

**HIGH-VALUE MARKET OPPORTUNITIES FOR SMALLHOLDER
VEGETABLE FARMERS IN ARUSHA REGION, TANZANIA**

GLORIA SANGITO SUMARI

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN
AGRICULTURAL ECONOMICS OF SOKOINE UNIVERSITY OF
AGRICULTURE. MOROGORO, TANZANIA.**

2017

ABSTRACT

This study was conducted to determine high-value market opportunities for smallholder vegetable farmers in Arusha Region. To do so, the study provides a micro level survey. The survey was conducted on smallholder vegetable farmers and high-value markets in Arusha Region. The specific objectives were identifying the characteristics of smallholder vegetable farmers in Arusha Region; determining factors that influence smallholder vegetable farmers participation in high-value market opportunities; and examine the capability of smallholder vegetable farmers to become preferred suppliers in selected high-value markets. Data were collected from primary source. The primary source data for this study was collected from 200 vegetable farmers, and 30 high-value markets (supermarkets, schools, and hotels). The results showed that age of farmers, sex, their household, their level of education and their main occupation had a positive influence on vegetable farmers' vegetable production and participation. For Binary logistic regressions it was found that vegetable farmers experience in growing cabbage and in growing tomato, distance to the high-value market, tomato yield, cabbage yield, and onion yield had a significant influence on smallholder farmers' participation in high-value market. SWOT analysis showed farmers strength, weakness, opportunities, and threats that enable them to become preferred suppliers to the high-value markets. Smallholder farmers strength included; owning land, possession of skills in cultivating either cabbage, onion or tomato, year-round availability of water for irrigation, access to inputs, access to extension service, and availability of high-value market in their area. The smallholder farmer's opportunities were good climatic conditions and training opportunities from various agricultural organizations.

DECLARATION

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

Gloria Sangito Sumari

(MSc. Candidate)

Date

The above declaration is confirmed.

Dr. Fulgence J Mishili

(Supervisor)

Date

COPYRIGHT

No part of this dissertation may be reproduced, stored in any retrieval system or transmitted in any form or by any means without prior written permission of the author or Sokoine University of Agriculture in that behalf.

ACKNOWLEDGEMENTS

I am humbly thankful to the Almighty LORD, for granting me life, strength, and blessing to Him be the Glory. I would like to express my sincere appreciation to all those who supported me morally and materially during my study period.

I also gratefully acknowledge my main supervisors Dr. Fulgence Mishili of School of Agriculture Economics and Business Studies (SAEBS) for his guidance, constructive advice, valuable criticisms, insight and experience that contributed immensely to the completion of this work and to the staff of School of Agriculture Economics and Business Studies (SAEBS) who provided me with the necessary theoretical and analytical tools that enabled me to accomplish this demanding task.

I would also like to thank the world vegetable center, Asian Vegetable Research, and Development Center (AVRDC) under its led project VINESA for supporting my research. I would like to thank them for their financial and professional support throughout my research in Arusha. I would also like to thank my supervisor Dr. John Macharia the VINESA project manager for his supervision, guidance, support, advice and constructive criticisms throughout my research writing.

My sincere gratitude also goes to my parents my father Mr. Sangito Sumari and my mother Lilian Nyange for sponsoring my post graduate studies. I would like to thank them for their support, prayers, and encouragement throughout my studies at SUA. Also, I would like to thank my young sister Zoe Sumari, my friends particularly Joseph Mugula, Neema Severua, Lemmi Swai, Sarah Ngowi and Samuel Severua for their

support, sacrifice, encouragement, spiritual advice, love and inspiration provided to me during the whole period of study.

Lastly, I would like to thank the entire team of enumerators who assisted me in data collection in Arusha Region. And to all respondents of this study, despite all the difficulties their co-operation was so crucial in the accomplishment of this task.

DEDICATION

To my lovely Mother Mrs. LILIAN NYANGE, my Father Mr. SANGITO SUMARI, and my sister ZOE SUMARI who had sacrificed a lot, morally and financially towards my struggle and survival in my academic career and prayed for me and encouraged me throughout my studies.

TABLE OF CONTENTS

ABSTRACT.....	ii
DECLARATION	iii
COPYRIGHT	iv
ACKNOWLEDGEMENTS	v
DEDICATION	vii
TABLE OF CONTENTS	viii
LIST OF TABLES	xii
LIST OF FIGURES	xiii
APPENDIX.....	xiv
LIST OF ABBREVIATIONS.....	xv
 CHAPTER ONE.....	 1
1.0 INTRODUCTION	1
1.1 Background Information	1
1.2 Problem Statement	4
1.3 Overall Objectives	6
1.4 Specific Objectives.....	6
1.5 Research Questions	6
1.6 Conceptual Frame Work	7
 CHAPTER TWO.....	 10
2.0 LITERATURE REVIEW	10
2.1 Defining Market and Marketing	10
2.2 Input Markets and Output Markets	11

2.2.1	Input markets.....	11
2.2.2	Output market	12
2.3	Common Vegetable Market Characteristics	13
2.3.1	Perishability.....	13
2.3.2	Price /quantity risks	13
2.3.3	Seasonality	14
2.3.4	Product bulkiness.....	15
2.4	High-value Vegetable Market Characteristics.....	16
2.5	Factors Influencing Smallholder Farmers to Participate in High-Value Market.....	18
2.6	The Concept of Market Participation	21
2.6.1	Factors influencing participation of smallholder farmer in high-value market	21
2.7	Smallholder Farmers' Ability to Meet Buyers Needs	22
2.8	Theoretical Framework	23
2.8.1	Value chain management theory.....	23
2.8.2	Utility theory	24
2.9	Empirical Review	25
2.9.1	Vegetable value chain analysis	25
2.9.2	Vegetable market analysis.....	27
CHAPTER THREE		29
3.0 METHODOLOGY		29
3.1	Description of the Study Area	29
3.2	Economic Activities	31
3.3	Research Design	31
3.3.1	Study population	31

3.3.2	Sample size.....	32
3.3.3	Types of data	33
3.3.4	Data Collection Methods and Tools	33
3.4	Data analysis	34
3.4.1	Data analysis tools	34
3.4.2	Descriptive analysis	34
3.4.3	Binary logistic model	34
3.4.4	Definition of variables.....	38
3.4.5	SWOT Analysis	40
CHAPTER FOUR.....		41
4.0	RESULTS AND DISCUSSION.....	41
4.1	Demographic and Social-Economic Characteristics of the Respondents	41
4.1.1	Age of the respondents	41
4.1.2	Sex of the respondent	42
4.1.3	Education level.....	43
4.1.4	Household size	43
4.1.5	Major occupation of the household in the study area	44
4.2	Determination of Factors That Influence Smallholder Farmers to Participate in High-Value Markets.....	46
4.3	SWOT Analysis	49
4.3.1	Strengths and weakness of the farms.....	49
4.3.2	Opportunities and challenges to the farmers	50

CHAPTER FIVE	52
5.0 CONCLUSIONS AND RECOMMENDATIONS	52
5.1 Conclusions.....	52
5.2 Recommendations	54
 REFERENCES	 56
APPENDICES.....	71

LIST OF TABLES

Table 1:	Fruits and vegetable area, production, yield and number of households	2
Table 2:	Specification of variables included in binary logit model for market participation.....	37
Table 3:	The age of the respondents.....	42
Table 4:	Sex of the Respondents	43
Table 5:	Education level of the respondents	43
Table 6:	Household size of the respondents	44
Table 7:	Major occupation of the respondents	45
Table 8:	Value Addition by Smallholder vegetable farmers	45
Table 9:	High-value Market Categories and Names	46
Table 10:	Binary logit regression results (N=200)	47
Table 11:	Strength and Weakness of smallholder vegetable farmers in Arusha Region.....	50
Table 12:	Opportunities and threats/challenges of smallholder vegetable farmers.....	51

LIST OF FIGURES

Figure 1: Conceptual Framework	9
Figure 2: Map of Arusha Region illustrating the locations of this study	30

APPENDIX

Appendix 1: Farmers' Questionnaire	71
--	----

LIST OF ABBREVIATIONS

AVRDC	Asian Vegetable Research and Development Centre
ESRF	Economic and Social Research Foundation
ESRI	Environmental Systems Research Institute
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FGD	Focus Group Discussion
GDP	Gross domestic product
HODECT	Horticultural Development Council of Tanzania
MLE	Maximum Likelihood Estimator
MU	Marginal Utility
NBS	National Bureau of Statistics
REPOA	Research on Poverty Alleviation
SWOT	Strength Weakness Opportunities Threats
SPSS	Statistical Package for Social Sciences
TAHA	The Tanzanian Horticultural Association
URT	United Republic of Tanzania
USDA	United States Department of Agriculture
VC	Value Chain

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Agriculture is the main stay of Tanzanian economy contributing about 26.5% of the GDP, 30% of the export and provides employment for the majority of the nation's population (HODECT, 2010). Horticultural produce has always been part of Tanzania's diet and mainstay of many Tanzanians. Fruits, vegetables, spices, and flowers have been cultivated in Tanzania for generations and traded throughout the region (Muhanji *et al.*, 2011). The sector is growing fast at an annual rate of 6 -10% and has contributed to the country's export earnings (HODECT, 2010). The sector makes a significant contribution to food security, nutrition improvements and economic growth. It is mainly practiced by small scale farmers with a few large scale operators (Mutayoba, 2015).

According to small and medium enterprise competitiveness facility (SFC) report of 2008 conducted in Tanzania, the major groups of crops in horticulture sub-sector in Tanzania include fruits, vegetables, and flowers. A large range of vegetable crops produced in the country is marketed through several domestic and international market outlets. These outlets include the local market where traditional vegetables such as amaranth, tomatoes, and African eggplant are sold; urban markets which apart from amaranth and tomatoes also sells high-value vegetables such as cabbage, carrots, sweet pepper, broccoli, zucchini, and lettuce. Apart from these national or domestic markets, there are few export markets. Crops like onions and tomatoes are sold through regional export market mainly in Nairobi, Kenya while high-value vegetable crops such as baby corn, mange tout, and French beans are exported to markets in Europe.

Therefore, according to National Bureau of Statistics Report of 2008 on the agricultural sample census in Arusha Region, fruits and vegetables were produced by a total of 17 737 households with the average area and harvest per household of 0.24 hectares per household and 1 tons per household respectively. Tomatoes were grown by the largest number of households (26%) followed by onions and cabbage (14% each), spinach and amaranths (9%), bitter aubergine (7%). Smallholder farmers produced the other fruits and vegetables in Arusha Region ranging between 1% and 6% (Table 1).

Table 1: Fruits and vegetable area, production, yield and number of households

Crop name	Quantity Harvested (tons)	Actual Planted Area (ha)	Yield (tons/ha)	Number of Household	Area per household	Harvest per household
Amaranths	309	120	2.26	1580	0.09	0.18
Bitter Aubergine	751	263	2.25	1218	0.22	0.43
Cabbage	4649	434	10.36	2396	0.17	1.38
Carrot	993	176	8.91	1029	0.15	1.00
Chilies	276	69	3.94	701	0.12	0.29
Cucumber	1464	272	5.39	488	0.56	3.00
Egg Plant	519	75	5.31	207	0.35	2.14
Okra	94	150	0.51	648	0.23	0.12
Onion	1925	754	1.99	2 513	0.52	1.14
Radish	110	122	0.44	472	0.20	0.12
Spinach	566	173	6.05	1 636	0.10	0.43
Tomatoes	18 866	1351	9.07	4 606	0.25	2.57
Turmeric	27	127	0.23	241	0.53	0.11
Total/Average	30 549	4087	5.08	17 737	0.24	1.00

Source: National Bureau of Statistics report 2008

The number of households growing tomatoes in the region during 2008 was 4606. This represents 26 percent of the total fruits and vegetable growing households in the area. Arumeru District had the highest number of tomato farmers and the largest percentage of tomatoes production (3 050 or 66 percent of tomatoes grown in the area).

It is then followed by Arusha Rural (597 or 13%), Longido (376 or 7.6%), Ngorongoro (355 or 8%), Monduli (143 or 3%) and Arusha (85 or 2%).

The numbers in Table 1 illustrate that vegetable production is a profitable business. Farmers involved in vegetable businesses usually earn much higher farm income as compared to cereal producers. Cultivation of vegetables allows for a more productive utilization of agricultural resources since returns per unit land or labor is normally higher than from the staple crops (SCF, 2008). Therefore, increasing horticulture production could help to commercialize the rural economy thereby creating many off-farm job opportunities. However, expanding the scale of vegetable production is often hindered by several factors including high perishability of fresh vegetables, poor access to markets, lack of market information, low prices at local markets as well as high costs of farm inputs and prevalence of pests and diseases (Weinberger and Lumpkin, 2005).

Improving market access for smallholder farmers has a great potential to improve incomes for small vegetable producers and traders (Weinberger *et al.*, 2004). Despite many studies confirming this fact, still access to market opportunities for the small farmers remains a major problem for small value chain players in the vegetable sub-sector. According to Jones (2015), findings show some issues such as poor infrastructure, grading systems, inadequate storage facilities, insufficient market information and communication between farmers, traders and consumers pose a significant hindrance to market accessibility. Other studies have found out that smallholder vegetable farmers face a limited access to farm credit due to high interest rates attached to these loans (Shute *et al.*, 2011). All these factors in combination limit smallholder farmers to participate effectively in and benefit equitably from high-value chains that serve either the local, regional or international markets.

Therefore, this study identified affordable high-value market opportunities for smallholder vegetable farmers in Arusha Region as well strength and weakness that may favor or hinder these farmers from participating in these market opportunities. High-value markets these are markets where by added value produce are sold, the addition of value in the case of vegetable could be standardizing, grading, cleaning, packaging, labeling and sorting (Simon, 2009). According to the National Bureau of Statistics census conducted in 2008, the three most grown vegetables were tomatoes, onions, and cabbage respectively. This study, therefore, assessed the market opportunity for smallholder vegetable farmers for these three vegetables.

1.2 Problem Statement

Despite various agricultural development efforts by national and international agencies that have brought about technical innovations such as improved crop varieties as well as better production techniques, the resultant increase in farm output has not necessarily been translated into higher incomes for smallholder farmers in Tanzania (Adejobi *et al.*, 2006).

Smallholder vegetable farmers are still faced with weak production base, most of fruits and vegetables produced in Tanzania come from small-scale farmers with plot sizes of 0.1 to 2.0 ha (HODECT, 2010). Consequently, these producers cannot supply large buyers with sufficient quantities of vegetable produce to make them attractive suppliers and sustain the market. Insufficient economies-of-scale and inadequate coordination among smallholders makes it difficult to reach the volume of supply necessary to gain access to the high-value market.

Moreover, a serious problem concerns the huge losses of vegetables due to their perishability nature. Post-harvest losses of vegetables vary greatly among commodities, production areas and seasons. It is estimated that between 20 to 50% of crops are lost in the varied steps from farmer to consumer (Kader, 2003). Other studies have also shown that more than 40% of agriculture producers in developing countries are lost after harvest (Gustavsson *et al.*, 2011). Every harvesting season 3000 metric tons of agriculture produce go to waste due to lack of ready markets to farmers as a result of price fluctuations as well as adverse weather conditions during harvesting, poor handling practices and lack of cooling facilities to prolong storage after harvest (Muhanji *et al.*, 2013).

According to Cernansky (2015), 20% of agriculture produce at Kilombero wholesale market in Arusha, Tanzania were unloaded from trucks with bruises that led to rotting and decline in quality before they are sold to retailers and consumers. Also according to studies conducted by Weinberger and Msuya (2004) in Arusha Region, inadequate storage facilities were found to be the primary cause of loss in quality of fresh vegetables thereby reducing returns to vegetable smallholder vegetable growers.

This study is expected to generate findings that could help smallholder farmers along selected vegetable value chains in Arusha Region, Tanzania adopts an attitude of producing what they can sell for the best price, rather than merely sell whatever they were used to grow. This way a farmer could have better access to high-value market opportunities that in return could help them to improve the quality of their products thereby increasing their sales, returns, and incomes. Recommendations from this study could also help policymakers in enacting policies that could encourage smallholder

farmers and other players in the vegetable value chain to change their attitude and behavior to target and benefit from high-value market opportunities.

1.3 Overall Objectives

The overall objective of the study was determination of high-value market opportunities available to smallholder vegetable farmers in Arusha Region that are best suited to their skills, attitudes, and resources to offer products and services that continuously meet the needs of end consumers and other customers at competitive prices.

1.4 Specific Objectives

Specific objectives of this study are to

- i. Identify the characteristics of high-value market opportunities available to smallholder vegetable farmers in Arusha Region.
- ii. Determine factors that influence smallholder vegetable farmers' participation in high-value market opportunities in Arusha Region.
- iii. Examine the capability of smallholder vegetable farmers in Arusha Region to become preferred suppliers in selected high-value markets.

1.5 Research Questions

- i. What are the characteristics of high-value market opportunities available to smallholder vegetable farmers in Arusha Region?
- ii. What are the factors that influence smallholder vegetable farmers' participation in high-value market opportunities in Arusha Region?
- iii. How can smallholder vegetable farmers in Arusha Region become preferred suppliers to selected high-value markets?

1.6 Conceptual Frame Work

More often than not, smallholder vegetable farmers aim to maximize profit by selling their vegetables at local or international markets. These farmers maximize their profits by minimizing their production cost and selling their produce at the highest prices. This kind of marketing behavior takes place in the spot market, a place where goods are sold for cash and exchange ownership immediately (Cronon, 1992). A spot market is characterized by high price fluctuations, lack of buyer and seller relationship, limited sharing of market information between buyers and sellers, lack of trust and poor knowledge of products that potential consumers and customers need.

In contrast, a group of smallholder farmers can choose to differentiate themselves by producing high-quality produce that would compete on value rather than producing the same standard product as most other farmers do. As a result, customers choose them as preferred suppliers, and consumers choose their products based on factors other than just price (Thompson, 2004). This increases the potential incomes of farmers and other players in the chain by producing few but good quality vegetables that could be sold at a premium in high-value markets. These farmers supply high-value product, nature long term relationship between them and other buyers and sellers. They work together to reduce wastes, develop good trust between them and their buyers, share market information openly, and are assured of a good price for their produce from buyers since they have a good knowledge of the needs of consumers and other purchasers. The aim of such farmers is to maximize value rather than profit.

However, both types of farmers are faced with three fundamental questions: where to sell, when to sell and whom to sell to. Both types of farmers are also faced with two market opportunities: either to sell at the local market or in the high-value markets such as hotels,

supermarkets, and other institutions. The decision of the vegetable smallholder farmer to sell in either market depends on farmers' knowledge of the needs of their potential consumers and customers as well as farmers' awareness of their strengths and limitation to meet these needs.

For smallholder farmers to benefit from high-value markets, they must grow vegetables required by that particular market and continue to supply this produce in specified quality, volumes, and times. Such farmers must base their decisions and behavior, not to grow their vegetables for profit maximization but supply vegetables that can enable them to maximize value (Figure 1).

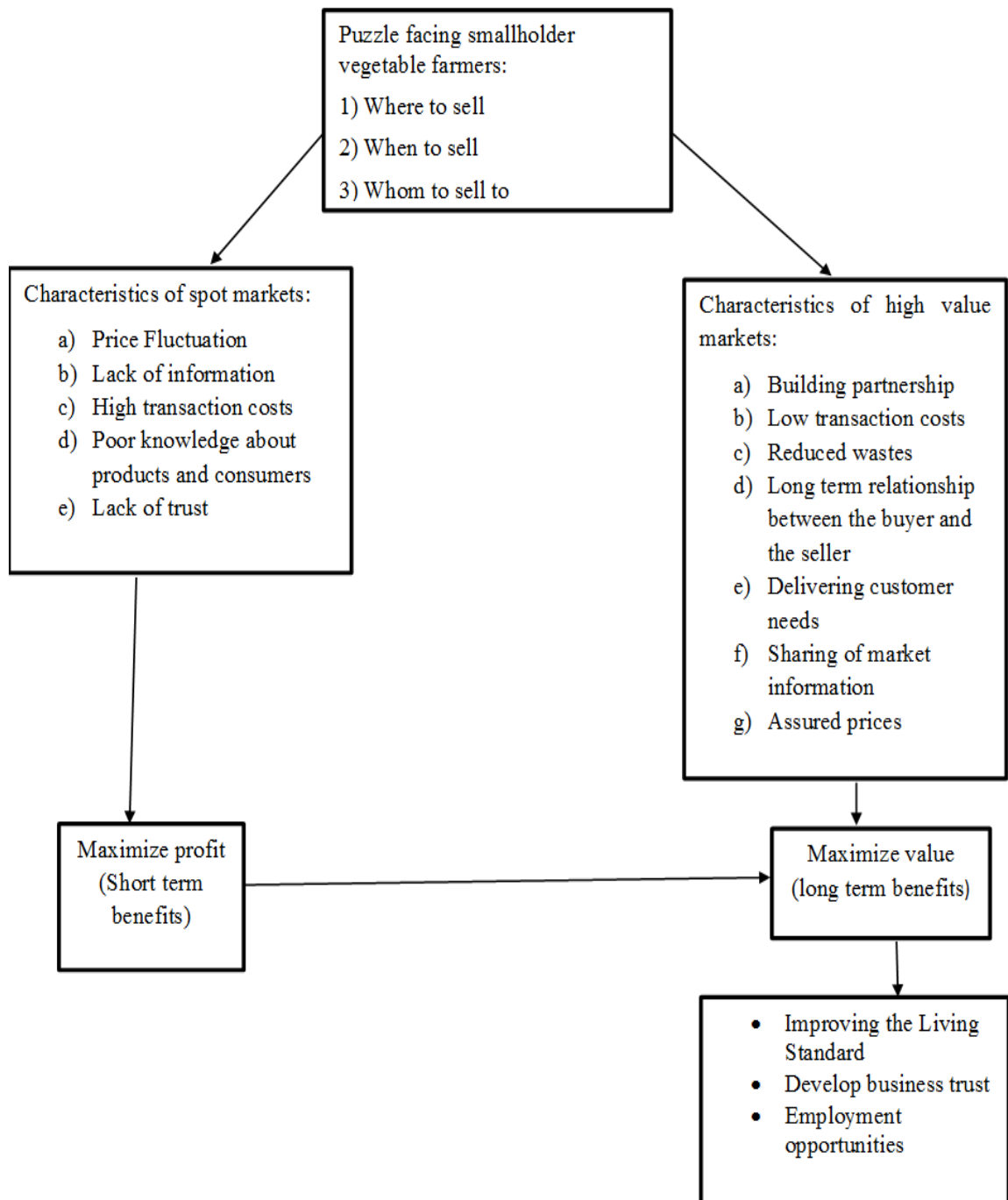


Figure 1: Conceptual Framework

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Defining Market and Marketing

Market is defined as an area in which one or more sellers of given products/services and their close substitutes exchange with and compete for the patronage of a group of buyers. A market is a point or a place or sphere within which price making force operates and in which exchanges of title tend to be accompanied by the actual movement of the goods affected (Beckman and Davidson, 1962). The concept of exchange and relationships lead to the notion of the market. It is the set of the actual and potential buyers of a product (Kotler and Armstrong, 2003). Still another scholar, Saccomandi (1998), defined market as the exchange, circulation, and distribution of commodities between people and places. By agricultural market, Saccomandi (1998) added refers to the economic 'place' in which farmers sell the products obtained in their farms with the degree of form, space, and time-related utility required by the buyers. Therefore conceptually, a market can be visualized as a place in which ownership of goods is transferred from sellers to buyers who may be final consumers or intermediaries.

On the other hand, marketing is defined as the process of satisfying customer and consumer needs by bringing products to the buyers in the proper form, time, and place (Branson and Norvel, 1983). Thus marketing comprises of a set of institutions and processes for creating, communicating, delivering, and exchange of goods and services that have value for customers, clients, partners, and society at large. Further, Kotler and Armstrong (2006) define marketing as the task of creating, promoting, and delivering goods and services to consumers and businesses. However, this study adopted Branson and Norvel definition of marketing. This definition suits well with this study because it

involves all activities, relationships, and interactions that go on between the smallholder vegetable farmers and other players in the high value market chains for vegetable crops such as collectors, transporters, and retailers. These activities are such as creating communication, delivering vegetables at the right time, with the right quality and quantity, and also the exchange itself between them.

2.2 Input Markets and Output Markets

2.2.1 Input markets

The upstream end of vegetable value chains begins with production. According to Bunemann *et al.* (2006) these inputs include mineral fertilizers such as urea, ammonium nitrate, sulfates, and phosphates, organic fertilizers such as animal manures, composts, and biosolids, and pesticides including herbicides, insecticides, nematicides, fungicides, and soil fumigants. Other inputs include equipment, energy, seeds, and seedlings. In another study Peterman *et al.* (2010) defined agricultural inputs in four main areas; (1) technological resources (including inorganic fertilizer, insecticide, improved seed varieties and equipment), (2) natural resources (including water and soil fertility), (3) human resources (including labor, extension services, and life-cycle concerns) and (4) social and political capital (including group membership, social networks, and political representation). All these products are applied with the ultimate goal of maximising productivity and economic returns. In this case, according to Abdulai (2006) 'vegetable farm inputs' as it applies to the area of agriculture can be defined as the resources that are used in vegetable farm production. Moreover, efficient production is not possible if necessary vegetable farm inputs of high quality are not available in time or if input prices are not affordable to farmers (Sebatta *et al.*, 2014). Thus there is a need to improved efficiency in the marketing of vegetable farm inputs in order to reduce their costs and increase their availability.

Most farm inputs for growing vegetables are purchased from agro-chemical retail outlets (Bunemann *et al.*, 2006) thereby making production costs of farmers susceptible to non-farm economic conditions. Consequently, over time, prices of vegetable farm inputs have increased over and above commodity prices, creating what can be described as a cost-price squeeze to small-scale farmers. Also, smallholder farmers can benefit from local research institutes such as Asian Vegetable Research and Development Centre (AVRDC). The Tanzania Horticultural Association (TAHA), and Tengeru Horticultural Research and Training Institute (HORTI) in Arusha Region. This organization can assist smallholder vegetable growers with training on production skills and provide them with market information.

2.2.2 Output market

Output market is the market in which goods and services are exchanged (Krugman, 2013). According to Peterman *et al.* (2010), an output in agriculture is the quantity of agricultural produce or livestock produced or increased in a given time period in the farm whether consumed or used for further production. According to Small and Medium Enterprise Competitiveness Facility (SCF) (2008), smallholder vegetable farmers in Arusha Region market their vegetables to the Arusha central market, Tengeru market, Kilombero market, Ngaramtoni market, supermarkets, hotels, schools and other sell their vegetables to traders who transport their vegetables out of the region. In order for smallholder vegetable farmers to participate in these vegetable output markets, they have to understand consumer needs (Afari-Sefa *et al.*, 2012). Consumers always prefer different vegetables and are keen on how these vegetables are produced and marketed.

2.3 Common Vegetable Market Characteristics

Vegetable marketing is influenced by some factors that can be attributed to production, product, and market characteristics. According to Adugna (2009), these characteristics as perishability, price/quality risks, seasonality and product bulkiness.

2.3.1 Perishability

According to Thomas *et al.* (2005) vegetables are highly perishable; they start to lose their quality right after harvest and continued throughout the process until they are consumed. Micro-organisms and natural enzymes change the color, texture, and flavor of raw vegetables quickly than other types of crops such as cereals (Shackleton *et al.*, 2010).

This behavior of vegetables limits the time they could stay unspoiled before they are processed or consumed. According to Nenguwo (2004) the perishable nature of fresh vegetable demand careful handling and investment in proper equipment such as cold storage facilities to increase their marketing period and to also reduce losses due to mechanical damage, pest or disease infestation, or rapid deterioration. Vegetable agro-industries are able to decrease the loss caused by the perishable nature of raw vegetables and extend their shelf life through effective and quality handling techniques during transportation and storage; as well as the utilization of modern processing and preservation technologies (Eric, 2006), however, such activities require a great deal of investment which may exceed the short-term return on investment and which may not be available and affordable to smallholder vegetable farmers.

2.3.2 Price /quantity risks

According to United States Department of Agriculture (USDA) report of 2009, the high perishable nature of vegetable makes it difficult for farmers and traders to schedule the

supply of vegetables to match the current demand in the markets. Thus the crops are sold at varying prices due to seasonal supply leading to high price risks. However according to Adeoye *et al.* (2009), price and quality are synonymous with vegetable production. Unfortunately, it is not always easy to know what is meant by “high quality” and quality judgment often varies from year to year and place to place. According to Kajumba (2012), the demand of vegetable consumers also changes across the seasons because buyers and consumers often have additional criteria by which they judge produce quality, including flavor, ripeness, odor, cleanliness, purchasing power, and the presence of insects and foreign material. Unusual weather during production or harvesting of vegetables or an outbreak of a major crop pest or disease (Nenguwo, 2004) can influence price and quality of vegetables being harvested or marketed. According to (Vassalos, 2013), for smallholder vegetable farmers to fetch higher prices for their produce they should practice contract farming, and also a proper disease management, harvest methods (including picker instruction and supervision), and postharvest handling is critical to their marketing success.

2.3.3 Seasonality

According to Kajumba (2012), the production of vegetables follows a seasonal pattern especially by smallholder farmers who depend on rainfall and have limited capacity for irrigation to off-season production. In turn, seasonal availability of different vegetables directly influences their marketing (Trienekens, 2011). Most common vegetables normally have a limited period of harvest (Lipinski, 2013) though they may have more or less a year-round demand. Seasonality of vegetable products may result in scarcity for vegetable in the markets, which is the most serious problem of the markets (FAO, 2009). According to Osano (2010), seasonality in the supply of most vegetables is worsened by lack of facilities to prolong shelf life, store and value of such vegetables. In some cases,

the cultural and religious set up of some societies renders demand of some vegetables to be seasonal.

2.3.4 Product bulkiness

According to Weinberger *et al.* (2011) water is the major components of vegetable products, this makes them bulky and of low value per unit weight and are expensive to transport in original form every time. This, therefore, make farmers lose a significant amount of vegetables since most of is left in the farms unsold. However, according to Chidumu (2007), smallholder farmers can avoid this loss by working together such as in farmers' groups or cooperatives and also engaging themselves in contract farming. According to FAO (2010), contract farming benefits smallholder vegetable farmers by providing them with inputs support and production services. Also, it is usually done on credit through advances from the sponsor. Contract farming often introduces new technology and also enables farmers to learn new skills (Reardon *et al.*, 2009). Through working under contract, smallholder farmers' price risk is often reduced as many contracts specify prices in advance. Also, by working together in groups' smallholder farmers would fetch high market for their produce.

Never the less the listed characteristics in Section 2.3 of the product according to Chidumu (2007) require an individual provision of extra inputs. It demands a regular marketing preparation process like washing, cooling, and proper management from the time of harvest until the produce is put on display tables in the market (Thomas *et al.*, 2005). According to (Reardon *et al.*, 2009), it is frequently believed that a vegetable not only remains attractive to the consumer it must also have a shelf life of few days after purchase by the consumer.

2.4 High-value Vegetable Market Characteristics

High-value vegetable markets include supermarkets, tourist hotels, and schools and colleges. According to (GlobalHort, 2009), contract farming characterizes these high-value markets to smallholder vegetable farmers, grading, and standardization, reliable and assured price, enough information about the produce and producer, good quality of the product, delivery schedule, the nature of the product, and food safety.

According to GlobalHort (2009), contract farming has become an increasingly popular means for the supply of agricultural commodities in many developing countries like Tanzania. This is particularly where missing markets or imperfect markets such as credit market, market information, and technical know-how do not permit a reliable supply of produce in quantity or quality (Reardon *et al.*, 2009). The requirements of standard compliance, particularly for high-value markets such as supermarkets, tourist hotels and school and colleges have also played a role in the expansion of contract farming (Irungu *et al.*, 2011). However according to Emongor (2006), due to their desire for good quality and reliable supply, these high-value markets enter into contracts with smallholder farmers to supply them with vegetable farm inputs and later return to buy their produce.

Apart from contracts, standard and grading are another characteristics of these high-value markets. According to GlobalHort (2009), standardization and grading refer to the process of setting up basic measures or standards to which the products must conform and taking steps to ensure that the goods produced adhere to these standards. Standards reflect desirable features of a product regarding its design, weight, size, and color (Mpenda, 2010). However, according to Adugna (2009) standardization means that goods are of a specified and uniform quality. Grading is the process of sorting individual units

of a product into distinct classes or grades of quality. Each high-value vegetable market has its standards and grade that they have decided to follow.

Smallholder vegetable farmers are assured of the prices that are offered by high value markets because prices set by these markets usually do not fluctuate as local market prices (Reardon *et al.*, 2009). High-value markets announce to consumers their selling prices so that the consumer is aware at what price he/she is purchasing a certain product (Adugna, 2009). According to Reardon *et al.* (2009), supermarkets compete with each other primarily on the basis of cost and therefore tend to stay within 10-30 percent of prices set at the street fairs and central markets that still dominate informal, or traditional, retail of fresh produce. Thus, quality becomes crucial in differentiating the supermarket's product from that of traditional markets and street fairs.

For the high-value markets information about the product is critical. The buyer knows well about the product and the farmer who produced it and how he/she produced it. This is very necessary for customers who would like to know about the product. However, according to Emongor (2006), high-value markets also have good storage facilities; this helps the vegetables to stay fresh until they are bought from the supermarkets. This contributes to reducing waste and income loss to the buyers and sellers of vegetables. Therefore according to Neven (2002), vegetable high-value markets relative to traditional local markets, high-value markets demand from their fresh vegetables suppliers: (1) higher, more consistent quality; (2) consistent, year-round supply of larger volumes according to pre-arranged supply calendars, (3) lower prices and participation in promotions, (4) lower transaction costs, (5) new products (new varieties or value-added products, imports), (6) food safety guarantees (good agricultural practices in farming and post-harvest activities), (7) adherence to specific logistical supply formats

(transportation, cold chain, crates), (8) more stringent delivery conditions (timing, payment terms, slotting fees, washing, grading, packaging, labeling).

2.5 Factors Influencing Smallholder Farmers to Participate in High-Value Market

According to Irungu *et al.* (2011), there are several factors that influence smallholder farmers to participate in high-value markets. These factors are land size, the presence of good transport and communication systems, skills on vegetable cultivation, transaction costs, and level of education of the vegetable farmer, the presence of irrigation systems, technology, fertilizer use, and availability of high quality seeds.

In Arusha Region, there is agro-climatic conditions suitable for growing various tropical crops (Lyatuu *et al.*, 2009). This is one of the opportunities for the development of sustainable vegetable production since there is a continued supply of water for irrigation purposes, good extension services and availability of vegetable seeds from several research institutes in the area (Temu and Marwa, 2007). Unlike the developed countries, which have a temperate climatic zone where the production of vegetable crops is limited to seasonality, most Sub-Saharan African countries have a tropical climate that is suitable for the production of different vegetable crops (Temu and Marwa, 2007). According to Ambrose-Oji (2009), Favorable climate and ample irrigational possibilities make one region possible for the growth of a variety of vegetable crops.

However, horticulture is the fastest growing industry in Tanzania, according to the Tanzania Horticultural Association, with export growth at 8% each year (Tanzania Horticultural Association 2010). Developing countries have a high contribution to the growth of the horticultural sector, though the highest contribution came from China (Mubarik, 2003). However, in recent years, 40% of the increase in horticultural crops

(including vegetables) came from developing countries, 52% from China while 8% came from developed countries (Mubarik, 2003). These figures show that the vegetable production in developing countries is increasing at a significant rate; hence there is an opportunity for smallholder vegetable farmer to export their vegetables to developed countries like Europe.

The other factor is the growth of supermarkets, tourist hotels, and colleges whereby smallholder vegetable farmers can sell their produces. According to Reardon (2004), Supermarkets were traditionally viewed by development economists, policymakers, and practitioners as the rich world's place to shop. However, today supermarkets are no longer places where only rich people shop. Over the past ten years or so, they have spread from the wealthy suburbs of the main cities to poorer areas and much smaller towns (Afari-Sefa *et al.*, 2013). This has happened in response to some forces, many of them which are interconnected. According to Neven *et al.* (2002), one of the reasons is raising incomes that are also associated with higher ownership of fridges, motorcycle, and cars that facilitate supermarket shopping. The other reason is urbanization, more female participation in the labor force which has increased the opportunity cost of time and the desire to emulate western culture, spurred on by the globalization of the media and advertising (Reardon, 2004).

Though there are positive factors that influence smallholder farmers to participate in high-value markets, there are also challenges that smallholder vegetable farmers meet. These challenges are farmers still find it difficult to participate in markets. Very few smallholder farmers participate in distant markets. According to the study by Makhura (2001), which investigated that the transaction costs barriers in the market participation of smallholder farmers in the Northern Province of Swaziland, it was found out that

marketing by smallholder farmers was constrained by poor infrastructure, distance from the market, lack of assets (for example own vehicles and motorcycles) and inadequate market information.

However according to Jaffe (2003), lack of bargaining power along with various credit bound relationships with the buyers which require the seller to market his produce under credit provision and get paid after quite some time thus this has caused farmers to be exploited during the transaction where most of the farmers become price takers. The majority of the farmers are smallholders and hence, unable to obtain a fair price for their produce due to presence of middlemen and market information asymmetry (Mubarik, 2003). This results in farmers not being able to sustain their livelihood. These challenges also apply to smallholder vegetable farmers in Arusha Region in Tanzania.

Also, the structure of the traditional vegetable supply chains is such that there are a large number of intermediaries (e.g. vegetable collectors, transporting agents, commission agents) between the producer and the final consumer (Navindra, 2003). Additionally, according to Kodithuwakku (2000), the marketing margins of all these intermediaries coupled with almost 30 to 40 percent of the vegetables being wasted as post-harvest losses have eventually resulted in producers receiving a low price for their produce while on the other end consumers are compelled to pay an inflated price for their purchases.

According to Jaleta (2007), small market channels and insufficient information regarding price were among factors affecting the commercialization of smallholder agriculture. Furthermore, Emana and Gebremedhin (2007), in their study on market chain analysis argued that the marketing of horticultural crops are affected by inadequate local markets,

poor pricing system, lack of domestic markets to absorb oversupply, low produce prices, many intermediaries, and weak marketing institutions and poor coordination of farmers. Emana and Gebremedhin (2007) further argued that poor handling and packaging of products, poor pricing systems, and limited information sharing affect the marketing of vegetables.

2.6 The Concept of Market Participation

The concept of market participation has been defined and interpreted in various ways. According to Barrett (2008), two basic interpretations can be inferred. This author asserts that households can participate in the market either as sellers or buyers. Both the decision to enter the market as a seller or a buyer is motivated by the theory of optimization where the household seeks to maximize utility subject to the cash budget and available non-tradable resources. In line with this, Goetz (1992), Key *et al.* (2000), and Holloway *et al.*, (2005), view market participation as a two stage phenomenon, where the market of a commodity and participation is determined by net sellers and buyers as households. The similarity of this view to Barrett's is in the second stage. Therefore market participation has a demand side where households participating as buyers, and a supply side where households participating as sellers. At the same time participation of smallholder farmers in the marketing of vegetables is influenced by several factors as explained below.

2.6.1 Factors influencing participation of smallholder farmer in high-value market

Rapid population growth and urbanization in developing countries imply high demand for food and require urgent supply response to prevent widespread famine, especially among low-income consumers (Pingali *et al.*, 2006). In Tanzania, about 30% of the approximately 44 million national population lives in urban areas. Close to 40% of the

urban population resides in the Dar es Salaam City, representing a considerable share of middle income and high-income consumers of fresh fruits and vegetables (Nyange *et al.*, 2000). Due to high growth of population, smallholder farmers in rural and peri-urban areas of developing countries are essential for the development of effective agribusiness value chains that could supply adequate food. This involved improving the production and marketing processes for key commodities that have greater potential for supply in more nutritious food, as well as capacity for income generation among resource-poor farmers.

According to McCullough *et al.* (2008), recent transformations in agri-food systems, particularly the rise of supermarkets and technological advances in the agricultural sector of many developing countries during the last decade, offer opportunities for smallholder vegetable farmers to participate in the high-value vegetable markets. The growth of transport and communication services has also helped smallholder vegetable farmers to take part in high-value markets (Mubarik, 2003). Other supporting factors include labor technology development, credit availability, supporting institution and storage technology growth.

2.7 Smallholder Farmers' Ability to Meet Buyers Needs

According to Economic and Social Research Foundation (ESRF) (2016), Most of the smallholder vegetable farmers that fail to meet the needs of consumers are faced with problems relating to drought and lack of pesticides, as well as their vegetables being rejected due to poor quality. According to McCullough *et al.* (2008), the smallholder farmers' rejection due to a poor quality of vegetables is due to among other things, vegetables exceed their harvest time, and crops having a high level of pesticides. Other reasons were drought, lack of pesticides, low quality leading to rejects,

overwhelmed with second contracts, pesticide destruction of crops, late in delivering produce, high price of inputs, lack of extension services, destruction of crops by pests, low production, inadequate capital and lack of hybrid seeds.

According to Sososay *et al.* (2015), value chain thinking can enable smallholder vegetable farmers to produce high-value products which would fetch high prices. Value chain thinking means that farmers enhance their income by looking for market opportunities where they would compete on their skills and quality of their products rather than just offering their produce at the highest price (Tenkouano, 2013). This assured consistency of supply of vegetables to high-value markets due to cooperation and working together with other farmers and traders.

2.8 Theoretical Framework

2.8.1 Value chain management theory

A value chain involves the full range of activities in production and distribution system, beginning with a product's conception, through its design, coordination, production, marketing, and consumption recycling (Kaplinsky, 2006; Kaplinsky and Morris, 2001). On the other hand, Henning *et al.* (2008), and Hichaambwa *et al.* (2006), defined value chain as chain consisting of activities and processes including production, processing, trading, and consumption. According to Ssango (2006), value chain is a particular type of supply chain where different actors actively seek to support each other so that they can increase their efficiency and competitiveness. They invest time, effort, money and build relationships with each other to reach a common goal of satisfying consumer needs so as to increase their profits.

In this study, value chain theory was used to explain the movement of vegetable produce along different actors from initial stage of production to the final consumer. The value chain functions such as input suppliers, production, marketing, and consumption were referred as potential criteria for the sustainable and consistent flow of goods within the value chain. Nevertheless, markets, whereby vegetables were sold, had to have a flexible and affordable channels to reach the spot markets and high-value markets from which consumers were considered to be the final target given the affordable price and quality demanded by the consumers.

2.8.2 Utility theory

Utility theory is a theory used in economics that holds the belief that an item or service's utility is a measure of the satisfaction that the consumer will derive from the consumption of that particular good or service (Aumann, 1962). Utility is a measure of preferences over some set of goods and services (Fishburn, 1970). Smallholder vegetable farmers aim at maximizing their utility. According to Bordley and Kirkwood (2004), the utility maximization model is built based on the following assumptions that consumers are assumed to be rational, trying to get the most value for their money. Consumers' incomes are limited because their individual resources are limited. They face a budget constraint. Consumers have clear preferences for various goods and services, thus they know their marginal utility (MU) for each successive units of the product. Also, every item has a price tag. Consumers must choose among alternative goods with their limited money incomes. According to Gilboa *et al.* (2009), the utility maximization rule states that consumers decide to allocate their money incomes so that the last shilling spent on each product purchased yields the same amount of extra marginal utility. According to Rahm and Huffman (1984), for this study the discrete decision of whether to participate in high-value market modeled as utility maximization functions specified as:

$$\text{Max}(U) = U(FC_{ji}, TA_{ji}) \dots \dots \dots (1)$$

Where $U(.)$ is the non-observable utility function that ranks the preference of the i th farmer for the j th market ($\forall j = 1, 0$); 1 for high-value vegetable markets and 0 for local vegetable market.

2.9 Empirical Review

2.9.1 Vegetable value chain analysis

Chagomoka *et al.* (2013), conducted a study on value chain analysis of indigenous vegetables from Malawi and Mozambique. According to the writers, several studies had shown that indigenous vegetables had high market potential and contribute substantially to household incomes. Therefore with that reassurance of their importance in human nutrition, they saw the need to understand the interactions among various actors in the value chain so as to be able to improve marketing efficiency by adding value to produce. In order to achieve their objective a multistage cross-sectional primary data of 240 respondents in Malawi and Mozambique were used. The study also employed participatory evaluation and market research of a wide range of indigenous vegetable value chain to identify potential outlets and target crops and, define processes of the value chains, including choice of market outlets and mode of farmer-buyer linkages. Value chain mapping was also used in the study to establish linkages among chain actors while strength, weakness, opportunities, and threats (SWOT) analysis was used to identify constraints and opportunities in the value chain. From this study, it was found out that indigenous vegetable sales contribute about 35% and 30% of the small-holders income in Malawi and Mozambique respectively. Most linkages between value chain actors are spot market transactions except for that between retailers and supermarket which are based on relationship marketing. The findings of the study also indicate that 12% of respondents in Malawi and 6% of respondents in Mozambique process their indigenous vegetables.

According to the study done by Beyene (2012), on the value chain analysis of selected vegetable sub-sectors in RAPID project areas of Oromiya and SNNP regional states. The main objective of this study was to explore ways to increase the productivity of food crops and expand the ranges of agricultural and marketing activities to generate cash income for the poor households. To support the achievement of this objective, effective extension advice, affordable agricultural inputs and credit and strengthening the capacity of actors along the supply chain are required. This study generated information along the production and marketing chain of the selected vegetables (onion, tomato, and potato) that could help to identify synergies and strategic intervention areas. The study used a descriptive analysis of value chains of onions, tomatoes, and potatoes by identifying the major challenges and opportunities of the market chain of these vegetables, understanding support service provisions and suggesting the key intervention areas and recommendations to strengthen value chains of these vegetables in the RAPID project sites in Oromiya and SNNP Regions of Ethiopia. The study also employed value chain framework for the analysis of its data. Focused Group Discussions (FGD) were employed to generate primary data from Value Chain (VC) actors. Also, support service providers and other experts at various levels were approached to collaborate with the primary data. This study found out that several different actors involved in the value chain of onions, tomatoes, and potatoes included input suppliers, producers, brokers, wholesalers, retailers, and consumers. The study noted that there was no basic structural difference between the onion, tomato, and potato value chain in SNNP and Oromiya Regions except the fact that value chain in SNNP region was less complex, and production of these vegetables was less commercialized, at low scale and hence most products were sold in local markets. However, there were no processors of the products along the value chain except free chips makers in urban areas and tomato processor in Upper Awash Region.

2.9.2 Vegetable market analysis

Millichamp *et al.* (2012) compared the availability, price, variety, and quality of fruits and vegetables across retail outlets and by area-level socioeconomic position. The primary objective was to explore whether area-level socioeconomic position or the form of the retail stream (conventional versus farmers' market) are associated with differences in the price, availability, variety, and quality of a range of fresh fruit and vegetables. The study design involved a multi-site cross-sectional pilot study of farmers' markets, supermarkets and independent fruit and vegetable retailers. Each was surveyed to assess the price, availability, variety, and quality of 15 fruit and 18 vegetable items. The study findings showed that average basket prices were not significantly different across the socioeconomic spectrum however prices in low socioeconomic areas were lowest. Availability, variety, and quality did not differ across levels of socioeconomic position however the areas with the most socioeconomic disadvantage scored poorest for quality and variety. Supermarkets had significantly better fruit and vegetable availability than farmers' markets. However, price, variety and quality scores were not different from retail streams. Results demonstrate a trend to fruit and vegetable prices were higher at farmers' markets, with the price of the fruit basket being significantly greater at the organic farmer's market compared with the non-organic farmers' markets. From their study, they concluded that neither area-level socioeconomic position nor the form of the retail stream was significantly associated with differences in the availability, price, variety, and quality of fruit and vegetables, except for availability that was higher in supermarkets than farmers' markets. The study suggested that further research was needed to determine what role farmers' markets can play in affecting fruit and vegetable intake.

Another study was conducted by Teka (2009) on the analysis of fruit and vegetable market chains in Alamata, southern zone of Tigray. The study was initiated with the

objectives of analyzing fruit and vegetable marketing chains (onion, tomato, and papaya) in Alamata District, the southern zone of Tigray. Specifically, the study attempted to assess structure-conduct-performance of fruit and vegetable marketing, analyze market supply determinants, and examine the institutional support services of extension, input supply, and credit. The study also analyzed the profitability of fruit and vegetable production and marketing and identifies problems and opportunities in fruit and vegetable production and marketing. Cobb-Douglas (logarithmic function) econometric estimation procedure was used to identify factors that determine onion, tomato, and papaya market supply of the farm households in the area. The research findings showed that it was profitable to produce and sell onion, tomato, and papaya. However, this potential benefit is under the challenges of imperfect marketing. The market conduct is characterized by unethical practices of cheating and information collusion that led to uncompetitive market behavior even though the calculated concentration ratio did not indicate oligopoly market behavior (24.56%).

From the above studies, this study employed descriptive statistic to identify the characteristics of smallholder vegetable farmers in Arusha Region. Also, the study used binary logit model to determine factors that influence smallholder vegetable farmers' participation in high-value market opportunities in the study area. SWOT analysis was also used to examine the capability of smallholder vegetable farmers in Arusha Region to become preferred suppliers in selected high-value markets.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

The study was carried out in Arumeru District in Arusha Region, although some data on marketing was collected from markets in Arusha Municipality. According to United Republic of Tanzania Report (URT) (2012), Arusha Region is located in the north-eastern corner of Tanzania. It lies below the equator between latitudes 2° and 6° . The Region is situated between longitudes 35° and 38° East and longitudes $35^{\circ} 40'$ and $3^{\circ} 21'$ south. The Region has a common border with Kenya in the North, to the east, it borders Kilimanjaro and Tanga Regions. To the South, it shares a common border with Dodoma Region and to the West with Singida, Simiyu, Shinyanga and Mara Regions. Arumeru District is among the five districts in Arusha Region (Figure 2). Other districts include Arusha Urban, Monduli, Ngorongoro, and Karatu (URT, 2012). According to Arumeru District Profile, (2000), the district is the main supplier of different vegetables to the city of Arusha.

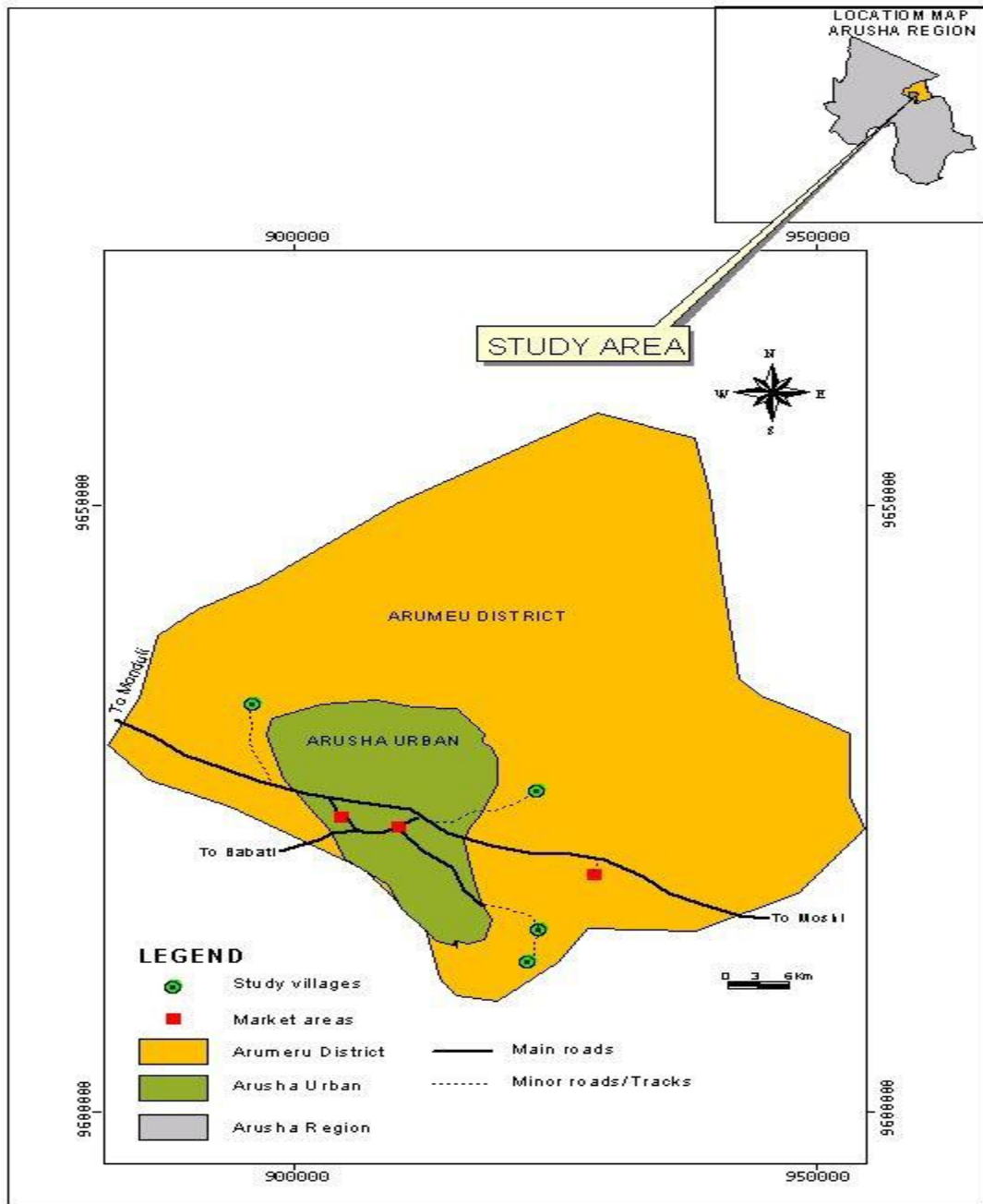


Figure 2: Map of Arusha Region illustrating the locations of this study (Source: ESRI (1991-1996))

3.2 Economic Activities

According to URT (2012), the main economic activities in Arumeru District are agriculture, livestock-keeping and on and off farm businesses. The main crops grown are maize, banana, beans, exotic vegetables such as tomato, cucumber, saro, broccoli, Chinese cabbage, spinach, Ethiopian mustard and fruits such as avocado, oranges, and mangoes. Other crops are coffee, indigenous vegetables such as African eggplant, amaranthus, African nightshade, okra, and asparagus. Main livestock reared are cattle, poultry, goats and sheep

3.3 Research Design

The study involved a cross sectional survey. This design allowed collection of data at one point in time in the month of March 2016. Data was collected from smallholder vegetable farmers at farm gate and in high value vegetable markets such as primary and secondary boarding schools, tourist and domestic hotels, vocational training colleges and supermarkets as well as vegetable consumers in selected market outlets in Arusha Region.

3.3.1 Study population

According to Greene (2007), population can be defined as a group of individuals or items that share one or more characteristics of interest from which data can be gathered and analyzed. In view of that, the population for the research comprised all households in Arumeru District producing onions, tomatoes, and cabbages. Also, the population comprised of high value vegetable markets such as primary and secondary boarding schools, tourist and domestic hotels, vocational training colleges and supermarkets found in Arusha Region.

3.3.2 Sample size

The sampling unit was the vegetable grower's household and high value vegetable markets such as primary and secondary boarding schools, tourist and domestic hotels, vocational training colleges and supermarkets and vegetable consumers found in Arusha Region. Determination of the sample size for smallholder vegetable farmers followed a proportionate to size sampling methodology as specified by Kaplinsky (2000) as follows:

$$n = \frac{(Z^2 PQ)}{d^2} \dots\dots\dots (5)$$

Where 'n' is the sample size $Z = 1.96$, 'P' is the proportion of the population of interest, smallholder vegetable farmers who cultivate tomatoes, cabbage and onions, the high-value markets and consumers of this vegetables. 'P' was set to 0.5 because statistically, a proportion of 0.5 resulted in a sufficient and reliable size, particularly when the population proportion is unknown with certainty. The variable 'd' is the significance level and was set at 5% as this was enough to remove 95% bias in sampling. This also led to 'Z' value of 1.96. Variable 'Q' is the weighting variable and is computed as '1-P'.

Based on the above proportionate to size sampling formulae, the sample size proposed is $[1.96^2 \times 0.5 \times 0.5] / [0.05^2] = 385$. However, 200 farmers were used for this study due to time constraint. Smallholder vegetable farmers were interviewed for this study. For high-value vegetable markets such as primary and secondary boarding schools, tourist and domestic hotels, vocational training colleges and supermarkets the sample size was selected randomly using simple random sampling.

3.3.3 Types of data

Primary data were collected for this study. It was collected through informal and formal surveys to get an in-depth understanding of the characteristics of high value markets in Arumeru District; strength and weakness of smallholder vegetable markets and how these influence their ability to supply vegetables to high value markets in Arusha Region. Data on how these farmers can become preferred suppliers of fresh vegetables to high value markets as well product preferences from shoppers at selected high value markets was also collected. The formal survey involved personal interviews using a pre-tested questionnaire.

3.3.4 Data Collection Methods and Tools

Both quantitative and qualitative methods of data collection were used in connection with all the information needed to answer the four research questions in Section 1.4. A structured interview was conducted using a structured questionnaire with both open and closed ended questions. One type of qualitative methods was used for the key informant interviews. Key informants interviews were conducted using a checklist of items for discussion with hotel, school and supermarket supervisors of a selected sample in Arusha Region. Additionally, review of documents from various sources was used to provide secondary information necessary to supplement primary data. Moreover, reference materials from Asian Vegetable Research and Development Centre (AVRDC) were used including books, journals, and various research reports.

3.4 Data analysis

3.4.1 Data analysis tools

The data were analyzed using Statistical Package for Social Science (SPSS) computer package and Microsoft Excel. SPSS was employed for both descriptive and quantitative analysis of the data, based on the objectives stated in section 1.4 in chapter one.

3.4.2 Descriptive analysis

Descriptive analysis and value chain mapping was employed in order to describe high-value market opportunities available to smallholder vegetable farmers in Arusha Region and to determine consumer preference for cabbage, onion, and tomato. In the descriptive analysis means, medians, frequency distributions, variance, standard deviations, range, percentage, cross tabulation, and skewness were computed from the data collected in this study (Green, 2007). Also, value chain mapping was used to show players, activities, and processes in the selected value chains and how vegetables, information and money move from the farm to the end consumers (Weinberger *et al.*, 2011).

3.4.3 Binary logistic model

The binary logistic model was used to determine factors that influence smallholder vegetable farmers to participate in high-value market opportunities. The participation in the high-value vegetable market decision was analyzed as a dichotomous response variable where a farmer either opts to participate in high-value vegetable markets or local markets. Logit and probit model is an appropriate tool in a situation where there is a dichotomous output that was thought to be influenced by different levels of some independent variables (Green, 2007). This model portrays a functional relationship between purchase decision and various explanatory variables and assumes that the individuals are faced with a choice between two possible alternatives. The model also

assumes that the chance of an individual making a given choice is a linear function of the individual's attributes. From a theoretical review of chapter two, Equation 6 was used to explain the utility maximization¹ of smallholder farmers when they sell their produce to high-value markets.

The function was specified as:

$$\text{Max}(U) = U(FC_{ji}, TA_{ji}) \dots \dots \dots (2)$$

Where $U(.)$ is the non-observable utility function that ranks the preference of the i^{th} farmer for the j^{th} market ($\forall j = 1, 0$); 1 for high-value vegetable markets and 0 for local vegetable market. FC is defined as farm and farmer specific attributes and TA is defined as other attributes of the innovation that may be unobserved to the analyst but observed and acted upon by the decision makers. The basic assumption in Equation (1) is that farmers perceive high-value as an optimal course of action to maximize their expected utility and decision is made in situation where the decision maker is full aware of this high-value markets and its attribute. Therefore, the utility derived from j^{th} market is a function of FC, TA and a disturbance term with zero mean. Equation (3) can be presented as:

$$U_{ji} = \alpha_j F_i(M_i, A_i) + e_{ji} \forall (j = 1, 0; i = 1, 2, \dots, n) \dots \dots \dots (3)$$

Since the utilities U_{ji} are random, the i^{th} farmer was selected the alternative $j = 1$ when $U_{1i} > U_{0i}$ or the non-observable (latent) random variable $Y^* = U_{1i} - U_{0i} > 0$. the probability that $Y_i = 1$ (i.e. farmer opts for participating in high-value market) is a function of the independent variables and is represented as:

¹ utility maximization for smallholder farmers are the benefits (value) that a smallholder vegetable farmer can get through producing better products, having a timely supply, better sales, assured returns and higher profits, good trust and relation with the buyer and assured price of their produce

$$\begin{aligned}
P_i &= P_r(Y_i = 1) = P_r(U_{1i} > U_{0i}) \\
&= P_r[\alpha_1 F_i(M_i, A_i) + e_{1i} > \alpha_0 F_i(M_i, A_i) + e_{0i}] \\
&= P_r[e_{1i} - e_{0i} > F_i(M_i, A_i)(\alpha_0 - \alpha_1)] \\
&= P_r[\mu_i > F_i(M_i, A_i)\beta] \\
&= F(X_i\beta) \dots \dots \dots (4)
\end{aligned}$$

Where X is the $n \times k$ matrix of the explanatory variables and β is a $k \times 1$ vector of parameters to be estimated $P_r(\cdot)$ is a probability function, μ_i is an error term following logistic distribution, and $F(X_i\beta)$ is the cumulative distribution function for μ_i evaluated at $X_i\beta$. The specification in Equation (5) indicates that the probability that a farmer participated in high-value vegetable market is a function of the vector of explanatory variables, unknown parameters, and the error, term. However, the specification in equation (4) cannot be estimated directly unless the functional form of F and the distribution of μ_i are known.

From equation (4), the regression model was specified as follows:

$$P_r(Y_i = 1) = F(X_i\beta) = \frac{\exp(X_i\beta)}{1 + \exp(X_i\beta)} \dots \dots \dots (5)$$

Where parameter β was estimated by maximum likelihood estimator MLE. Therefore the logit equation will be

$$\begin{aligned}
\text{Logit}(P_i) = \ln\left(\frac{P_i}{1 - P_i}\right) &= \beta_0 + \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \beta_4\chi_4 + \beta_5\chi_5 + \beta_6\chi_6 + \beta_7\chi_7 + \beta_8\chi_8 + \beta_9\chi_9 + \\
&\beta_{10}\chi_{10} + \beta_{11}\chi_{11} + \beta_{12}\chi_{12} + \varepsilon
\end{aligned}$$

Whereby;

$$\ln\left(\frac{P_i}{1 - P_i}\right) = \text{logit for market participation}$$

P_i = participating in high-value markets

$1 - P_i$ = not participating in high-value markets

χ_i = independent variables

β_i = parameters to be estimated

ε = error term

Table 2: Specification of variables included in binary logit model for market participation

Variables	Description of Variables	Expected Sign
Dependent variable (P _i)	1 if farmer participates in high-value market; “0” Otherwise	
Sex (X ₁)	Sex (0=female, 1=male)	
Education level (X ₂)	Education level (0=no formal education, 1=formal education)	+
Income (X ₃)	Farmers income earned per month	+
Access to credit (X ₄)	Access to credit (0= do not have access, 1= have access)	-
experience(X ₅)	Experience in growing cabbage, onion, and tomato (in years)	+
Distance to the main road (X ₆)	Distance from the farm to the main road (km)	+/-
Distance to the main market (X ₇)	Distance to the main market	
Distance to high-value (X ₈)	Distance to the high-value market	+
Total yield (X ₉)	Total yield cabbage, onion and tomato (kg)	+
Irrigation (X ₁₀)	Irrigation (0= do not irrigate, 1= irrigate)	+
Extension service (X ₁₁)	Extension service (0= have no access to extension service, 1= have access to extension services)	+
Market information (X ₁₂)	Market information (0= no access to market information, 1= have access to market information)	+
Bi	Vector of parameters to be estimated	
€i j	Random error terms or disturbance terms	

3.4.4 Definition of variables

Sex: If a respondent is a male or female. It was hypothesized that sex of the farmer could affect market participation. Male tend to participate more in high-value market opportunities than female.

Education: this is a dummy variable with a value of one if a household head has formal education and zero otherwise. Education increases farmers' ability to get and use information. Since households who have better knowledge are assumed to participate better in available high-value market opportunities, this variable is assumed to have a positive relationship.

Income: Income of the farmer was hypothesized to be positively related to smallholder vegetable farmer's participation in high-value market opportunities. A farmer participating in high-value market are likely to have a higher income compared to farmers who do not participate.

Access to credit: this is a dummy variable with a value of one if a household head has access to credit and zero otherwise. Access to credit increases farmer's income and ability to participate in available high-value market opportunities. Since households who have access to credit are assumed to participate better in available high-value market opportunities, this variable is expected to have a positive relationship.

Experience: this was measured in years a farmer has been participating in the production of cabbage, onion, and tomato. Farmers with more years in production had more experience than farmers who had few years in production. Farmers with experience knew better about high-value markets available than the others. It was easier for farmers with

experience to participate in high-value market opportunities than farmers with less experience.

Distance from the production area to the main road: This is a continuous variable included in the model to indicate the distance of household from the main road. As the crops are bulky the proximity to the road will matter the farmers need to produce and participate in the farming of marketable commodities. There is no doubt that transport is of great importance for marketing agricultural produce. In particular, rural communities in remote areas suffer from lack of transportation facilities. These happen due mainly to the absence of adequate means of transformation and due to poor infrastructural conditions like roads (Robbins *et al.*, 1990). It is measured in kilometers of single trip and is expected to take negative signs.

Distance to the major market: distance was measured in kilometers. Vegetable farmers whose farm are near major markets are more likely to sell their produce to the market than those farmers whose farms are far.

Distance to high-value market: vegetable farmers who are located near high-value market are more likely to participate in these markets due to short distance than those farmers who are allocated far from these markets.

Total yield: total yield for cabbage, onion, and tomato was measured in pieces, bags, and crates respectively. Smallholder vegetable farmers with high yield are more likely to participate in high-value market opportunities due to high yield.

Irrigation: this is a dummy variable with a value of one if a farmer irrigates and zero otherwise. Vegetable farmers who used irrigation were sure of their produce than those farmers who relayed on rain. Irrigation will influence smallholder vegetable farmers to participate high-value market opportunities than those who depend on rain.

Extension service: If extension officer visits the farmer. It was expected that Visits from extension staff are positively related to smallholder vegetable farmers to participate in the high-value market by exposing farmers to new information.

Access to market information: access to market information is assumed to have a positive impact on high-value market opportunities of cabbage, onion, and tomato at the farm level. It is a dummy variable with a value of one if a household head has access to market information and zero otherwise. The general idea is that maintaining a competitive advantage requires a sound business plan. Again, business decisions are based on dynamic information such as consumer needs and market trends. This will require that an enterprise to be managed with due attention to new market opportunities, changing needs of the consumer and how market trends influence is buying (Lenné *et al.*, 2011).

3.4.5 SWOT Analysis

SWOT analysis was used to examine the capability of smallholder vegetable farmers in Arusha Region to become preferred suppliers in selected high-value markets. SWOT analysis matrix was used to examine the factors. The matrix table included strength, weakness, opportunities, and threats.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Demographic and Social-Economic Characteristics of the Respondents

The social-economic profile of the respondents examined was age, marital status, and household size, education of the respondent and main activities of the respondents as follows:

4.1.1 Age of the respondents

The age of the respondent indicated that the farmers, experience had a positive influence on the vegetable production and the marketing of the produce (Table 3). From the findings, 61% of the respondents aged between 32-51 years old, followed by 26.5% of those who aged between 18-32 years old and lastly the group of farmers who were above 51 years old contributed only 12.5% to the total count. The age of the farmer is considered to be an important factor since the experienced vegetable farmer is positioned better to the positive opportunities on farming and marketing due to the information that one possesses from the gained experience in agriculture. The head of the household has an influence on agriculture activities which includes the production and marketing of the produce.

Older farmers are more like to pursue the positive changes in their farming activities and marketing. The nonresistance trait has often been a cause for better production and marketing strategies. Moreover, with aging, experienced farmers become familiar with the off-farm managements thus the marketing network increases due to the experience acquired doing the market transaction. Study by Makhura (2001) and Basnayake and Guraratne (2002) on overcoming transaction costs barriers to market participation among

smallholder farmers in the Northern Province of South Africa found that, older farmers have more experienced (45%) in marketing management and tend to have stronger networks and more credibility, thus experience lower transaction costs.

Table 3: The age of the respondents

Age	Frequency	Percent
<32	53	26.5
32-51	122	61.0
above 51	25	12.5
Total	200	100

4.1.2 Sex of the respondent

The result in Table 4 shows that there is a huge difference in participation in the vegetable production and marketing by gender. Male respondents dominated the majority of the household farmers by 72.5% and female by 27.5%. The results explain the division of labor among in farmers.

The contribution of women to the vegetable production and marketing were counted by responsibilities attached to them on daily home activities while men are subjected to the farming activities and other responsibilities apart from the daily household activities. The results contradict with those found in the studies by Lenné *et al.* (2011) who argued that vegetable marketing activities were done exclusively by women.

Moreover, farming activities are mostly undertaken by men throughout phases of production which includes ploughing, planting, weeding, harvesting, and threshing. Women were left to take care of the house activities such as fetching water, firewood collection and caring for the children.

Table 4: Sex of the Respondents

Sex	Frequency	Percent
Male	145	72.5
Female	55	27.5
Total	200	100

4.1.3 Education level

Education is one of the factors that influence vegetables production and marketing. Results indicated that 76% of the respondents had primary education, 20% had a secondary education while only 3% informal education (Table 5). A similar trend was reported in Coastal region by the study on the assessment of the agricultural marketing information needs (MAFC, 2006). The level of education has been a limiting factor to most of the farmers who have a low level of education, regardless of the available means to communicate with customers; these farmers are usually operating at a breakeven point due to the lack of negotiation skills and marketing strategies.

Table 5: Education level of the respondents

Education level	Frequency	Percent
None	6	3.0
Adult education	1	0.5
Primary education	152	76.0
Secondary education	40	20.0
Others	1	0.5
Total	200	100

4.1.4 Household size

From Table 6, the findings show that 52.5% of the respondents had an average of 5 to 10 household size members, and 47% had an average of below 5 household members while only 0.5% respondents had an average of above 10 household members (Table 6). Results from this study indicated that household size is positively related to the production of vegetables. A family with enough labor force is perceived to have the necessary inputs for

the efficient vegetable production. Moreover, along with the needed workforce, households with large farm size were more likely to engage in vegetable production efficiently and were also reported to have the means to find and enlarge their market channels and networking.

Table 6: Household size of the respondents

Household size	Frequency	Percent
<5	94	47.0
5 to 10	105	52.5
Above 10	1	0.5
Total	200	100

4.1.5 Major occupation of the household in the study area

Agriculture is perceived to be one of the most important sectors when it comes to employment capacity and its contribution to the GDP. The findings show 98% of the respondents were employed in the agriculture sector and considered agriculture as their primary source of income.

Agriculture components like livestock keeping have been very helpful in food, income and inputs provision to the household and their farms. These findings of the study are in line with the results of the study by Eskola (2005) who argued that agriculture is the principal employer for the majority of the Tanzania population by 80%. Therefore there is a high level of crop and livestock trade activities integrated among the farming household. Livestock particularly, small, medium and large size animals who are kept by the households to provide milk, income once they are sold and inputs such as manure along with ploughing and cultivation of their farms.

Table 7: Major occupation of the respondents

Main occupation	Frequency	Percent
On-farm work	196	98.0
Paid employment (civil servant	1	0.5
Employed	2	1.0
Family worker	1	0.5
Total	200	100

Results in Table 8 shows that majority of small-scale producers 19% sell vegetables without adding any value. About 47% sort their vegetables before they sell while only 17.5% of smallholder vegetable farmers graded their produce before they sell. High-value markets require an additional value to the vegetable produce before they purchase them. These requirements from high value market can be a hindering factor that prevents smallholder vegetable farmers to sell their produce to high-value market. Other requirements that high-value market require are packaging and processing. Additional of value to the vegetable produce can also enable smallholder vegetable farmer to fetch higher prices for their produces compared to if they sell without adding any value.

Table 8: Value Addition by Smallholder vegetable farmers

Value addition	Frequency	Percent
Do not do any value addition	38	19.0
Grading	35	17.5
Sorting	93	46.5
Cleaning	34	17.0
Total	200	100.0

Table 9: High-value Market Categories and Names

High-value market category	High-value name	Frequency
Supermarkets	NAKUMAT	1
	Sakina	1
	Village	1
	Rushda	1
	Pick N pay	1
	Njiro Matunda	1
Schools and colleges	Trust St Patric Schools	1
	Haradali primary school	1
	Amani schools	1
	Usa River Academy	1
	Tengeru boys high school	1
	Duluti Secondary school	1
	VETA Njiro	1
	Arusha Teachers College	1
	Arusha technical college	1
	Upendo primary school	1
	Arusha Schools	1
	Patandi Teachers College	1
	Precious Blood secondary school	1
Hotels	Ngurudoto	1
	Dickdick	1
	Arumeru River Lodge	1
	Ngaresero Lodge	1
	Panone	1
	New Africa	1
	New Arusha	1
	Vijiji	1
	Nazi	1
	Cafe Laziz	1
	Mount Meru	1
	Total	30

4.2 Determination of Factors That Influence Smallholder Farmers to Participate in

High-Value Markets

The determination of factors that influencing smallholder farmers to participate in high-value markets was estimated by binary logistic regression which was used to establish which factors are significantly influential to smallholder farmers’ participation in high-value markets’. The model was statistically significant at ($p < 0.05$) with entered variables.

Results show regression summary statistic value of 108.437 at -2 log likelihood. This statistic value implies how best the model predicts the factors (Table 10). The Cox and Snell R^2 was 0.568 and it was interpreted like R^2 in any multiple regression model. The Nagelkerke R^2 was 0.759 which means that the model predicted correctly 75.9% variation of the variables entered. This finding is clearly supported by Kothari (2006) who reported that the smaller the summary statistic value the better the model.

Table 10: Binary logit regression results (N=200)

	B	S.E.	Df	Sig.	Exp(B)
Sex	0.883	0.675	1	0.191	2.417
Education	1.373	4.156	1	0.741	3.949
Income	-0.878	0.577	1	0.128	0.415
Access to credit	0.938	0.637	1	0.141	2.556
Cabbage experience in years*	0.302	0.159	1	0.058	1.353
Onion experience in years	0.03	0.172	1	0.864	1.03
Tomato experience in years**	0.212	0.072	1	0.003	1.236
Distance to main road	0.017	0.302	1	0.955	1.017
Distance to nearby market	-0.105	0.175	1	0.55	0.901
Distance to high-value market**	0.098	0.033	1	0.003	1.102
Cabbage total yield***	0.004	0.001	1	0.000	1.004
Onion total yield**	0.045	0.019	1	0.019	1.046
Tomato total yield***	0.017	0.004	1	0.000	1.017
Irrigation	0.765	0.715	1	0.285	2.15
Extension	-0.518	0.677	1	0.444	0.596
Marketing information	-0.305	0.64	1	0.634	0.737
Constant	-5.517	4.537	1	0.224	0.004

-2 log likelihood = 108.437, Cox and Snell R Square = 0.568, Nagelkerke

R Square = 0.759

***Significance at 1%, **Significance at 5%, *Significance at 10%

The binary logit regression estimation in Table 10 shows that the coefficient of experience in growing cabbage was 0.302 and growing tomato was 0.212. The results indicate that experience was positively related to high-value market access by smallholder vegetable farmers and was statistically significant at ($p < 0.1$) for cabbage and ($p < 0.05$) for tomato. The positive log odd of 0.302 with odd ratio of 1.353 (Exp B) for cabbage and

0.212 with odd ratio of 1.236 (Exp B) for tomato, means a direct relationship between high-value market access by smallholder vegetable farmers and experience in production among cabbage and tomato growing farmers. Therefore, cabbage and tomato smallholder farmers with more experience were more likely to participate in high-value market opportunities found in Arusha Region than their counterparts. Nevertheless experienced farmers benefited from their skills on marketing of their produce to find their targeted consumers compared to the short experienced farmers (Makhura *et al.*, 2001).

Distance from the farm to the nearest high-value market (schools, colleges, hotels, tourist hotels, and supermarkets) has a negative regression coefficient (b) of 0.098 and the odds ratio of 1.102 (Table 10). This implies that a unit decrease in this variable, which was statistically significant at probability of 5%, increases smallholder farmers' participation in high-value market opportunities by a factor of 1.102. Smallholder vegetable farmers with less distance from the farm to the nearby high-value are more likely to sell their produce to these markets especially schools and hotels that are surrounding them compared to farmers with more distance to high-value markets.

The output of cabbage, onion, and tomato are significantly associated with higher probability of participating in high-value market opportunities. The estimates are all statistically significant at 1% for cabbage, 5% for onion and 1% for tomato. This finding is consistent with Lenné *et al.* (2011) and underscores the importance of increased output by smallholders to enhance their chances of stepping out of poverty and improving their livelihood through increased income from increased participation in the market.

Cabbage total yield has a positive regression coefficient (b) of 0.004 and the odds ratio (Exp b) of 1.004 (Table 10). This implies that a unit increase in this variable, which was

statistically significant at probability of 5% ($p=0.000$), increases in total yield of cabbage by a factor of 1.004. Smallholder cabbage farmers with more total yield are more likely to participate in high-value market opportunities compared to those smallholder farmers with fewer yields.

Onion total yield has a positive regression coefficient (b) of 0.045 and the odds ratio (Exp b) of 1.046 (Table 10). This implies that a unit increase in this variable, which was statistically significant at probability of 5% ($p=0.019$), increases in total yield of onion by a factor of 1.046. Smallholder onion farmers with more total yield are more likely to participate in high-value market opportunities compared to those smallholder farmers with fewer yields.

Tomato total yield has a positive regression coefficient (b) of 0.017 and the odds ratio (Exp b) of 1.017 (Table 10). This implies that a unit increase in this variable, which was statistically significant at probability of 5% ($p=0.000$), increases in total yield of tomato by a factor of 1.017. Smallholder tomato farmers with more total yield are more likely to participate in high-value market opportunities compared to those smallholder farmers with fewer yields.

4.3 SWOT Analysis

4.3.1 Strengths and weakness of the farms

Studying the capability of smallholder vegetable farmers to become preferred suppliers in high-value markets farmer's strengths and weaknesses provided information for understanding the current situation of the farmers. Most farmers owned land as shown in Table 11; also they possessed skills in cultivating cabbage, onion, or tomato. Most farmers had year round availability of water, had access to inputs and extension

services and there were high-value markets available around their area. This strength will enable smallholder farmers to be preferred to any high-value market. High-value markets need a constant supply of products throughout the year (Reardon, 2004). Therefore with water for irrigation and extension services smallholder farmers can produce throughout the year and also produce products with good quality (Jaenicke *et al.*, 2007).

Table 11: Strength and Weakness of smallholder vegetable farmers in Arusha

Region	
Strength	Weakness
<ul style="list-style-type: none"> • Owning land (96.5 %) • Year round availability of water for irrigation (72.5%) • Access to inputs (80%) • Access to extension service (72%) • Availability of high-value market in their area (56%) 	<ul style="list-style-type: none"> • Lack of skills in growing cabbage, onion, or tomato for high-value market (68%) • Inadequate information about markets (61%) • No access to credit (72%) • Lack of contract agreements (94.5%) • Poor seed quality (60%)

Despite this strength, there is also weakness which could hinder smallholder farmers to become preferred suppliers in the available high-value market opportunities. These weaknesses are such as lack of skills in growing cabbage, onion, and tomato for the high-value market. According to Reardon (2004), the high-value market requires products with specific characteristics hence many smallholder farmers fail to meet these product characteristics due to lack of skills (Table 11).

4.3.2 Opportunities and challenges to the farmers

Opportunities that enable smallholder vegetable farmers to become preferred suppliers in the high-value market are presence of good climatic condition and availability of training opportunities from various agricultural organizations (Isaac *et al.*, 2006). The presence of good climate condition that favors vegetable production in Arusha Region will help

increase vegetable production for smallholder farmers. Furthermore, farmer's training and farm demonstrations are good as they do help to improve production and marketing in terms of quality and quantity (Neven *et al.*, 2002).

Lack of or uncertain markets are a challenge for the vegetable smallholder vegetable farmers (Table 12). Market uncertainties such as volatile price have been a threat for produces who operated at high cost and expected to cover the cost through the price set also poor agricultural policies has been a threat as the support from the government is limited example subsidies provided by the government have not been able to help most of the rural areas farmers as the remaining 50% of the cost that should be paid by the farmer have been observed to be too high for them to afford (Al-Hassan *et al.*, 2006).

Table 12: Opportunities and threats/challenges of smallholder vegetable farmers

Opportunities	Threats
<ul style="list-style-type: none"> • Good climatic condition (69.5%) • Training opportunities from various agricultural organizations (40%) 	<ul style="list-style-type: none"> • Lack of or uncertain markets (95%) • Poor agricultural policies (93.5%)

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Several findings emanated from the analyses with respect to this study. The first objective of this study was characterization of smallholder vegetable farmers in Arusha Region. In addressing this objective the study made an assessment of variables that were thought to be the characteristics of smallholder vegetable farmers. These variables include age, sex, education level, household size and their main occupation.

It was found that age category of the respondent indicated that the farmers, experience had a positive influence on the vegetable production and the marketing of the produce. 61% of the respondents aged between 32-51 years old, followed by 26.5% of those who aged between 18-32 years old and lastly farmers who were above 51 years old had 12.5% to the total count. Experienced vegetable farmer is positioned better to the positive opportunities on farming and marketing due to the information that one possesses from the gained experience in agriculture. There was a huge difference in participation in the vegetable production and marketing by gender. Male respondents dominated the majority of the household farmers by 72.5% and female by 27.5%. These explained the division of labor among in farmers. The contribution of women to the vegetable production and marketing was counted by responsibilities attached to them on daily home activities while men are subjected to the farming activities and other responsibilities.

Education was one of the factors that influenced vegetable production and marketing. It was apparent that 76% of the respondents had primary education, 20% had a secondary education while only 3% informal education. Household size is positively related to the

production of vegetables. 52.5% of the respondents had an average of 5 to 10 household members, and 47% had an average of below 5 household members while only 0.5% respondents had an average of above 10 household members. A family with enough labor force was perceived to have the necessary inputs for the efficient vegetable production.

The second objectives was “To determine factors that influence smallholder vegetable farmers’ participation in high-value market opportunities in Arusha Region.” Binary regression analysis was used and results showed that farmers experience in growing cabbage, farmers experience in growing tomato, the distance to the high-value market, total yield of cabbage, total yield of onion and total yield of tomato were significantly affecting smallholder vegetable farmers participation to high-value market. Experienced farmers benefited from their skills on marketing of their produce to find their targeted consumers compared to the short experienced farmers while Smallholder vegetable farmers with less distance from the farm to the nearby high-value are more likely to sell their produce to these markets especially schools and hotels that are surrounding them compared to farmers with more distance to high-value markets. Farmers with more total yield of cabbage, onion, and tomato are more likely to participate in high-value market opportunities compared to those smallholder farmers with fewer yields because they could meet the market surplus.

The third objective of the study was to examine the capability of smallholder vegetable farmers in Arusha Region to become preferred suppliers in selected high-value markets. SWOT analysis was used and results showed smallholder farmers had strength which favored them in growing vegetable these included; owning land, possession of skills in cultivating cabbage, onion or tomato, year round availability of water for irrigation, access to inputs, access to extension service, and availability of high-value market in their

area. Opportunities were good climatic conditions and training opportunities from various agricultural organizations. While, weakness faced by smallholder vegetable farmers were lack of skills in growing cabbage, onion, or tomato for high-value market, inadequate information about markets, no access to credit, lack of contract agreements, and poor seed quality.

5.2 Recommendations

In the view of the major findings of the study and the above conclusion the following were recommended:

(a) Recommendations to farmers:

In order to maximize value and sell their produce to high-value markets, smallholder farmers should also add value to their produce in order to fetch more price while selling to high-value markets. Also, income was also found to be an important factor affecting the participation of vegetable farmers in the high-value market. Therefore it is important for farmers to engage themselves in different activities such as small business apart from agriculture so as to improve their income.

(b) Recommendation to policy makers

- i.) There is a need to have a clear policy framework to support smallholder vegetable farmers and the production so as to increase the yield and profit through sufficient marketing strategies. Research and development programmers should be linked to farmers who are vegetable farmers.
- ii.) To make vegetable production an efficient farming system and facilitate its marketing and smallholder farmers participation in the high-value market, the

following preconditions are recommended (i) strengthening extension services by the government and other stakeholders (ii) providing smallholder farmers with financial, institutional and technical support services (iii) stakeholders including the public and private sector be sensitized more on increasing investments on vegetables farming.

(c) Recommendation for further research

This study was conducted on high-value market opportunities for smallholder vegetable farmers. But it failed to look on consumer preference in high-value markets for vegetables. Why consumers prefer vegetables from high-value market other than other markets. Therefore it is recommended that further studies should conduct a research on consumer preference in high-value markets for vegetable in Arusha Region.

REFERENCES

- Abdulai, A. (2006). Resource use efficiency in vegetable production: The Case of Smallholder Farmers in the Kumasi Metropolis. Thesis for Award of PhD Degree at University of Science and Technology, Kumasi, Metropolis, 121pp.
- Adejobi, A., Amaza, P. and Ayoola, G. (2006). Enhancing the access of rural households to output markets for Increased Farm Incomes. *Poster Paper Prepared for Presentation at the International Association of Agricultural Economists Conference*, Gold Coast, Australia, 12 – 18 August, 2006. pp. 1 – 20.
- Adeoye, I. B., Odeleye, O. M. O., Babalola, S. O. and Afolayan, S. O. (2009). Economic analysis of tomato losses in Ibadan Metropolis, Oyo State, Nigeria. *African Journal of Basic and Applied Science* 1: 87 – 92.
- Adugna, G. (2009). Analysis of fruit and vegetable market chains in Alamata, Southern Zone of Tigray: The Case of Onion, Tomato, and Papaya. Dissertation for Award of MSc Degree at Haramaya University, Haramaya, Ethiopia, 114pp
- Afari-Sefa, V. and Beed, F., (2012). *Enhancing Vegetable Value Chains in Rice-Based and Sole Crop Production Systems to Improve Household Income and Consumption in Morogoro*. International Institute of Tropical Agriculture, Ibadan, Nigeria. 122pp.

- Afari-Sefa, V., Chagomoka, T., Karanja, K., Njeru, E., Samali, S., Katunzi, A., Mtwaenzi, H. and Kimenye, L. (2013). Private contracting versus community seed production systems: Experiences from farmer-led seed enterprise development of indigenous vegetables in Tanzania. *Acta Horticulture* 1007: 671–80.
- Al-Hassan, R. M., Sarpong, D. B. and Mensah-Bonsu, A. (2006). Linking smallholders to markets. Ghana strategy support program. *Management Science* 42: 850 – 867.
- Ambrose-Oji. B. (2009). Urban Food Systems and African Indigenous Vegetables: Defining the Spaces and Places for African Indigenous Vegetables in Urban and Peri-Urban Agriculture. In *African Indigenous Vegetables in Urban Agriculture* (Edited by Shackleton, C. M., Pasquini, M. and Drescher, A. W.), Earthscan Publisher London. pp. 1 – 33.
- Aumann, R. (1962). Utility theory without the completeness axioms. *Econometrica* 30(3): 445 – 462.
- Barrett, C. B. (2008). Smallholder market participation: Concepts and Evidence from Eastern and Southern Africa. *Food Policy* 33(4): 299 – 317.
- Basnayanke, B. M. J. K., and Gurnarate, L. H. P. (2002). Estimation of technical efficiency and its determinants in the tea small holding sector in the mid-country of West-zone of Sri-Lanka. Sri-Lanka. *Journal of Agriculture Economics* 4: 137 – 150.

- Beckman, T. N. and Davidson, W. R. (1962). *Marketing*. (7th Ed.), The Ronald Press Company, New York. 13pp.
- Beyene, G. (2012). *Value Chain Analysis of Selected Vegetable Sub-sectors in RAPID Project Areas of Oromiya and the SNNP Regional States*. International Development Enterprise. Ethiopia. 51pp.
- Bordley, R. F. and Kirkwood, C. W. (2004). Multiattribute preference analysis with performance targets. *Operations Research* 52(6): 823-835.
- Branson, R. and Norvell, D. G. (1983). *Introduction to Agricultural Marketing*. McGraw- Hill Inc., USA. 521pp.
- Bunemann, E., Schwenke, D, and Van Zwieten, L. (2006). Impact of agricultural inputs on soil organisms a review. *Australian Journal of Soil Research* 44: 379 – 406.
- Cernansky, R. (2015). The rise of Africa’s super vegetables. *Nature* 522: 146 – 148.
- Chagomoka, T., Afari-Sefab, V. and Pitoroc, R. (2014). Value chain analysis of traditional vegetables from Malawi and Mozambique. *International Food and Agribusiness Management Review* 17(4): 1 – 28.
- Chidumu, J.I. 2007. The impact of “One Village One Product (OVOP) on household income—implications on food security: the case of Bvumbwe operation area, Thyolo District, Malawi. Master thesis. Egerton University.
<http://ageconsearch.umn.edu>

Cronon, W. (1992). *Nature's Metropolis: Chicago and the Great West*. WW. Norton and Company, New York. 30pp.

Economic and Social Research Foundation (2016). *Medium Term. Strategic Plan*. Economic and Social Research Foundation, Dar es Salaam, Tanzania 14pp.

Emana, B. and Gebremedhin, H. (2007). *Constraints and Opportunities of Horticultural Production and Marketing in Eastern Ethiopia*. Report No. 46. Drylands Coordination Group, Ethiopia. 45pp.

Emongor, R. and Kirsten, J. (2006). Supermarkets in the food supply systems in Southern African development community: A case study of Zambia. *Journal of Applied Sciences* 6: 800 – 809.

Eric Baas (2006). The world of vegetables; Challenges and opportunities for vegetable suppliers. [<http://www.rabobank.com>] site visited on 21/01/2016.

Eskola, E. (2005). Agricultural Marketing and Supply Chain Management in Tanzania. [<http://www.tanzaniagateway.org/docs/agriculturalmarketingandsupplychainmanagementintanzania.pdf>] site visited on 14/7/2015.

FAO (2009). Fruit and Vegetable processing. Agribusiness handbook. [<http://www.Fao.org>] site visited on 04/01/2016.

Fishburn, P. C. (1970). *Utility Theory for Decision Making*. Huntington Publishers, New York. 14pp.

Food and Agriculture Organization (2010). *Expert Consultation on Nutrition Indicators for Biodiversity 2. Food consumption*. Food and Agriculture Organization of the United Nations, Rome, Italy. 12pp.

Gilboa, I. (2009). *Theory of Decision under Uncertainty*. Cambridge University Press, Cambridge. 50pp.

GlobalHort (2009). Market standards and preferences for horticultural produce in Tanzania. [<http://www.globalhort.org/media/uploads/File/Video%20Conferences/VC%20Tanzania%20Position%20Paper.pdf>] sited visited on 29/1/2016.

Goetz, S. J. (1992). A selectivity model of household food marketing behavior in Sub-Saharan Africa. *American Journal of Agricultural Economics* 74(2): 444 – 452.

Greene, W. H. (2007). *Econometric Analysis*. Macmillan Publishers, New York. 134pp.

Gustavsson, J., Cederberg, C., Sonesson, U., Van Otterdijk, R. and Meybeck, A. (2011). *Global Food Losses and Food Waste: Extent Causes and Prevention*. United Nations, Food and Agriculture Organization. Rome, Italy. 15pp.

Henning, R. and Donahue, N. A. (2008). End market research toolkit: Upgrading value chain competitiveness with informed choice. USAID, Washington DC, USA. [http://pdf.usaid.gov/pdf_docs/PNADP053.pdf] site visited on 29/06/2016.

- Hichaambwa, M. and Tschirley, D. (2006). Understanding Zambia's domestic value chains for fresh fruits and vegetables. [<http://ageconsearch.umn.edu/handle/54621>] site visited on 29/06/2016.
- Holloway, G., Barrett, C. B. and Ehui, S. (2005). The double-hurdle model in the presence of fixed costs. *Journal of International Agricultural Trade and Development* 1: 17 – 28.
- Horticultural Development Council of Tanzania (2010). *Tanzania Horticultural Development Strategy 2012- 2021*. Ministry of Agriculture Food Security, Dar es Salaam, Tanzania. 36pp.
- Irungu C, Mburu JMP, Hoeschle-Zeledon I (2011). The Effect of Market Development On-farm Conservation of Diversity of African Leafy Vegetables around Nairobi. *Int. J. Hum. Soc. Sci.* 1(8):198-207.
- Isaac, K. Ngugi, R. James, K. (2006). *Access to High-Value Markets by Smallholder Farmers of African Indigenous Vegetables in Kenya*. Tegemeo Institute, Egerton University, Kenya. 39pp.
- Jaenicke, H., Hai, V. and Hung, N. Q. (2007). *Scoping Study on Enhancing the Safe Production, Promotion, and Utilization of Indigenous Vegetables by Women in Vietnam*. Hanoi, Vietnam. 29pp.
- Jaffee, S. (2003). *From Challenge to Opportunity: Transforming Kenya's Fresh Vegetable Trade in the Context of Emerging Food Safety and Other Standards in Europe*. The World Bank, Washington DC. 19pp.

- Jaleta, M. (2007). Econometric analysis of horticultural production and marketing in central and eastern Ethiopia. Thesis for Award of PhD Degree at Wageningen University, Wageningen, Netherlands, 101pp.
- Kader, A. A. (2003). Perspective on postharvest horticulture. *Horticultural Science* 38: 1004 – 1008.
- Kajumba, C. (2012). *Ethno-Cultural Vegetable Retail Analysis: Pricing, Structure and Market Information. Capacity Development and Extension International Development*. The University of Guelph, Guelph, Ontario, Canada. 80pp.
- Kaplinsky, R. (2006). How can agricultural commodity producers appropriate a greater share of value chain incomes? In: *Agricultural Commodity Markets and Trade: New Approaches to Analyzing Market Structure and Instability*. (Edited by Sarris, A. and Hallam, D.), Edward Elgar Cheltenham, UK. pp. 356 – 379.
- Kaplinsky, R. and Morris, M. (2001). A handbook for value chain research. [<http://www.ids.ac.uk/ids/global/valchn.htm>] site visited on 24/3/2016.
- Key, N., Sadoulet, E. and de Janvry, A. (2000). Transactions costs and agricultural household supply response. *American Journal of Agricultural Economics* 82(2): 245– 259.
- Kodithuwakku, K. A. S. S. (2000). *Analysis of Tomato Supply Chains in the Kandy District*. University of Peradeniya. 16pp.

Kothari, C. R. (2006). *Research Methodology: Methods and Techniques*. (2nd Edition), New Age International, New Delhi, India. 256pp.

Kotler, P. and Armstrong, G. (2003). *Marketing: An Introduction*. (10th Ed.), Englewood Cliffs, Prentice-Hall, New Jersey. 135pp.

Kotler, P. and Armstrong, G. (2006). *Principles of Marketing*. (11th Ed.), Prentice-Hall, Upper Saddle River, New Jersey. 651pp.

Krugman, P. and Wells, R. (2013). *Economics*. (3rd Edition), Worth Publishers, New York 539pp.

Lenné, J. M., and A.F. Ward. 2011. An approach to strengthening vegetable value chains in East Africa: potential for spillovers. In *Vegetable Production and Marketing in Africa: Socio-Economic Research*, (Edited by Mithöfer, D. and Waibel, H.), Commonwealth for Agriculture Bureau International, London, UK. 288pp.

Lipinski, B., Hanson, C., Lomax, J., Kitinoja, L., Waite, R. and Searchinger, T. (2013). *Reducing Food Loss and Waste, Installment two of Creating a Sustainable Food Future*. World Resource Institute, Ethiopia. 20pp.

Lyatuu, E., Msuta, G., Lebotse, L. and Marope, M. (2009). Marketing of indigenous leafy vegetables and how small-scale farmers income can be improved in SADC region Tanzania, Zambia and Botswana: *Implementation and Coordination of Agricultural Research and Training in the SADC Region Regional Workshop*, Arusha, Tanzania. 39pp.

MAFC (2006). Performance issues and options. *Agricultural Sector Review* 1: 42 – 46.

Makhura, M. T. (2001). Overcoming transaction costs barriers to market participation of small holder farmers in the northern province of South Africa. Thesis for Award of PhD Degree at University of Pretoria, South Africa, 134pp.

McCullough, E., Pingali, P. and Stamoulis, K. (2008). *The Transformation of Agri-Food Systems: Globalization, Supply Chains, and Smallholder Farmers*. Earthscan Ltd., London, UK. 416pp.

Millichamp, A. and Gallegos, D. (2012) Comparing the availability, price, variety, and quality of fruits and vegetables across retail outlets and by area-level socioeconomic position. *Public Health Nutrition* 16(1): 171 – 178.

Mpenda, Z. (2010). Economic effects of food safety standards on supply chain actors in agro-food exports: Case of Nile perch fish from Tanzania. Thesis for Award of PhD Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 172pp.

Msuya, E. E. (2006). Unlocking Smallholders' potentials in Tanzania; Value chain and other analyses: A case study of Maize in Kiteto and Mbozi Districts. Thesis for Award of PhD Degree at Kyoto University. Kyoto, Japan, 159pp.

Mubarik, A. (2003). *Horticulture Revolution for the Poor: Nature, Challenges, and Opportunities*. International Assessment of Agriculture Science and Technology, Shanhua, Taiwan. 30pp.

- Muhanji, G., Roothaert, R. L., Webó, R. C. and Mwangi, S. (2011). African indigenous vegetable enterprise and market access for small-scale farmers in East Africa. *International Journal of Agriculture Sustainability* 9(1): 194 – 202.
- Muhanji, G., Ralph, L., Webó, C. and Stanley, W. (2013). African indigenous vegetable enterprises and market access for small-scale farmers in East Africa. *International Journal of Agricultural Sustainability* 10: 1473 – 5903.
- Mutayoba, V. (2015). Market performance and farmers' choice of marketing channels of high value crops in Tanzania. *International Journal of Economics Commerce, and Management* 3(8): 1 – 14.
- Navindra, B. (2003). Prospects, constraints, and opportunities for fruit and vegetable processing in Mauritius. [<http://www.gov.mu>] site visited on 04/01/2016.
- NBS (2008). *Agricultural Sample Census in Arusha Region*. National Bureau of Statistics, Dar es Salaam, Tanzania. 45pp.
- Nenguwo, N. (2004). *Review of Vegetable Production and Marketing Supply Chain Analysis Increasing the Value and Quality Assurance for the Fresh Vegetables and Herbs Supply Chain to Sun International Hotels in Zambia*. Agency for International Development, Gaborone, Botswana. 67pp.
- Neven, D., Weatherspoon, D., Reardon, T., Thiru, A., Chenge, J. and Kibiriti, P. (2002). *The Rapid Rise of Kenyan Supermarkets: Opportunities and Challenges for Farmers and Value-Added Product Suppliers*. Michigan State University, USA. 19pp.

- Nyange, D., Duma, T. and Temu, A. E. (2000). Fresh Fruits Marketing in Tanzania: Prospectus for international marketing. *Cases and Research in Agribusiness* 1: 201 – 235.
- Osano, Z. (2010). Market chain analysis of African indigenous vegetables in Tanzania: A Case Study of African Eggplant (*Solanum Aethiopicum*) in Kahama District. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 107pp.
- Peterman, A., Behrman, J. and Quisumbing, A. (2010). *A Review of Empirical Evidence on Gender Differences in Nonland Agricultural Inputs, Technology, and Services in Developing Countries. Poverty, Health, and Nutrition Division*. Discussion Paper No. 975. International Food Policy Research Institute, Norway. 50pp.
- Pingali, P. L., Khwaja, Y. and Meijer, M. (2006). The role of the public and private sector in commercializing small farms and reducing transaction costs. In: *Global Supply Chains, Standards, and the Poor*. (Edited by Swinnen, J. F. M.), Commonwealth for Agriculture Bureau International, London. UK. 23pp.
- Rahm, M. and Huffman, W. (1984). The adoption of reduced tillage: The role of human capital and other variables. *American Journal of Agricultural Economics* 66: 405 – 413.
- Reardon, T., Barret, C. B., Berdegue, J. A. and Swinnen, J. F. M. (2009). Agrifood industry transformation and small farmers developing countries. *World Development* 37(11): 1717 – 1727.

- Reardon, T. (2004). Induced organizational, institutional, and technological change in agrifood systems. *Electronic Journal of Agricultural and Development Economics* 1(2): 168 – 183.
- Robbins, P., Bikande, F., Ferris, S., Klein, U., Okoboian, G. and Wandschneider, T. (1990). *Collective Marketing for Smallholder Farmers Manual*. The Territorial Approach to Rural Agro-enterprise Development, USA. 104pp.
- Saccomandi, V. (1998). *Agricultural Market Economics: A Neo-Institutional Analysis of the Exchange*. Circulation and Distribution of Agricultural Products, London UK. 231pp.
- SCF (2008). *Fresh Fruit and Vegetable Sub-Sector / Value Chain Analysis Tanzania. Study Commissioned By SME Competitiveness Facility and Conducted*. Match Maker Associates Limited, Dar es Salaam, Tanzania. 33pp.
- Sebatta, C., Mugisha, J., Katungi, A., Kashaaru, A. and Kyomugisha, H. (2014). Smallholder farmers' decision and level of participation in the potato market in Uganda. *Scientific Research, Modern Economy* 5: 895 – 906.
- Shackleton, C., M. Pasquini and A. Drescher (Eds.) (2010). African indigenous vegetables in urban agriculture, Earthscan, London: 298 pp.
- Shute, L. L. (2011). *Building a Future With Farmers: Challenges Faced by Young, American Farmers and a National Strategy to Help Them Succeed*. National Young Farmers' Coalition, Tivoli, New York. 15pp.

- Simon, J. (2009). Inclusion of small-scale producers in dynamic local and regional markets. Dissertation for Award of MSc Degree at Sokoine University of agriculture. Morogoro, Tanzania. 123pp.
- Sososay, C., Fearn, A. and Dent, B. (2015). Sustainable value chain analysis: A case study of Oxford Landing from wine to dine. *Supply Chain Management International Journal* 17(1): 68 – 77.
- Ssango, F. (2006). *Chain Empowerment; Supporting African Farmers to Develop Markets*. English Press Ltd., Oxford. 286pp.
- Teka, K. (2009). Analysis of fruit and vegetable market chains in Alamata, Southern Zone of Tigray. Thesis for Award of PhD Degree at Haramaya University, Ethiopia, 144pp.
- Temu, A. E. and Marwa, N. W. (2007). *Changes in the Governance of Global Value Chains of Fresh Fruits and Vegetables: Opportunities and Challenges for Producers in Sub-Saharan Africa*. Sokoine University of Agriculture Morogoro, Tanzania. 40pp.
- Tenkouano, A. (2013). Improving Incomes and Nutrition in Eastern and Southern Africa by Enhancing Vegetable-based Farming and Food Systems in Peri-urban Corridors (VINESA), Project Document, AVRDC-The World Vegetable Center, Shanhua, Taiwan, pp 7-9.

- Thomas, A. L., Katinka, W. and Shanna, M. (2005). *Increasing Income through Fruit and Vegetable Production Opportunities and Challenges*. Consultative Group for International Agricultural Research, Morocco. 40pp.
- Thompson, C. (2004). A logistics perspective: being a preferred supplier. A guide to help you become and stay a preferred supplier to your customers.
[<http://www.Customercentricity.biz> site visited on 25/11/2015.
- Trienekens, J. H. (2011). Agricultural value chains in developing countries: A Framework for Analysis. *International Food and Agribusiness Management Review* 14(2): 51 – 82.
- United States Department of Agriculture (2009). *Fruit and Vegetable Consumption by Low-Income Americans Would a Price Reduction Make a Difference?* Economic Research Report No. 70. United States Department of Agriculture, Washington DC. 17pp.
- URT (2012). *The Tanzania Five Year Development Plan 2011/2012-2015/16: Unleashing Tanzania's Latent Growth Potentials*. Government Printers, Dar es Salaam, Tanzania. 11pp.
- Vassalos, M. (2013). *Essays on Fresh Vegetable Production and Marketing Practices*. Paper No. 12. University of Kentucky, USA. 56pp.

- Weinberger, K, Pasquini, M., Kasambula, P. and Abukutsa-Onyango, M. (2011). Supply chains for indigenous vegetables in urban and peri-urban areas of Uganda and Kenya: a gendered perspective. In: *Vegetable Production and Marketing in Africa Socio-economic Research*. (Edited by D. Mithoefer, D. and Waibel, H.), Commonwealth for Agriculture Bureau International, London. 288pp.
- Weinberger, K. and Lumpkin, T. A. (2005). *Horticulture for Poverty Alleviation the Unfunded Revolution*. Working Paper No 15. Asian Vegetable Research and Development Centre, Shanhua, Taiwan. 20pp.
- Weinberger, K. Msuya, J. (2004). *Indigenous Vegetables in Tanzania – Significance and Prospects*. Shanhua, Technical Bulletin No. 31. Asian Vegetable Research and Development Centre, Shanhua, Taiwan. 22pp.

APPENDICES

Appendix 1: Farmers' Questionnaire

A. Questionnaire identification information

Questionnaire no.....date of interview.....

Time start (am/pm) time stop (am/pm)

Division.....ward.....village.....

Interviewer's name.....

Name of respondent (optional).....

Phone number of respondent.....

B. Socio-demographic information

1. Age..... 2. Gender..... [1=male, 2=female]

3. Marital status of household.....

[1=married, 2=single, 3=divorced, 4=widowed]

4. Level of education.....

[1=none, 2=adult education, 3=primary education, 4=secondary, 5=others (specify)]

5. How many persons belong to your family?

6. What is your main occupation?

[1= on-farm work; 2= paid employment (civil servant, working in private company); 3= self-employed; 4= wage labor (working on others farms); 5= student; 6= family worker; 7= unemployed; 8= others (please specify)]

C. Farm information

7. Do you grow cabbage, onions or tomatoes on your farm? (1= yes; 2= no)

7a. If yes name the vegetables that you grow? Tick all that apply

[1= cabbage () 2= onion () 3= tomato ()]

8. What is the main reason for growing tomatoes, cabbage, and onions on your farm?

[1= selling/ business, 2= opportunity to earn extra income, 3= contract with trader's remove, 4= family consumption, 5= available market, 6= others' specify]

9. Do you grow other crops in your farm?..... [1= yes; 2= no]

10. If yes please tick on the appropriate crop below.....

Crop	Tick to what apply
1. Maize	<input type="checkbox"/> yes <input type="checkbox"/> no
2. Banana	<input type="checkbox"/> yes <input type="checkbox"/> no
3. Beans	<input type="checkbox"/> yes <input type="checkbox"/> no
4. Cucumber	<input type="checkbox"/> yes <input type="checkbox"/> no
5. Broccoli	<input type="checkbox"/> yes <input type="checkbox"/> no
6. Chinese cabbage	<input type="checkbox"/> yes <input type="checkbox"/> no
7. Spinach	<input type="checkbox"/> yes <input type="checkbox"/> no
8. Ethiopian mustard	<input type="checkbox"/> yes <input type="checkbox"/> no
9. Coffee	<input type="checkbox"/> yes <input type="checkbox"/> no
10. African eggplant	<input type="checkbox"/> yes <input type="checkbox"/> no
11. Amaranthus,	<input type="checkbox"/> yes <input type="checkbox"/> no
12. African nightshade	<input type="checkbox"/> yes <input type="checkbox"/> no
13. Okra	<input type="checkbox"/> yes <input type="checkbox"/> no
14. Asparagus	<input type="checkbox"/> yes <input type="checkbox"/> no
15. Cassava leaves	<input type="checkbox"/> yes <input type="checkbox"/> no
16. Rice	<input type="checkbox"/> yes <input type="checkbox"/> no
17. Oil seeds	<input type="checkbox"/> yes <input type="checkbox"/> no
18. Pumpkin leaves	<input type="checkbox"/> yes <input type="checkbox"/> no
19. Sorghum	<input type="checkbox"/> yes <input type="checkbox"/> no
20. Millets	<input type="checkbox"/> yes <input type="checkbox"/> no
21. Cassava	<input type="checkbox"/> yes <input type="checkbox"/> no
22. Others (specify)]	<input type="checkbox"/> yes <input type="checkbox"/> no

11. If you grow your vegetables for sale, which markets do you sell to?.....

[1= supermarkets; 2= boarding schools and vocational training collages; 3= tourist hotels and lodges; 4= normal hotels; 5= open air market (please name it)]

12. Do you grow cabbage, tomatoes and onions under contract

[yes=1; no=2]

13. If yes what is name of contracting firm/individual that you are in contract with?

.....

14. Do you have pre-selling arrangements with your trading partner(s) you normally transact with?..... [yes=1, no=2]

15. If yes please give example of these agreements

.....

D. Farm input information

16. Land and irrigation information

Description	Crop 1= cabbage 2= onion 3= tomato	Land Size (in Acre)	Irrigated (in Acre)	Irrigation Source	Distance of the water source from the field where vegetables are grown (In km)	Type of Irrigation	Rent in TZS per Acre	Remarks
				Code (a)		Code (b)	TZS/acres	
1. Own Area (under given vegetable cultivated)	1							
	2							
	3							
2. no of plots under cultivation	1							
	2							
	3							
3. Area rented for cultivation	1							
	2							
	3							

Local unit code:

Source of irrigation code (a); (1) Canal (2) pond/tank (3) surface (4) ground water (5) Others **Type of irrigation code (b):** 1=Furrow without ridges, 2=Furrow with ridges, 3=Manual from tube well 4=Manual from tank/lake 5=sprinkler 6= drip 7=pump with siphons, 8=Others (specify)

17. Do you use fertilizer in your farm?.....[1=yes, 2= no]

18. If yes, which fertilizer are you using in your farm?

[1= organic fertilizer/manure; 2= inorganic fertilizers]

19. What is the source of fertilizers you mentioned in question 18 above?

[1= from shop..... 2= neighbor/friends..... 3= from NGO's..... 4= cooperative/groups 5= others (specify).....]

20. Fill in the table below for input used

Input Details					
SNo	Activities	Unit	For cabbage	For onion	For tomato
1	Did you purchase any seeds in last 12 months	1=Yes; 2=No			
2	If yes purchase seed Qty	Grams			
3	If no, why	code			
4	Purchased Seeds cost – value	TZS			
5	Source of Seeds	Code			
6	Major reason for choice of this vendor	Code			
7	Distance to vendor	KM			
8	Method of pay	Code			
9	Tagged product	Code			
1	If yes, tagged product price	TZS			
1	Branded	Code			
1	Package	Code			
1	Hybrid	1=Yes; 2=No			
1	Satisfied purchase	1=Yes; 2=No			
1	If No, why?	Code			
1	Manure-quantity	Kgs			
1	manure–value	TZS			
1	Inorganic fertilizer– quantity	Kgs			
1	Inorganic fertilizer– cost	TZS			
2	Inorganic Sellers	Code			
2	Pesticide (fungicides, insect, pactical etc) - Qty	mls			

2	No of times applied per season/crop cycle	Numbers			
2	At what growth stage	Code			
2	Pesticide (fungicides, insect, pactrical etc) – cost	TZS			
2	Pesticide (fungicides, insect, pactrical etc) Sellers	Code			
2	Herbicides - Qty	mls			
2	No of times applied per season	Numbers			
2	At what growth stage	Code			
2	Herbicides – cost	TZS			
3	Herbicides Sellers	Code			
3	Source of info. on pesticides/harbicides	Code			
3	Cost of Irrigation	TZS			
3	Frequency of irrigation	No. of times /season			
3	Hired labor– quantity per acre	Man-days			
3	Hired labor– value per person	TZS			
3	Family labor– quantity per acre	Man-days			
3	Machine rental – value	TZS			
3	Other input costs – value.....	TZS			

If multiple answers create a separate code for it and note down in your note book for the future reference.

Code for buyer ;1=Collector in village (outside wholesale market); 2=Wholesaler on market; 3=processing firm; 4=Contractor; 5=modern retailers; 7=NGO; 9=Cooperative society; 10=Farmer co-op; 11=Retailer; 12=Consumers; 13=Hotels (restaurants, ordinary hotels, tourist hotels)s; 14= schools (primary and boarding schools, vocational colleges, universities); 15= supermarkets(name it); 16=Others:_____

Code reason buyer ;1=He gives higher prices; 2=He accepts large quantities; 3=He accepts small quantities; 4=He gives advances when needed; 5=He pays immediately; 6=He is close by; 7=He is always available 9=He gives better quality inputs; 10= under a contract; 11=No other option

Codes for vendor/ seller 1= Agro dealers 2=Seed (producing) companies 3= Seed retailers in the village 4= Other (Specify)_____

Codes reason for choice of vendor/seller; 1= He deliver better quality inputs; 2= He sell large quantities 3= He sell small quantities 4= He gives in credit when I don't have money; 5= He deliver immediately; 6= He is close by;7= He is always available; 8=No other option

Code mode of payment): 1=In cash; 2=In kind (agricultural input); 3=Partly in cash and partly in kind; 4=Cheque; 5=Others (specify)

Code time of payment: 1=Immediately on the day of the sale; 2=In the days after the sale; 3=A week after the sale; 4=Later than a week after the sale; 5=Weekly; 6=Monthly; 7=Quarterly; 8=Others:_____

Code sale location : 1=Farmer's field 2=Wholesale market; 3=Local retail market; 4=modern retail; 5=cooperative 6=farmers' group; 7=Others_____

Code main transport mean : 1=Porter/own carry; 2=Handcart; 3=Tractor; 4=Truck; 5=Car; 6=Bicycle; 7=Motorbike; 10=Others

Code source of price info : 1=Radio 2=Television 3=Newspaper 4= Government's agricultural marketing information center 5= Any trader at the local market 6= Collector who comes to the farm 7= Other farmers 8= Extension officers 9= Internet 10= Cooperative/farmer's association 11= Contract company 12= NGOs 13= Through mobile phone services 14= Other (specify)

Code If no, why: 1=No need; 2=Unable to find the seeds at the right time; 3=Seeds were too expensive; 4=Did not find the required quality

Source of Seed Code : 1=Other farmers 2= stockiest 3= Friends 4=company store; 5=contract company; 6=Others (specify)

Tagged product Code : 1=none; 2=seeds; 3=fertilizer; 4=chemical; 5=others (specify)

Branded Code : 1=Unbranded; 2=national/international brand; 3=local brand; 4=don't know

Package Code : 1=loose; 2=packaged with printed crop photo; 3=packaged with pasted sticker of crop photo

If no, why Code : 1=Spurious or fake product; 2=under-weight; 3=others (Specify)

Inorganic Buyers code : 1=Other farmers 2= stockiest 3= Friends 4=company store 5=Others (specify)

At what growth stage code : 1= At seedling stage 2=Before flowering; 2=At harvest stage; 3=Less than 14 days before harvest; 4= Any time (I don't care timing) 5= Every growth stage

Sellers code : 1=Other farmers 2= stockiest 3= Friends 4=company store 5=Others (specify)

Source of Seed Code): 1=Other farmers 2= stockiest 3= Friends 4=company store; 5=contract company; 6=Others (specify)

Code source of price info : 1=Radio 2=Television 3=Newspaper 4= Government's agricultural marketing information center 5= Any trader at the local market 6= Collector who comes to the farm 7= Other farmers 8= Extension officers 9= Internet 10= Cooperative/farmer's association 11= Contract company 12= NGOs 13= Through mobile phone services 14= Other (specify)

E. Harvest and traded quantities

21. Post-harvest and storage information.

What do you do with your fresh produce immediately after harvest? <i>(Tick only one.)</i>	1. On ground in sun	
	2. On ground in shade	
	3. In basket	
	4. In crate	
	5. In cart	
	6. In plastic bag	
	7. In plastic sack	
	9. Other (Specify)	
Do you pre-cool your produce?		1=Yes; 2=No
If YES, how do you do the pre-cooling?	1. Place in shade	
	2. Sprinkle water over crop	
	3. Cover with leaves/palms	
	4. Place in cold room	
	5. Use umbrella, shadehouse	
	6. Other (Specify)	
Do you always bring your harvested produce to your homestead?		1=Yes; 2=No
If yes, how is your produce brought from the field to the homestead?	1. Baskets on foot	
	1. Bicycle	
	3. Hand cart/push truck	
	4. Motor bike	
	5. Pick-up truck	
	6. Motorized tricycle	
	7. Other (Specify)	
	8. Not applicable	
Do you do packaging of produce before selling? If yes, how do you pack your produce?	Yes=1; No=2	
	1. Plastic Bag	
	2. Sacks (Woven Polypropylene)	
	3. Baskets	
	4. Wooden boxes	
	5. Large crates	
	6. Paper boxes/Cartons	
	7. Insulated/Styrofoam boxes	
	8. Loose	
	9. Other (Specify)	
Do you do any processing of produce after harvest? What value addition activities do you do for each crop?	Yes=1; No=2	
	1. Grading	
	2. Sorting	
	3. Cleaning	
	4. Packing	
	5. Labeling	
	6. Cooling	
	7. Storage	

	8. Transportation	
	9. Processing (Juicing, canning, drying, etc)	
Do you have storage facilities for fresh produce? If yes, what type of storage facilities do you have?	Yes=1; No=2	
Tick only one.	2. Own Store room on farm	
	3. Use neighbours	
	4. Rent/hire facilities	
	5. Use cooperative/association facilities	
	6. Outside/roadside	
	8. Other (specify)	
What is the normal/average length of storage?	Days	

22. What is the distance from the farm to the main road? (km); to the nearby market(km) to the major market where they sell(km)

23. What is the distance from the main road to the nearest high-value market.....(km)

24. Please provide the following information:

Crop	Total yield (kg or bundle/acre)	Quantity sold (kg or bundle/acre)	Transportation cost (Tsh/kg or bundle)
Cabbage			
Onion			
Tomatoes			

24. Where do you acquire market and production information from?

[1= radio; 2= farmers groups; 3= mobile phone; 4= television; 5= traders/collectors; 6= brochures/ fliers; 7= extension; 8= ngos (specify); 9= others (specify)]

25. What kind of marketing information are you receiving?

[1= price; 2= product quality; 3= product physical traits; 4= crop high in demand; 5= others (specify)]

26. What packages do you use for to store and/or transport your vegetables?

[1= baskets; 2= wooden crates; 3= plastic sacks; 4= plastic bags; 5= plastic crates; 6= others (specify)]

F. Sales information

27. Please fill the table below

Crop	Frequency of harvest (week/days)	Main form sold	Main place to sell	Criteria for market place selection
1= cabbage 2= onions 3= tomatoes		1= fresh (loose unsorted) 2= fresh (loose sorted) 3= fresh (packed) 4= preserved 5= others (specify)	1= supermarkets; 2= boarding schools and vocational training collages; 3= tourist hotels and lodges; 4= normal hotels; 5= garden 6= town/city market 7= village market 8= open air market (please name it)	1= good prices 2=short distance from the farm 3= transport availability 4= others (specify)

28. Do you sell to farm collectors? [1= yes; 2=no]

29. Do you transport cabbages, tomatoes and onions from farm to the market?

[1= yes; 2=no].....

30. How are these crops usually transported to the market place?

Crop	Means of transport	Cost (tsh) /kg or bag
1= cabbage 2= onions 3= tomatoes	1= walk 2= bicycle 3= motorbike 4= daladala/public transport 5= individual car 6= other means (specify)	

31. If you do not sell to high-value market (schools, supermarkets, hotels, vocational collages, hospitals) give reasons.....

[1= they require constant supply; 2= they are located at a long distance; 3= they need large supplies; 4= they have their contractual buyer; 5= i do not meet standards; 6= they don't have instant payment; 7= others (please specify)]

32. Do you sell more of cabbage, onion or tomatoes to high-value markets?..... [1= yes; 2=no]

32. If no what currently preventing you from selling more of cabbage, tomatoes, and onions?

(Mention).....

33. Are there any challenges in marketing the following vegetables in accessing high-value market for cabbages, tomatoes, and onions?..... [1=yes; 2= no]

34. If yes can you list those problems?

Cabbages;.....

Tomatoes;.....

Onions;.....

35. What are your major marketing constraints (rank them accordingly)

[1= low producer price, 2= higher transport cost, 3= poor road to the market, 4= poor market to information, 5= lack of reliable transport cost, 6= others (specify)]

Rank.....

36. Is there any institutions or association that influences bargaining power between you and consumers?[1= yes, 2= no]

37. If yes what is the name of institutions and explain how they influence your bargaining power

38. In your opinion, do you think there is any importance of having such institutions/associations?.....,

Why?

G. SWOT analysis for smallholder vegetable farmers

Strength	Tick appropriately
Do you own land?	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you possess any skills on planting cabbages, onions and tomatoes for high-value markets?	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you have year-round availability of water for irrigation?	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you have access to inputs such as certified seeds, fertilizer, and pesticides?	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you possess experience on growing vegetables for high-value market?	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you have access to extension services? (please specify source)	<input type="checkbox"/> yes <input type="checkbox"/> no
Are there high-value markets available in your area? (please name them)	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you get access to market information (on prices, demand and supply of vegetables)?	<input type="checkbox"/> yes <input type="checkbox"/> no
Is there a good transportation infrastructure in your neighborhood?	<input type="checkbox"/> yes <input type="checkbox"/> no

Weakness	Tick appropriately
Do you have enough land?	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you have enough water for irrigation?	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you have enough money to buy inputs such as seeds, fertilizer, and pesticides?	<input type="checkbox"/> yes <input type="checkbox"/> no
Are there any climate challenges to vegetable growers? (please specify challenges)	<input type="checkbox"/> yes <input type="checkbox"/> no
Are there major pest and disease problems?	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you have poor market information system?	<input type="checkbox"/> yes <input type="checkbox"/> no

Opportunities	Tick appropriately
Are there any agriculture policies that favor small vegetable growers like you? (please specify)	<input type="checkbox"/> yes <input type="checkbox"/> no
Are there NGOs that work with you in your area?	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you have any training opportunities in agriculture? (please specify)	<input type="checkbox"/> yes <input type="checkbox"/> no
Are there high-value markets present near your area? (please specify)	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you grow any crops under contractual arrangement with buyers? (please specify)	<input type="checkbox"/> yes <input type="checkbox"/> no
Do you have access to credit services? (please specify)	<input type="checkbox"/> yes <input type="checkbox"/> no

Threats	Tick appropriately
Are your vegetables affected by pests, and diseases?	<input type="checkbox"/> yes <input type="checkbox"/> no
Are your vegetables affected by animals and birds?	<input type="checkbox"/> yes <input type="checkbox"/> no
Does the climatic condition favor your vegetable production?	<input type="checkbox"/> yes <input type="checkbox"/> no
Are there any agricultural policies that do not favor you?	<input type="checkbox"/> yes <input type="checkbox"/> no
Are there market uncertainties for small vegetable growers? (please specify)	<input type="checkbox"/> yes <input type="checkbox"/> no

Thank you for your cooperation

END