%) of the respondents practised organic farming which does not involve the use of industrial fertilizer or pesticides. The respondents generally use animal manure and mulching to add nutrients to the soil. Respondents decided to practise organic spice production to fetch premium prices from SAT and Spice Up. Cultivation is mainly done using mixed tools (hand hoe, machetes and axe) as indicated in (Table 3.3). Spices are intercropped with trees such as jatropha and other crops thus it is difficult to use tractors.

According to Table 3.3 majority (93%) of respondents cultivate between 1 and 3 hectares and most, depend on family labour. This implies that spice farming in the study area is dominated by smallholder farmers and it is labour intensive. These findings are in line

with the findings of Rosinger (2014) in India who reported that spice farming in developing countries is dominated by smallholders with limited capacity to expand production. Therefore, farmers need to be facilitated in terms of farming tools and capital to increase spice production because piece of land suitable for spice productions is sold high price compared to a piece of land for the cultivation of other crops.

Table 3.3: Agronomic practices for spice production of respondents

	Characteristics	Frequency	Percent
Farming practices	Traditional	16	13.3
	Organic	104	86.7
	Mixed tools (Hand hoe, machete and axe)	91	75.8
Farming tools	Hand hoe and Machete	29	24.2
Farm Size	1-3 hectares	93	77.5
	4-6 hectares	27	22.5

3.7 Challenges experienced by respondents in organic spice farming

3.7.1 Pests and diseases problem

Study findings (Table 3.4) show that 84.5% of respondents encountered the pests and diseases problem. Generally black pepper vine is attacked by fungi that cause plant leaves to turn yellow and wither. It was observed that respondents control pests attacking spices by using the mixture of ginger, chili and distilled water, though this practice is common in Mfumbwe village. Therefore, the prosperity of the spices business is threatened since black pepper is among the major spice produced in the Uluguru Mountain. The same finding was reported in Indonesia by Karmawati *et al.* (2020) that fungi diseases cause a decline in black pepper production. Among the four wards, Kinole ward black pepper vines were highly affected by diseases according to SAT this is because Kinole ward is leading producer of black pepper. SAT host participatory research workshop each year with deferent agriculture stakeholder such as farmers and Sokoine University of Agriculture (SUA). During workshop farmers and pastoralists found in Morogoro District

are invited to presents challenges facing them thus allowing SUA students to conduct research. The aim of this workshop is to familiarized farmers with local herbal tree such as neem which are easily accessible to their environment without incurred high cost.

Table 3.4: Challenges facing spice farming households (n=120)

Challenges	Frequency	Percent
Pest & Diseases	98	84.5
Market arrangement	77	64.9
Climatic change	32	27.6
Infrastructure	28	24.1
Capital & Input	22	19

3.7.2 Poor market arrangement

Study findings in (Table 3.4) show that more than half (64.9%) of respondents experienced problems related to marketing. It was observed that spices were either sold to middleperson at home or on the weekly Friday's market. In additional, farmers were not aware of the market price; as a result, middleperson use this opportunity to purchase spices at low prices. Farmers experienced this problem because they are not actively involved in seeking market information. Moreover, they neither plan when to, where to sell their product nor how to transport their spices from farm to home. These results are in line with a study conducted in Mvomero District by Gulamiwa (2015), who reported that middleperson purchase agriculture products from smallholder farmers at low prices. Therefore, farmers must have market information so that they became aware of market dynamics such as price fluctuation.

3.7.2.1 Value addition and grading

Spice farmers do not grade or add value to their produce thus affecting its selling prices. Spice farmers sell their produce to middlemen in bulk thus, it is not a buyer requirement.

These traders discouraged value addition and grading practices because it will increase spices selling price. Furthermore, value addition, grading, and suitable packages attract premium prices (Tesfa *et al.*, 2017). Currently, in the study area, farmers are trained to add value to cinnamon by chopping them into small pieces like chips, which attract higher prices than conventional methods. Therefore, for farmers to benefit from spice production, they should learn to practise agribusiness skills.

3.7.2.2 Inadequate storage facilities

It was noted that respondents lack storage facilities, which forced them to sell their spices as soon as they harvested or else left to decompose especially turmeric and ginger. Respondents reported that they cannot store their produce over a long period. Spices require a well-ventilated room and to be kept away from moisture. Observation of their housing structure showed that farmers do not have rooms to store spices. Furthermore, respondents lack the technology to dry ginger and turmeric. Observed as well that it is easy to store dried ginger and turmeric than fresh ones. Thus, farmers in Uluguru Mountains lost a lot of yields because of poor storage facilities. The same was reported by Babu *et.al.* (2013) that spice loss was caused by poor drying techniques and limited storage facilities. Adequate storage facilities can influence farmers not to sell their spices instantly after harvest and wait until the price is favourable. About the inadequate storage facilities. The quote below emphasises the above:

“Spice farmers in Mtombozi ward experienced a great loss when harvested turmeric lacked market, and therefore access to storage technology could serve the problem” (Key informants, extension officer, Mtombozi ward, 23rd January, 2020).

Lack or limited storage facilities limit the bargaining power of the farmers, hence they are forced to sale their products at low price which reduces the household’s income earnings.



Figure 3. 1: Drying of spices

Source: Justus Vicent Nsenga, Nsenga Department of Development and strategic Studies, Sokoine University of Agriculture

3.8 Farmers' attitude towards organic spice farming

3.8.1 Likert scale score

The results in Table 3.5 show that about (95%) of the respondents agreed with the statement “organic spice farming conserves the environment”. Respondents agreed with this statement because firstly spices require trees for shading and inclination and secondly, spices are perennial crops that last for a long time. This result is similar to the results of a study conducted in the East Usambara Mountains by Reyes *et al.* (2010) who reported that spice farming conserves the environment. The quote below emphasises the above:

“Almost all spice trees last for decades, especially cloves which can last for more than 100 years” (Key Informant, extension officer, Tawa ward, 23rd January, 2020).

This implies that spice farmers are aware of environmental conservation.

Also, the results in Table 3.5 show that (56.7 %) and (80.8 %) of the respondents agreed that “growing spices organically is wasteful of resources” and “I will not recommend spice production to anyone”. This indicates that there are farmers who are not aware of benefit associated with organic spice production.

Table 3. 5: Farmers’ attitude towards organic spice farming

SN	Statements	Attitude		
		Disagree	Undecided	Agree
1	Organic spice farming conserves the environment	3 (2.5)	3(2.5)	114(95)
2	Earnings from spices can support other economic activities	89 (74.2)	5 (4.2)	26 (21.7)
3	Quality of spices is more important than quantity	10 (8.3)	5 (4.2)	105 (87.5)
4	Certified spices have high returns	16 (13.3)	3 (2.5)	101 (84.2)
5	Organic farming improves soil fertility	9 (7.5)	6 (5)	105 (87.5)
6	The procedures for spice certification are complex	21 (17.5)	28 (23.3)	71 (59.2)
7	Growing spices organically is wasteful of resources	49 (40.8)	3 (2.5)	68 (56.7)
8	You cannot live depending on spice only	35 (29.2)	6 (5)	79 (65.8)
9	Government has neglected supporting spice farming.	8 (6.7)	5 (4.2)	107 (89.2)
10	I will not recommend spice production to anyone	12 (10)	11 (9.2)	97 (80.8)

NB: Numbers in brackets indicate percentages

.3.8.2 Overall score of farmers attitude towards organic spice farming

The results Table 3.6 show that about (47.5%) of the respondents had favourable attitude towards organic spice farming. Therefore, farmers know and understand the organic spice farming practices and its importance. This implies that organic spice farming is an acceptable practice on the Uluguru Mountain. Farmers who managed to sales organic spices with premium price have favourable attitude (Malkanathi, 2020). However, there is slightly different between farmers with unfavourable attitude (45%) and fovourable attitude (47.5%) as shown in (Table 3.6) this indicates that not all farmers are willing to cultivate spice organically.

Table 3. 6: Overall score of farmer’s attitudes towards organic spice farming (n=120)

Attitude	Frequency	Percent
Unfavourable Attitude	54	45.0
Undecided Attitude	9	7.5
Favourable Attitude	57	47.5

3.8.3 Association between socio-demographic characteristics and farmers' attitude towards organic spice farming

The results in Table 3.7 show that more than half (60.2%) of male respondents had a favourable attitude towards organic spice farming compared to their counterpart's female respondents (18.9%) who had favourable attitude. Males were found to be significantly associated with organic spice production ($\chi^2 = 25.909^a$, $df = 2$, $p < 0.001$). This implies that men engage mostly in agriculture for commercial purposes, but women involve themselves in agriculture to sustain the family. This result is similar to results of a study conducted in Nigeria by Adebisi (2012) who reported that men were more involved in spice production because they are high cash earning crops that attract foreign exchange. Therefore, earnings from spices have the potential of improving farmers' livelihoods.

The results in Table 3.7 further show that all farmers (100%) with secondary education had a favourable attitude towards organic spice farming. Therefore, education was found to be significantly associated with organic spice production. ($\chi^2 = 34.579^a$, $df = 4$, $p < 0.001$). Organic spice farming is associated with standards and specifications like grading, sorting therefore it is easy for educated respondents to replicate knowledge received during training. This result is similar to the finding of a study conducted in Indonesia by Malkanthi (2020) who reported that educated farmers were associated with a favourable attitude towards organic farming. Education is a very important tool for improving agricultural production in rural areas.

However, marital status was not significantly associated with a favourable attitude towards spice farming in Uluguru Mountain ($p > 0.05$) though other studies such as Udin (2014) revealed that marital status was statistically significant associated with organic spice farming. This study used sex, education level and marital status as explanatory variables of attitude because these variables have high ability to influence person's

behaviour and choice of action; attitude (Fishbein and Ajzen, 1975). Also, studies of (Udin, 2014; Shams *et al.* 2017; Malkanthi; 2020) have used the same explanatory variables on attitude.

Table 3.7: Socio-demographic characteristics and attitude towards organic spice farming (n=120)

Social demographic characteristics			Attitude		
			Unfavourable attitude	Undecided	Favourable attitude
Sex	Male	Count	32	1	50
		%	38.6%	1.2%	60.2%
	Female	Count	22	8	7
		%	59.5%	21.6%	18.9%
			Chi square	$\chi^2 = 25.909^a$, df=2, p<0.001	
Education Level	Informal	Count	25	6	4
		%	71.4%	17.1%	11.4%
	Primary	Count	29	3	42
		%	39.2	4.1	56.8
	Secondary	Count	0	0	11
		%	0%	0%	100%
			Chi square	$\chi^2 = 34.579^a$, df = 4, p < 0.001	
Marital Status	Unmarried	Count	9	0	3
		%	75.0%	0.0%	25%
	Married	Count	45	9	54
		%	41.7	8.3%	50%
			Chi square	$\chi^2 = 5.088^a$, df = 2, p >0.05	

3.9 Conclusion and Recommendations

3.9.1 Conclusion

This manuscript has assessed challenges facing spice farming households and determined farmers attitudes towards organic spice farming on the slopes of the Uluguru Mountains. Based on the study findings it can be generally concluded that farmers do not earn much from spice sales because of challenges associated with spice production such as fungal disease, poor market arrangement and inadequate drying and storage facilities. Also, spice farming is dominated by smallholder farmers with low capacity to expand production because a piece of land suitable for spice cultivation are sold at high price. Furthermore, surveyed farmers have favourable attitude towards organic spice farming. Meaning that organic farming is acceptable practise in Uluguru Mountains. However, there is slight difference between farmers with favourable attitude and unfavourable attitude.

3.9.2 Recommendations

Based on study's findings and conclusion it is hereby recommended that:

- i. Farmers should learn different drying techniques such as thermal drying techniques especially for turmeric and ginger to reduce spices loss.
- ii. Spice stakeholders should provide more training organic farming so as to raise farmers awareness as means attracting positive attitude.
- iii. Spice stakeholders such as SAT and Spice UP are advised to assist farmers to have improved varieties of black pepper which are resistant to diseases and pests.
- iv. Actors of environmental conservation like Eastern Arc Mountains Conservation Endowment Fund (EAMCEF), National Environment Management Council (NEMC) are urged to continue supporting organic spice farming.
- v. The Vice President's Office which is responsible for environmental affairs is urged to include spice farming as one of the acceptable initiatives to preserve the environment.
- vi. Ministry of agriculture is recommended to enact policy which will regulate middle person conducts when buying spices direct from farmers.
- vii. Ministry of works and transport through TARURA should construct roads and bridge that are reliable especially during rainy season.

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CHAPTER FOUR

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Summary of the Major Findings

Below is the study's summary of a major findings in chronological order as per presented manuscripts.

4.1.1 Contribution of spice farming to household's income on the slopes of Uluguru Mountains

Objective one of this study aimed at identifying types of spices cultivated in the study area. Generally, the results show that, black pepper and cinnamon are the major spices produced especially in Tandai and Kisarawe villages followed by cardamon, cloves, ginger, turmeric and vanilla. In addition, farmers have started to cultivate vanilla due to its potential as an income earner. However, its agronomic practices are quite different compared to other spices. Vanilla production in the study area involves mulching, irrigation and artificial pollination. The requirements for other spices are simple just planting, weeding and harvesting thus allowing farmers to engage in other economic activities.

Objective two aimed at examining the contribution of spices to household's income. The results show that income generated from spices was very high compared to income generated from other sources ($p < 0.007$, $t = 2.727$). Farmers reported to generate high amount of money from black pepper, cinnamon and vanilla. In addition, spice income contributes TZS 64 341 300 while other sources contribute TZS 51 394 500 in total households' income. Spices generated lump sum of money at once, thus it is easy for a farmer to purchase iron sheets, motorcycles and payment for medical expenses as opposed

to other crops which offer a little amount of income. Therefore, spice farming is very importance to the economy of households found on the slopes of Uluguru Mountains.

4.1.2 Farmers' attitude towards organic spice farming on the slope of Uluguru Mountains

Objective three of this study aimed to determine challenges facing spice farming households in the study area. The results show that pests and diseases are the major problems followed by poor marketing arrangement and inadequate storage facilities. Black pepper vine is being attacked by fungi which cause leaves to turn yellow and wither. Also, the business is controlled by middleperson thus farmers have no final say to their produce. Hence the prosperity of spice production in the study area is threatened by the above problems.

Objective four aimed at determining farmers attitudes towards organic spice farming. The results show that more than three quarter (86.7%) of respondents practised organic farming which does not involve the use of industrial manure or pesticides. Cultivation is mainly done using mixed tools (hand hoe, machetes and axe) and spices are intercropped with trees such as jatropha, coconut and other crops thus it is difficult to use tractors. Also, study findings reveal that (47.5%) of the respondents had favourable attitude towards organic spice farming. However, there is slight deference on the percentage of those with favourable and unfavourable attitude. In addition, Males were found to be significantly associated with organic spice production ($\chi^2 = 25.909^a$, $df = 2$, $p < 0.001$). Possibly, men engage mostly in agriculture for commercial purposes, but women involve themselves in agriculture to sustain family. Therefore, spice farmers have understood the benefits of organic spice farming to household's income and to the environment.

4.2 Conclusion

Based on the objectives and findings of the study on the contributions of spice farming to household's income on the slopes of the Uluguru Mountains it is concluded that the respondents produce varieties of spices with high density of black pepper and cinnamon. Also, both sales from spices and from other crops were the major sources of household's income. However, spices sales generated more income compared to sales from other crops. Spice sales generated more money because of its high selling price as compared to food crops. Noted that well dried spices can last for more than a year which is contrary to perishable crops such as bananas and cassava which are major food crops produced in the study area. Therefore, spice production is very important to the livelihoods of spice farmers on the slopes of Uluguru mountains.

Based on the findings of objective three and four it can be concluded that despite high commitment on spice production spice farmers do not earn much from spices due to the challenges associated with its production such as fungi diseases, poor market arrangement, inadequate drying and storage facilities. Thus, prosperity of spice production on the slopes Uluguru mountains is threatened by the above problems. Also, respondents have favourable attitude towards organic spice farming this imply that respondents have understood the relationship between organic practices and environmental conservation.

4.3 Recommendations

From the study findings and conclusions made above, the following recommendations are drawn:

- i. Farmers should increase the production of black pepper, cinnamon and vanilla because there is a reliable market for them.

- ii. Farmers should learn different drying techniques such as thermal drying techniques especially for turmeric and ginger to reduce spices loss. Furthermore, farmers are advised to have storage facilities such as cold rooms to store fresh ginger and well-ventilated rooms to store other types of spices.
- iii. Local government, through extension officers, should motivate and educate farmers to use good farming practices that can increase spice production especially black pepper, cinnamon and vanilla.
- iv. Also, spice stakeholders such as SAT and Spice Up should introduce hybrid variety of spices to increase production. Furthermore, improved varieties of black pepper which are resistant to diseases and pests are highly required.
- v. Spice stakeholders should provide more training organic farming so as to raise farmers awareness as means attracting positive attitude.
- vi. Government through the Ministry of Agriculture should facilitate farmers to get soft loans that will enable them to acquire storage facilities. Also, Ministry of agriculture is recommended to enact law which will regulates middle person conduct when buying spice directly from farmers.
- vii. Actors of environmental conservation like Eastern Arc Mountains Conservation Endowment Fund (EAMCEF), National Environment Management Council (NEMC) are urged to support spice production.
- viii. The Vice President's Office which is responsible for environmental affairs is urged to include spice farming as one of the acceptable initiatives to preserve the environment.

APPENDICES

Appendix 1: Smallholder Spice Farmers' Questionnaire Sheet

Good morning/ afternoon/ evening

My Name is **Ngolle Ainessy**, a student at Sokoine University of Agriculture (SUA) undertaking M.A in Project Management and Evaluation. In collaboration with Sustainable Agriculture Tanzania, I am carrying out my study in Uluguru Mountains to gather information regarding the “**Contribution of Spice Farming to Household's Income on the slopes of Uluguru Mountains, Morogoro District**”. I am kindly requesting you as my respondent to fill in the given questionnaires as honestly as possible. All your information will be treated with the utmost confidence and will only be used for academic purposes. Your assistance in answering the questions accurately will be highly appreciated. The findings will be shared with relevant stakeholders to improve spice farming among smallholder farmers in Uluguru Mountains.

A. GENERAL INFORMATION

Are you willing to participate? (Tick where applicable)

Yes No.....

Date of interview.....

Name of the Village.....

Name of the Ward.....

B. PERSONAL INFORMATION

What is your age? (*exactly age*)

1. Sex of the respondent

1. Male ()

2. Female ()

2. Marital status

1. Single ()

2. Married ()

3. Divorced/ Separate ()

4. Widow/ widower ()

3. Are you the Head of this household?

1. Yes ()

2. No ()

4. What is your highest education level?

1. Informal education—0. Years. ()

2. Primary education—7 Years ()
3. Secondary education—11Years ()
4. College/ University—16 Year ()
5. Others (*please specify*)
5. What is your main occupation?
 1. Civil servant ()
 2. Private sector employee ()
 3. Smallholder farmer ()
 4. Businessman ()
 5. Causal labor ()
 6. Others (*please specify*)

C. AGRICULTURAL RELATED ACTIVITIES

6. What type of farming do you practice?
 1. Organic farming ()
 2. Certified farming ()
 3. Convectional farming ()
7. What is the main use of spice produced in your area?

S/N	spices	Main Use

8. What is your total farmland size? (*exact size*)
 9. What is the approximate distance from your home to the spice farm?(*in Km*)
 10. Years of practicing spice farming (*exact years*)
 11. Did you cultivate other crops apart from spices in the last farming season?
 1. Yes ()
 2. No ()
- (*If YES, please go to Qn. # 12; If NO, please proceed to Qn. # 13*)

12. If the answer is YES in Qn. # 12, please mention those other crops

1.
2.

13. Cultivation equipment (s) (*Put a TICK ✓ everything which you use in space farming*)

- | | |
|-----------------|---|
| 1. Hand hoe () | 4. Mundu |
| 2. Axe () | 5. Water sprinkling machine () |
| 3. Machete () | 6. Other equipment please specify |

D. SPICE FARMING**14. Information for last season of spice farming**

S/N	Spice Name	Farming Type	Farm Yield (Kg)	Unit Sold	Price per Unit	Earning
1						
2						
	Total					

15. Information for last season of other crops apart from spice

S/N	Crop Name	Farm Yield (Kg)	Unit Sold	Price per Unit	Total earning
1					
2					
	Total				

E. SPICE FARMING SUPPORT**16. Who supports spice farming in your area? (*Mention*)**

1. Organic Farming Organization(s) ()
2. Private Company(s) ()
3. Government ()
4. Individual Farmers Trainer(s) ()
5. I don't have ()
6. Others

17. What kind of support is offered?

1. Input supply ()
2. Marketing ()
3. Training ()
4. Other specify.....

18. Are you forced to sell the crops to the organization supporting you?

1. Yes
2. No

19. Do you have occasional training from your supporters?

1. Yes ()
2. No ()

(If YES, please go to Qn. # 21; If NO, please proceed to Qn. # 20)

20. If YES, how often?**21. Do you have any other non-farm activities?**

1. Yes ()
2. No ()

22. What other non-farm activities are you involved in?

1. Petty trading ()
2. Casual labour ()
3. Food tendering ()
4. Poultry keeping ()
5. Fishkeeping ()

23. How much did you earn from the sale of spices in the last season?

Give estimation of annual profit or monthly profit

24. How much did you earn from the sale of other crops in the last season?

Give estimation of annual profit or monthly profit

25. How much did you earned from non –farm income gaining activities in the last season?

Give estimation of annual profit or monthly profit.....

F. FARMERS' ATTITUDE TOWARDS SPICE FARMING

25. How many types of spice farming are your familiar with.....?

26. Tick where appropriate (✓)

S/N	STATEMENT	Connotation	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
1	Organic spices conserve environment	+					
2	Income from spices can support other activities	+					
3	Quality of spices is more important than quantity	+					
4	Certified spices have high returns	+					
5	Organic farming improves soil fertility	+					
6	The procedure for spice certification is cumbersome	-					
7	Growing organic spice is wasteful of resource	-					
8	You cannot live depending on spices only	-					
9	The government has neglected to supports spice farming	-					
10	I will not recommend organic spice production to anyone	-					

27. What is the difference between organic spice farming and certified organic farming?

.....

...

G. MARKET CONDITION

28. What is the trend for spice yield in Kg?

Spice Name	2017	2018	2019	Total
Black paper				
Cinnamon				
Cardamom				
Cloves				
vanilla				
Turmeric				
Ginger				

29. What is the local market price of spice per Kg?

S/N	Spice Name	Price/Kg per bag
1	Black paper	
2	Cloves	
3	Cinnamon	
4	Cardamon	
5	Turmeric	
6	Vanilla	
7	Ginger	

H. THE USE OF INCOME GENERATED FROM SPICES

30. Affordability to acquire society service before starting practicing spice farming *(Please tick ✓ where appropriate)*

Social services	Highly affordable	Affordable	Not affordable
Food			
Health			
Clothes			
Solar energy			
Education fee			
Any others			

31. Affordability to acquire society service after starting practicing spice farming *(Please tick ✓ where appropriate)*

Social services	Highly affordable	Affordable	Not affordable
Food			
Health			
Clothes			
Solar energy			
Education fee			
Any others			

32. What are the main uses of income obtained from spice sales?
-
33. What are the challenges do you face while practicing organic spice farming in general?
-
34. What are the opportunities for spice production?
-
35. What is your opinion (s)/ suggestion(s)? (If any)

Appendix 2: Checklist for Key Informant Interview (Extension Officers)

1. Spice can be regarded as the main economic activity of this area?
3. How do smallholder farmers perceive spice farming?
4. What kind of services are provided to smallholders' farmers to support spice farming?
5. What is the trend for spice production in recent years?
6. Is there a market available for the spices produced?
7. Is certified organic spice farming beneficial to smallholder farmers?
8. What are the challenges facing organic spice farmers in your area.
9. Spice farming can be regarded as a source of revenue?
10. Is there any opportunity for spice produced in your area?
11. What are your opinion (s)/ suggestion(s)? (If any)

Appendix 3: Checklist for Key Informant Interview (Sat Staffs)

1. How do farmers perceive spice farming?
2. Can spice be regarded as a major economic activity?
3. What are the benefits of USP to the farmers?
4. What are the achievements of USP?
5. What are the shortcomings of USP?
6. How does spice conserve the environment?
7. What are the opportunity and challenges for spices in Tanzania?

Appendix 4: Checklist for Key Informant Interview (Spice Farmer)

1. What is dominant spice in your village?
2. What is organic farming in your understandings?
3. How much did you earn from spice and food crops last season?
4. What were the uses of income from spices?
5. Do you have any opinion to your fellow farmers, NGO and government authority?