

**INFLUENCE OF FARMER ORGANIZATIONS AS A MARKET INFORMATION
SYSTEM ON MARKET ACCESS AND INCOME OF SMALLHOLDER
VEGETABLE FARMERS IN BABATI DISTRICT, TANZANIA**

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**A Thesis Submitted to the Graduate School in Partial Fulfilment of the Requirements
for the Award of a Master of Science Degree in Agricultural Economics of Egerton
University**

EGERTON UNIVERSITY

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DECLARATION AND RECOMMENDATION

DECLARATION AND RECOMMENDATION

Declaration

I declare that this thesis is my original work and it has not been submitted in this or any other university for the award of a degree.

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RECOMMENDATION

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DEDICATION

I dedicate this work to my parents, siblings and relatives for their support.

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ABSTRACT

Vegetable production is of great importance in terms of nutrition improvement, income generation and food security. Africa Research in Sustainable Intensification for the Next Generation (Africa RISNG) action research project actively integrates vegetable farming and marketing practices in order to reduce the vulnerability of indigenous populations of Babati district located in the Manyara region of Tanzania. In Tanzania smallholder vegetable farmers receive asymmetrical and incomplete market information which is costly. Mobilizing farmers into groups so as to access viable market information while enhancing their bargaining power is one way to overcome this challenge. However the extent to which this has been achieved has not yet been evaluated. This study sought to evaluate the influence of farmer organizations towards improving smallholder income in Babati. Objectives of the study were: to determine types of market information accessed by smallholder vegetable farmers through farmer organizations, determine factors influencing information seeking behaviour of vegetable farmers and determine effect of access to market provided by farmer organizations on smallholder vegetable farmer's income. The target population was smallholder farmers who grow vegetables within maize based farming systems. Multi-stage sampling technique was employed where by 250 smallholders vegetable farmers were interviewed using structured questionnaire. The results showed that the type of market (29%) is the most type of market information accessed by vegetable farmer through farmer organization. From the Poisson model the results show that distance to the market information source point has a negative influence on farmer's information seeking behaviour. In contrast, gender, education, income and group membership had a significant positive relationship with farmers' information seeking behaviour. In estimating the effect of access to market provided by farmer organizations on smallholder vegetable farmer's income, Propensity Score Matching (PSM) was used. The results indicate that farmers who had access to the market provided by farmer organization have more income (501691.413 TZS) than non member (405471.429 TZS). From the results, it is recommended that an enabling policy environment that establishes and strengthens farmer organizations be supported. This will assist in transforming smallholder farming as viable business ventures through increased productivity and increased household incomes while reducing rural poverty.

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LIST OF ABBREVIATIONS AND ACRONYMS

Africa RISING	Africa Research In Sustainable Intensification in the Next Generation
AMIS	Agricultural Market Information Services
DAICO	District Agriculture, Irrigation and Livestock Cooperatives Office
ECA	Economic Commission for Africa
FAO	Food and Agricultural Organization
FO	Farmer Organization
GDP	Gross Domestic Product
GNP	Gross National Product
HODECT	Horticulture Development Council of Tanzania
ICT	Information and Communication Technology
MDB	Marketing Development Bureau
MIS	Market Information System
MMA	Match Maker Associates limited
NGO	Non Government Organizations
SMS	Short Message Service
SPPS	Statistical Package for Social Science
SSA	Sub-Saharan Africa
TAHA	Tanzania Horticulture Association
TAPP	Tanzania Agricultural Productivity Program
TZS	Tanzania Shillings
UNDP	United Nations Development Project
URT	United Republic of Tanzania
USAID	United State Agency for International Development

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Agriculture is an important activity to the society. The sector plays a major role in terms of poverty alleviation, food security and economic growth (Balarane and Oladele, 2012). As such majority of the people in the world depend on agriculture with approximately 1.5 billion people being engaged in smallholder agriculture (Shaun *et al.*, 2014). In Africa about 70% of the population lives in the rural areas and depends on the sector for their livelihood. The sector accounts for about 20% of Africa's Gross Domestic Product (GDP) (Economic Commission for Africa, 2004), 60% of its labour force and 20% of the total merchandise exports.

In Tanzania the sector contributes about 26.7% to the Gross National Product (GNP) and 32% to the Gross Domestic Product (GDP) (food security, employment and foreign exchange earnings) (Horticulture Development Council of Tanzania, 2010). The sector is made up of different sub sectors like crops (food and cash) and livestock. Over the years, most of the cash crops like coffee, tea and sisal have mostly benefited large scale farmers with most smallholders concentrating on such crops like maize and beans. These crops have had minimum returns to smallholders. Therefore, to improve the livelihoods of smallholders, the government and development partners have encouraged smallholders to diversify to high value crops such as horticultural crops.

The horticultural subsector is one of the upcoming subsectors in the country with annual average growth of 9-12 percent per annum (Netherlands Enterprise Agency, 2017)). The growth of this subsector is more than double the overall annual growth rate of the agricultural sector. The subsector contributes to employment opportunities where by about 2.5 million people are employed. Hence this makes the industry a major employer within the agricultural sector.

The growth of this subsector is as a result of the increased health awareness of people in terms of the benefits of eating fruits and vegetables (Dolan and Humphrey, 2000). Consequently, there is increased demand and market opportunity for horticultural produce in urban centres of both developing and developed countries. Due to this, smallholder farmers have an enormous opportunity to invest more in horticulture production especially vegetables.

Vegetable production has received considerable attention in recent times. Vegetables are of great importance in terms of nutrition improvement, income generation, food security and improving resource use efficiency in agriculture. In Tanzania the total production of vegetables is about 1,869,485 tonnes (FAOSTAT, 2017). Most vegetables are grown on small scale despite the fact that horticultural crop usually generate higher earnings per unit area and represent an alternative for farmer with too small cultivable land to provide adequate income from field crops (Helen Keller International, 2004). Since vegetables can be grown in small landholdings, the subsector is attractive to smallholder farmers and can be promoted as an avenue to improve their livelihoods. As a result, smallholder farmers have diversified to vegetable production in order to increase their per capita income.

Despite the importance of vegetables, their production is associated with high risk and uncertainty because they are a highly perishable produce. The perishable nature of vegetables necessitates effective marketing channels (Xaba and Masuku, 2012). According to Antwi and Seahlodi (2011), the success of vegetable growers (operation and decision) depends on market availability, accessibility and affordability.

Access to markets for smallholder rural farmers, however, is fraught with challenges such as poor infrastructure as well as, up to- date market information (Magnus and Piters, 2010). Marketing information such as market prices guide farmers in making informed decisions about product planning and marketing place (Uchezuba *et al.*, 2009). However, most smallholder farmer's receive asymmetrical and incomplete market information. This is due to the fact that information is scattered across a variety of agencies, government departments and private sector organizations. This limits the chances of smallholder farmers accessing market information.

In order to overcome asymmetrical and inadequate information problem, Market Information System (MIS) such as farmer organizations need to be enhanced so as to encourage a more competitive economic environment by reducing informational asymmetry between buyers and sellers of agricultural commodities. Therefore policy makers and the private sector should join together with smallholder farmers and design appropriate programmes to help them easily access complete and symmetry market information.

One of the ways of enhancing market access through provision of market information to smallholder vegetable producers is by forming farmer organizations. Mobilizing producers into

groups/associations and establishment of contractual arrangements between farmers and buyers (contract of farming) can be an important entry point to link farmers with buyers hence a market assurance to farmers and sufficient supply to buyers (Horticulture Development Council of Tanzania, 2010). Kaganzi *et al.*, (2009) indicated that farmer groups in Uganda, through collective action, help meet basic market requirements for minimum quantities, quality and frequency of supply which they cannot achieve as individuals. They are able to access new markets arising in the context of market reform, government policy, and globalization. Moreover, marketing in groups reduces transaction costs of accessing inputs and outputs for smallholders and enable them to obtain necessary market information and secure access to new technologies, which allow them to compete with larger farmers and agribusinesses (Ellis and Bahigwa, 2003). Due to this forming farmer groups has become one of the ways through which smallholder farmers can access markets.

In Babati district-Tanzania the Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) project funded by USAID in collaboration with World Vegetable Centre (WolrdVeg) and Tanzania Horticulture Association (TAHA) have come up with initiatives of integrating vegetables into maize-based systems for improved nutrition and income of smallholder farmers. The project has devoted much effort in encouraging the establishment of vegetable farmer organizations, while strengthening existing ones. These organizations are aimed at acting as a market information system to allow the coordinated produce to meet the demands of large volume regional markets, as well as institutional consumers. This effort aims at contributing to improving household food and nutrition security among the most vulnerable households and their members, especially women and children.

1.2 Statement of the Problem

Smallholder farmers' have integrated vegetables into their farming systems to increase and /or diversify their income as well as nutritional/dietary needs. In as much as many smallholders have adopted vegetable production, they have not realized the expected returns. Daily price fluctuations coupled with seasonality of supply leads to uncertainty. In Tanzania as is the case in many other Sub-Saharan African countries, smallholder vegetable farmers receive asymmetrical and incomplete market information which is costly. To overcome this, Africa RISING has promoted and encouraged commercial vegetable farming by smallholders through formation of farmer groups so as to provide market information and market access. However, the extent to which this has been achieved has not been evaluated. As such, there was a need

to explore the influence of farmer organizations in providing market information and market access towards improving income.

1.3 Research objectives

1.3.1 General objective

The general objective of the study was to contribute to improved livelihoods of smallholder vegetable farmers through enhanced market access in Babati district, Tanzania.

1.3.2 Specific Objectives

- i) To determine the types of market information accessed by smallholder vegetable farmers through farmer organizations in Babati District, Tanzania.
- ii) To determine factors influencing market information seeking behaviour of vegetable farmers in Babati District, Tanzania.
- iii) To determine the effect of access to market provided by farmer organizations on small holder vegetable farmer's income in Babati District, Tanzania.

1.3.3 Research Questions

- i) What are the types of market information accessed by smallholder vegetable farmers through farmer organizations in Babati District, Tanzania?
- ii) What are the factors influencing market information seeking behavior of vegetable farmers in Babati District, Tanzania?
- iii) What is the impact of access to market provided by farmer organizations on small holder vegetable farmer's income in Babati District, Tanzania?

1.4 Significance of the Study

Market information systems (MIS) are designed to enhance competition in the market by increasing market transparency and accessibility for all market participants, and in particular the weakest who are smallholder farmers. Farmers need information to deal with various problems confronting their farm operations. They need to decide what to produce and how much, and where to market in order to maximize their profit. Vegetables are perishable by nature and need immediate disposal in the market. Therefore vegetable farmers need an efficient market information system that can disseminate information and make farmers aware of existing market opportunities. Joining farmer groups enables smallholders to pool resources to enable them process (value addition) and enter into contractual agreement with buyers to sell their produce. By doing this it reduces transaction cost, gives assurance of the market, extension services and increase production leading to increased smallholder's vegetable

producer's income. Farmer organizations as a Market Information System empower farmers by strengthening their bargaining power in order to increase their share of the retail proceeds from their produce. Information channelled through farmer groups tends to be more efficient and effective because it encourages competition and group members tend to motivate one another. Therefore, determining the influence of farmer organizations as a market information system to enhance market access and improve income will provide useful insights to both the producers and other actors on the importance of the system and how to enhance it so that it can operate effectively and efficiency towards improving smallholder income.

1.5 Scope and Limitation

Information asymmetry exists in any market system that has different actors. Tanzania agricultural sector has many players with different information needs. Linking these key players is crucial for market efficiency. However the study was focused on the influence of farmer organizations as a Market Information System (MIS) on income of smallholder vegetable producers who have 5 acres of land and below. Although there were many species of vegetables, this study only focused on Tomato, African eggplant and Amaranth cultivated at the area of the study under the framework of Africa Research in Sustainable Intensification for the Next Generation (Africa RISING). The study was conducted in Babati and involved Tanzanian Agricultural Productivity Program (TAPP), Babati agricultural offices, World Vegetable Centre (WorldVeg) and other existing development initiatives in the project region. The absence of detailed data from local authority offices and relevant NGOs offices mentioned above presented limitations for this study. To counter this limitation, the researcher collected primary data directly from the target group members to enlarge the data from secondary sources.

1.6 Definitions of terms

Indigenous vegetables: refers to a crop species or varieties genuinely native to a region, or to a crop introduced into a region where over a period of time it has evolved, although the species may not be native.

Market information: refers to the information that helps the producer to make decision and plans for the product development activities.

Market information system: In this study, is a farmer organization system that analyzes and assesses market information, gathered continuously from diverse sources.

Asymmetric information: is the situation in which information is shared out in unbalanced manner leading to some parties receiving more or superior information compared to others.

Transaction cost: is the cost of doing business or cost of exchange between two trading partners, in our case smallholder vegetable farmers and buyers.

Smallholder farmer: is a farmer owning small based plots of land (5 acres and below) on which they grow subsistence crops.

Market access: is the concept that describes the sum total of all skills acquired through experience or training that enable a farmer to participate by selling and maintain regular customers to his/her produce.

Farmer organization: is a voluntary social group that is formed in communities which differ in size, common interest/objectives and degree of interaction among members.

Household: is a person or group of persons who reside in the same homestead/compound but not necessarily in the same dwelling unit, have same cooking arrangements, and are answerable to the same household head

Information Seeking Behaviour: is the situation where farmer demanding for information as a consequence of a need to satisfy some goal.

CHAPTER TWO

LITERATURE REVIEW

2.1 Historical background of agricultural market information system

During the past two decades, agricultural marketing in most developing countries were controlled by government including regulating the major export and strategic food commodities and inputs (Kherallah *et al.*, 2000). This was seen to be important as a result of the common view that private traders were exploitative and that markets cannot be relied upon for optimal allocation of resources (*ibid*). As such, government enterprises were given the responsibility of organizing food markets and fixing nationwide prices for farmers and consumers, managing export crop production by providing inputs on credit, fixing their prices, and monopolizing the processing and export of the crops (Kilima *et al.*, 2007). According to Barrett (2005), commodity prices were generally set below market levels, implicitly taxing producers while subsidizing consumers. Marketing channels were typically very inefficient, with centralized storage and processing facilities. Consequently, farmers were exploited due to insufficient market information which led them to sell their produce at low prices, not only that higher taxes are charged due to high costs the enterprises incurred and delayed payments (Pokhrel and Thapa, 2007). Government enterprises could not provide any services to the overwhelming majority of the farmers who possessed small landholdings and produce crops beyond the mandate of marketing parastatals.

During the government intervention and control era, some developing countries had initiatives of providing Agricultural Market Information Services (AMIS). The Government of Tanzania for example, established the Marketing Development Bureau (MDB) in 1970 with financial support from The United Nations Development Programme (UNDP) and Food and Agriculture Organization (FAO). MDB provided advice to the government on marketing policy; provided training; established regular market news service; set consumer prices; carried out research on costs of crop production; and recommended producer prices for staples and major cash crops (Ashimogo *et al.*, 2001).

In Sub-Saharan Africa (SSA), the need for MIS emerged as a result of economic liberalization policies and structural adjustment, when governments stopped intervening directly in the markets. These MIS were intended to correct the asymmetries created by economic liberalization, giving more bargaining power to farmers, creating a more transparent, open trading environment and fostering more efficient market systems for all stakeholders. They

also provided market information to government officials in order to monitor the economic liberalization process.

2.2 Vegetable marketing in Tanzania

There is a large range of vegetables produced in Tanzania which are marketed through several channels. These include the local market, urban market and regional market consuming vegetables, such as tomatoes and Indigenous vegetables (amaranth and african eggplant). Urban markets have a high demand for vegetables exotic and indigenous. Exotic vegetables include tomatoes, cabbage, carrots, sweet pepper, broccoli, zucchini and lettuce , while indigenous vegetables includes amaranth, african eggplant, jute mallow and Ethiopian mustard (MMA, 2008). This demand shows the potential of the subsector to alleviate poverty (Weinberger and Lumpkin. 2007). However, there are critical issues that constrain full exploitation of the urban markets for vegetables including the scattered nature of smallholder farmers in the area, small quantities of vegetables produced by individual smallholder farmer, long distances between the vegetable supply demand areas and perishability of vegetables as well as lack of storage facilities.

Apart from these regional markets there are few export markets. There is a national export market, mainly Nairobi for onions and tomatoes as well as Europe. The ability of farmers to participate in the export market is beneficial as it reduces the risk of dependency on traditional exports, whose price has been fluctuating in recent years. However, there is still lack of information regarding profitability, movement and coordination of fresh fruit and vegetable export marketing and institution bound chain actors, hence there is a challenge for small scale farmers to remain competitive and cope with domestic and international market forces (Mgeni *et al.*, 2010).

2.3 Market access and collective action

Many markets in developing countries are flawed. As a result, it is difficult for farmers to be successful in getting fair prices for their produce. However, small scale farmers can increase their income if they can compete in the food market. For smallholder farmers to thrive in the global economy, it is necessary to create an entrepreneurial culture in rural communities where “farmers produce for markets rather than trying to market what they produce” (Lundy *et al.*, 2002). From an implementation perspective, this means shifting the focus from production related programs to more market oriented interventions. This has placed renewed attention on institutions of collective action, most often realized through the structure of farmer groups as

an important and efficient mechanism for enhancing the marketing performance of smallholder farmers (Kariuki and Place 2005).

Farmer organizations exist to support small scale farmers to compete with other actors at the market and along the supply chain. For them to perform more effectively, they need certain services and information, like rural roads and education to be successful in getting a fair price on their produce (Markelova *et al.*, 2010). Usually many of these services and information is non-existing or lacking in rural markets. By utilizing farmer organizations and collective action, small scale farmers may overcome and compensate for some of these flaws, for instance overcome financial obstacles, share transport costs and access other services. Brahm *et al.* (2009) argue that market imperfection and flaws are not their only obstacles farmers encounter in selling crops to different markets. Other obstacles include: inadequate infrastructure low demand for products, oversupply of the product in the market which makes the price very low or inadequate quality. Some of the obstacles may be overcome through farmer organizations. It has been argued that formal organization ensures that the agricultural produce fulfils quality and quantity standards and that the food safety requirements demanded by the buyer are met.

2.4 The role of farmer organizations in provision of market information and market access

The purpose of farmer organizations is to plan, implement and monitor social and economic development programs. It positively affects the process of rural agricultural changes such as increase in income. Provision of market information, market access and market linkage are some of the roles that farmer organizations play in developing the agricultural sector.

2.4.1 Provision of market information

Farmer organizations have a role to play in collecting and/or disseminating market information and awareness provision on how farmers can access and benefit (Magnus and Omanukwue, 2009). Farmer organizations integrate and provide not only market information but also other information related to agriculture activities.

Market information generally refers to market price information, and in some cases includes information on quantities. Marketing information is a wider concept, including information on marketing channels, buyers, quality standards and so on. Accurate, appropriate and timely marketing information (on prices and on marketing issues more broadly) is very important for producers and traders. Farmer organization can assist local government in establishing MIS, training information officers and/or provision of transport and equipment. However they

encounter several challenges in providing useful and timely information such as poor management and planning, government support and inadequate finance (Longenecker *et al.*, 2006). Mwaura and Ngugi (2014) observed that good performance of farmer organizations is based on better project management practices, involving the community and good governance systems. Therefore farmer organization needs to be strengthened in sourcing agricultural marketing information for their members. This will help farmers develop trust and confidence in their local organizations for economic progress.

2.4.2 Farmers' market access

Dorward *et al.* (2004) and Ton (2008) revealed that smallholder led economy is obstructed by lack of market access. Market access is crucial in smallholders' development because it creates the necessary demand, offers remunerative prices, thereby increasing smallholder incomes (Al-Hassan *et al.*, 2006). The proponents of this thought strongly argue that effective market access can lead to increased incomes and food security, more rural employment, and sustained agricultural growth. Another study by Hugo *et al.* (2006) supports market access scholars by contending that greater agricultural markets means increased trade and from increased trade comes greater income growth. Hence market access needs to be improved by coordinating various market actors, players, forming farmer's groups and other necessary supporting services.

In developing countries, market access can be improved through farmer organizations. Poulton *et al.* (2005) contends that farmer organization is one of the possibilities for smallholder farmers to compete with actors at the market. Therefore by acting collectively, small scale farmers may overcome several challenges they face in the market.

In addition, farmer organizations develop contacts between farmers themselves, traders and processors. Such interventions will help farmers to benefit both directly and indirectly, through better access to market or improved market opportunities. However, when assessing the role of farmer organizations in market development, it is important to take several issues into account; sustainability, the need and challenge to get differing players – government, the private sector and others working effectively together. According to Stockbridge (2003), farmer organizations build up internal and external relationship of trust during market access. Hence defend farmer interest and improves their market participation.

2.5 Information seeking behaviour of farmers

Information seeking behaviour is a broad term encompassing the ways individuals articulate their information needs, seek, evaluate and use the needed information. According to Pettigrew *et al.* (1996), information seeking behaviour involves personal reasons for seeking information, the kinds of information which are being sought, and the ways and sources with which needed information is being sought. Barriers that prevent individuals from seeking and getting information are also of great importance in understanding the information seeking behaviour of individuals and organizations. Information acquisition depends on needs of individuals involved in special activities such as vegetable farming and home management.

Therefore, when making an important decision the farmer will devote time and effort to collecting information, considering the alternatives and selecting the best option, in order to minimize the risk of “getting it wrong”. This process is known as complex decision making (Assael, 1998). The purposeful search for information to inform decision making is called information-seeking behaviour (Wilson, 1981).

Moreover, there are several factors that influence use of information by farmers including their personal characteristics such as age (Carter and Batte, 1993), education (Waller *et al.*, 1998), experience in farming (Schnitkey *et al.*, 1992, farm size (Solano *et al.*, 2003; Alvarez and Nuthall, 2005; Llewellyn, 2007), type of farm enterprise (Carter and Batte, 1993), debt level (Tucker and Napier, 2002), ownership of farm (Ngathou *et al.*, 2006), and geographical characteristics such as distance to market centres (Solano *et al.*, 2003) and distance to nearest technological adopter (Llewellyn, 2007). In addition farmers who have access to information technology are more likely to participate in agricultural and rural development programs and other political, social, and cultural practices (Anastasios *et al.*, 2010).

2.6 Market information needs of smallholder farmers

Market information services usually involve the regular collection of commodity prices from major markets and supply conditions, processing and storing them, and disseminating the information to different stakeholders using one or more channels (Staatz *et al.*, 1992). Establishing market information services is seen as a means of increasing efficiency of marketing systems and promoting improved price formation (Svensson *et al.*, 2009). Market information products include market news (information on prices, quantities, market conditions, and business contacts), market analytical reports (reports that analyze factors that cause changes in market conditions and their effects on stakeholders), and business reports (providing information that can help stakeholders identify reliable trade partners).

Market information services have the function of collecting and processing market data systematically and continuously, and making it available to market participants in a form relevant to farmer's decision making. Information on current prices of the produce and on market trends assists farmers in planning their market products. Information on sales timing helps farmers in ensuring that they do not cause a market glut. This enables them to stagger harvesting and quantity for marketing.

2.6.1 Impact of market information on smallholder farmers marketing

Access to timely market information services and analyses has benefits to market participants. Improved information enables farmers plan their production more in line with market demand. Moreover, it enables smallholders to schedule their harvest at the most profitable times as well as helping them decide to which markets they should send their produce at the right quantity in order to reduce transaction cost. It also assists farmers negotiate on a more even footing with traders. Other benefits have been seen for traders. Improved information enables traders to move produce profitably from a surplus to a deficit market; and make decisions about the viability of carrying out storage, where technically possible. Market information services provide transparency by creating awareness of all parties of prevailing market prices and other relevant information (Shepherd, 1997). By improving transparency of the marketing system, reducing the riskiness of participating in the markets, and transmitting market signals more effectively to farmers and traders, they are encouraged to produce more for the markets.

2.7 The importance of agricultural market information to smallholder farmers

Smallholder farmers are restricted to market access due to lack of information. Consequently excess price dispersion across markets is common (Aker, 2010). A study on improving information and performance in grain marketing undertaken by Tschirley *et al.* (1995) in Ethiopia showed that the social benefits of providing accurate and timely market information exceeds the returns that a private company would receive from investing in such activity. Thus, a number of initiatives both by governments and private sectors are in place to ensure provision of market information to small holder farmers. Farmer organizations also find Information and Communication Technology (ICT) better in providing services to their members. Short Message Service (SMS) systems enable farmers to compare prices in different markets and to take a stronger negotiating position when selling their produce. Developing and utilizing ICT applications in delivering agricultural information are constrained by a number of factors. Some of these challenges are related to market access and infrastructure, others to ICT infrastructure and the mode of delivery of information.

2.8 Farmer organizations as market information systems to smallholder farmers

A farmer organization as Market Information System (MIS) is an instrument which is generally developed and used by a group of people with a common interest in improving the marketing of their products. It plays the role of collecting, processing and disseminating market information where local government or private sector capacity is weak. The system helps the interest group to increase market transparency, which enhances the user's possibility to make better-informed marketing decisions and, eventually, to increase their returns on the good they produce or trade (Helen *et al.*, 2011).

Market Information System (MIS) information can be used by farmers both for advocating for more producer-friendly policies (through farmers' organization) and to guide their production and marketing decisions (choice of what, when and where to sell). In addition, as small farmers' market power is hindered by their lack of information on price levels and changes at different points of the marketing chain, strengthening smallholder farmers' access to information can improve farmers bargaining position (*ibid*).

A farmer organization MIS is founded on the idea that the people who will be using it will take the lead in its design, operation and possible expansion; the departure point is the user's need for information as well as their interest and capacity to operate the system. This shows that the major tool for farmers to make economic decision is agricultural market information of which

they can get through acting collectively in groups and thus, enhance their market access (Olukosi *et al.*, 2005). To them, marketing has a connection to immediate income and is dependent on useful information and knowledge which enables the farmers make decisions on what to produce, where and when to purchase inputs, availability of transportation and how to dispose of produce.

2.9 Farmer organizations and market access

Many studies have been conducted on farmer organizations and market access. Tolno *et al.* (2015) investigated the economic analysis of farmer organizations in enhancing smallholder potato farmer's income. In their study, probit model was used as a selection equation to identify factors that influence group membership decision by smallholder potato farmers. The results revealed that the age of the potato farmers, land ownership, extension service, access to credit and off-farm income positively influenced their decision to join a farmer group. Results of the second stage outcome equation found positive farm income effects of group membership. Furthermore, results revealed that farm income is predominantly determined by labour used, the size of the cultivated potato area, share of potato sold and potato market price.

Another study by Skjoldevald, (2012), evaluated small scale farmers' access to and participation in the market. The study used different approaches on farmers' organizations and small scale farmers' access to and participation in markets to create an analytical context. The study found that food markets in developing countries are lacking in infrastructure, market information and bank credit. Mukwevho and Anim (2014) conducted a study on the factors that affect small scale cabbage farmers in accessing markets. Discriminant analysis was used to determine whether there are statistically significant differences that existed between the average score profiles for the two groups of farmers:-those who had access to markets and those who did not. The results indicated that the independent variables that accounted for most of the differences were, transaction costs, agricultural extension education, level of education of farmers, distance from farm to the market, where farmers sell their produce, and value of equipment owned by farmers.

A study by Barham *et al.* (2009) identified the underlying factors that enable smallholder farmer groups to improve their market situation. The findings suggest that more mature groups with strong internal institutions, functioning group activities, and a good asset base of natural capital are more likely to improve their market situation. Another study by Fischer and Qaim (2011) investigated the determinants and impacts of cooperative organization, using the

example of smallholder banana farmers in Kenya. They employed propensity score matching. Their findings pointed to a positive income effects for active group members. Yet price advantages of collective marketing are small, and high-value market potentials have not yet been tapped. Beyond prices, farmer groups function as important catalysts for innovation adoption through promoting efficient information flows.

2.10 Theoretical Framework

2.10.1 Collective action theory

Collective action refers to actions of a group working toward a common goal. When individuals engage in collective action, the strength of the group's resources, knowledge and efforts is combined to reach a goal shared by all parties. This action should be voluntary, to distinguish collective action from hired labour. Marshall (1988) defines collective action as “action taken by a group (either directly or on its behalf through an organization) in pursuit of members’ shared interests” (Meizen-Dick *et al.*, 2005). Collective action has become an important strategy for smallholders in developing countries to remain competitive in rapidly changing markets.

Farmer organization and collective action are often seen as key factors in enhancing farmers’ access to markets. Often, too little attention is directed at whether farmer organization makes less or more sense in the case of provision of market information and market access. The benefits of farmer organization are more evident in the vegetable sector, characterized by high transaction costs associated with market access. This study will look at how farmer organizations as a market information system provide agriculture market information and linking smallholder vegetable farmers to market. From the theory, it is expected that, farmer acting collectively will minimize different challenges incurred in vegetable production and marketing such as the transportation cost, searching cost for market information and trader exploitation. Therefore it implies that acting collectively helps farmers in making production decisions and enhances market access.

2.10.2 Social capital theory

Social capital is the resource inherent in the social relations which facilitate collective action. It includes trust, norms and networks of associations representing any group which gather consistently for common purpose. Social capital can be achieved through bonding, bridging and linking. Mancur (1965) argues that any group of individuals attempting to provide a public good has trouble to do so efficiently. This leads to the formation of organization based on the common interest of groups of individuals and as a means to overcome free-rider problems and design cooperative solutions for the management of common resources. However the probability of farmer's to organize in groups depends on several factors such as easy access to market information. This shows that acting collectively has the advantage of improving the position of smallholder farmers in markets including the delivery of inputs and training, economies of scale and increasing bargaining power. Group marketing, for instance, has been used as a strategy to strengthen linkages and build trust among farmers, traders and the private sector.

This study will mainly concentrate on the influence of farmer organizations as a social network (bridging and linking) between farmers and traders, farmers and extension officers, farmer and financial institutions and also bonding among smallholder farmer. Therefore from the theory, we expect farmers with access to market information, to have greater productivity and access to the market. It implies that through collective action farmers will have better prices and reduce risk and thus improve their income.

2.11 Conceptual Framework

The importance of accessing market information on smallholder farmers can be understood through understanding how farmers make marketing decisions and the role market information plays in this decisions.

Figure 1 represents the conceptualized interrelationship of key variables used in the study. The conceptual framework is based on the assumption that smallholder vegetable farmers have information seeking behaviour due to their needs of certain market information in order to attain optimum income from their produce. Such market information includes; knowledge of prevailing market prices, information on forecast of market trends, types of markets, quantity demanded and sales timing. The efficiency of the flow of information is enhanced if the farmers are organized into farmer groups as one of the market information systems. Such that they will be aware of quantity demands and quality standards, also they will have high bargaining power

and lower cost of transportation. However other factors such as age, education, farm size and extension services influence and enable small holder farmer to be in a group hence easy access to information and market. Vegetable farmer's access to market will contribute to their income through considering vegetable price and share of vegetables to be sold. This study hypothesizes that, farmer groups as a vehicle of market information systems have a positive impact to small holder vegetable farmer's income. This is achieved through provision of adequate market information which will help them to access the market. Therefore there is a possibility that farmers will improve their income.

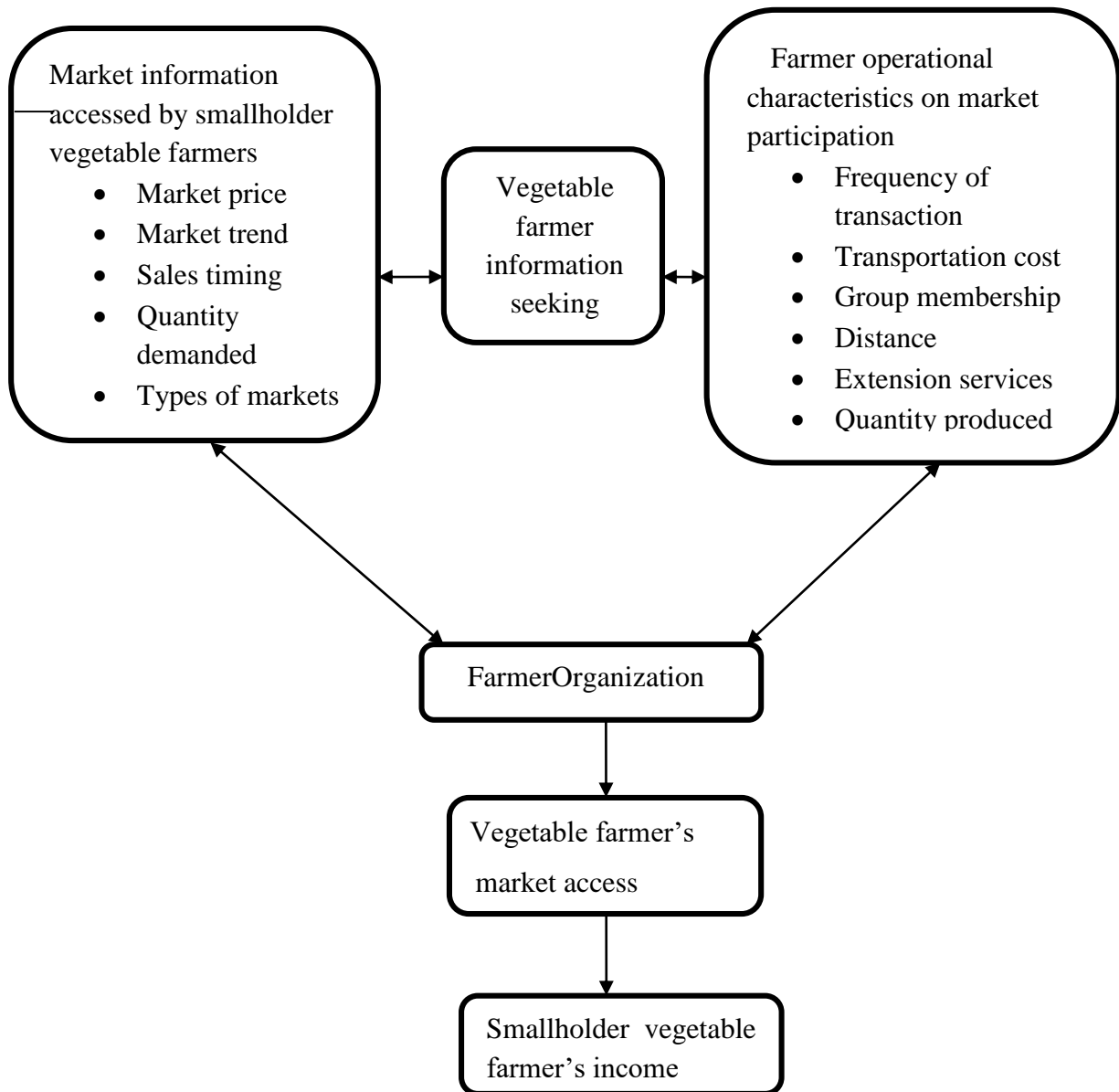


Figure 1: Conceptual framework of farmer organization as a MIS

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter defines and shows the research methods used to conduct the study. It explains how the necessary data and information to address the research objectives and questions was collected presented and analyzed. Reasons and justification for the research design, research instruments, data sources, data collection techniques, data presentation and analytical techniques used were given.

3.2 Study area

This study was conducted in Babati District, located in Manyara region of Tanzania. Babati District is situated in Northern Zone of Tanzania, and located between latitude 3° and 4° south and the longitude 35° and 36°. The district is one of five districts in the Manyara region of the country. It consists of four divisions, 21 wards and 82 villages. The population of the district in 2012 was 405,500 (312,392 for Babati District Council and 93,108 for Babati Town Council) (URT, 2013). The growth rate for the district was about 3 % per year between 2002 and 2012. The agricultural survey of 2007/08 revealed 63,816 agricultural households, of which 15% were female-headed (URT 2012).

The District has a total land area of 6069 km² where about 180,000 ha (36%) is arable land (Lofstrand, 2005). Babati District was selected for this study as it has a comparative advantage in vegetable production because of fertile soil and favourable agro-climatic condition. Hence the area attracts many people from different parts of Tanzania and beyond. Different crops are grown in Babati ranging from maize, pigeon peas, cotton, wheat, Irish potatoes, vegetables and Rice. Livestock keeping is an essential activity in this predominantly agro-pastoral area (Hillbur, 2013). The map of the study area is shown in Figure 2 below.

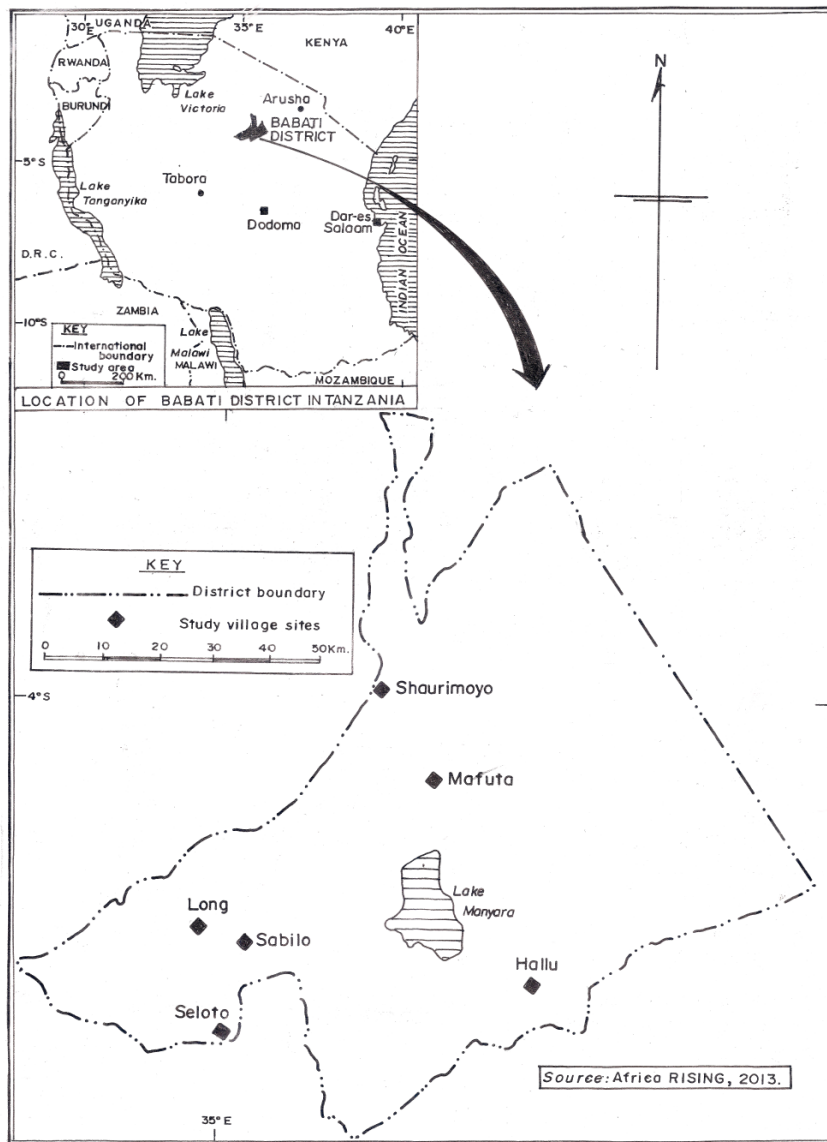


Figure 2: A map of Babati District

3.3 Study design

In this study, cross – sectional survey design was employed. This design was preferred as it allows data to be collected at one point in time and allows data to be collected from a large population (Mugenda and Mugenda, 2003). The design was also appropriate because it allowed for the use of quantitative and qualitative data.

3.4 Sampling Procedure

The target sample size for this study was smallholder farmers who grow vegetables in Babati district. The study employed a multi-stage sampling technique where the first stage involved purposive selection of Babati district from Manyara region. In stage two, five villages (Matufa, Seloto, Bermi, Gallapo and Babati town) were purposely selected from Babati due to their prominence in vegetable production. Stratified sampling was used to select non-members and members of farmer organizations in each village. Given source list, smallholder's vegetable farmers were systematically selected. 25 smallholder vegetable farmers were selected from each strata to come up with 250 sample size.

The sample size was determined using the proportionate to size sampling method by (Kothari, 2004).

$$n = \frac{z^2 pq}{e^2} \dots\dots\dots (1)$$

Where n is the sample size, z is the confidence level ($\alpha=1.96$), e is the acceptable error, $q= (1-p)$ and p is the proportion of vegetable farmers (under Africa RISING action research) that responded to the given survey questions.

$$p = \frac{n_r}{n} = \frac{156196}{312392} = 0.5$$

Where by

p is the proportional allocation of the population

n_r is the population of smallholder vegetable farmers (156,196)

n is the population of smallholder farmers (312,392)

$$q = (1-p) = (1-0.5) = 0.5$$

The acceptable error was 0.062 with an estimated proportion of sample that was responded to the given survey question of 50%. Replacing the values above to the formula gives the following:

$$n = \frac{(1.96)^2 0.5 * 0.5}{(0.062)^2} = 250 \dots\dots\dots (2)$$

3.5 Methods of Data collection

Data was collected using structured questionnaire (see Appendix 6). The questionnaire was pretested to determine the amount of time spent per questionnaire and convenience of getting data from the farmers. It was used to collect data on type of market information accessed by smallholder vegetable farmers from farmer organization, factors influencing market information seeking behaviour and effects of market access on smallholder vegetable farmers' income. Secondary data was collected through documentary analysis from the World Vegetable Centre (Worldview), Barbate District Agriculture, Irrigation and Livestock Cooperatives Office (DAICO) as well as from other existing development initiatives in the study region. The documents that were analyzed included existing system used in disseminating market information, number of training provided to encourage farmers to forms groups, number of farmer's who are in groups and challenges encounter when providing market information.

3.6 Data analysis

The collected data was cleaned, organized and analyzed using SPSS version 16 and STATA version 12. The SPSS computer program was used to types of market information accessed by farmers through farmer organization. STATA program was used to estimate Poisson regression model to determine factors influence market information seeking behaviour. Propensity Score Matching (PSM) method was used to determine the effect of market access provided by farmer organizations on smallholder farmers' income.

Objective one: Determine types of market information accessed by smallholder vegetable farmers through Farmer Organizations.

Percentage is a descriptive statistic that was used in determining type of market information accessed by smallholder vegetable farmers. The percentages were presented in a pie chart; however mean, *Chi-square* and T-test were used in the socio-economic characteristics of smallholder vegetable farmers.

Objective two: Determine factors influencing market information seeking behavior of vegetable farmers.

Poisson regression model was used to address this objective. The probability distribution that is specifically suited for count data is the Poisson probability distribution (Gujarati, 2005). Poisson model meets the classical assumptions with only one exception. This exception is that the dependent variable assumes Poisson distribution. Information seeking behaviour

was measured in terms of number of times that farmer demand for the market information. The major concern of this regression was to determine factors influencing vegetable farmer seeking behaviour of market information. However this is a very common distribution for the random variable having a value 0, 1, 2, 3 ... n.

Assuming a Poisson distribution, there is defined likelihood function and is possible to develop the Maximum Likelihood Estimator (MLE). Within the Poisson model, it is possible to obtain estimates of unknown regression parameters $\beta_0, \beta_1, \beta_2, \beta_k$. As with other regression, in order to explain the distribution of y_i or the expected value y_i by the set of explanatory variable x_i . Assume that the expected value of y_i is given by

$$E(Y_i | X_i) = \exp(X_i^T \beta) \dots\dots\dots (3)$$

A common assumption in count data models is that, for given x_i , the count variable y_i has a Poisson distribution with expectation $\lambda_i = \exp(X_i^T \beta)$. Thus the probability mass function of y_i conditional upon x_i , is given by

$$P(Y_i = Y | X_i) = \exp(-\lambda_i) \lambda_i^y / Y!, Y = 0, 1, 2, \dots, \dots\dots\dots (4)$$

Where $y!$ expresses 'y factorial'. Substituting the appropriate functional form for λ_i produces expressions for the probabilities that can be used to construct the log likelihood function for this model, referred to as the Poisson regression model. There is one important property of the Poisson distribution, that conditional variance of y_i is equal to λ_i . This condition is referred to as equi-dispersion. If variance of y_i is higher than λ_i , it implies over dispersion. It leads on the hypothesis $H_0 = E(Y_i | X_i) = V(Y_i | X_i)$.

It is possible to use Cameron–Trivedi test (tests of over dispersion). If the test will indicate the inappropriateness of using the Poisson model, most will probably look for a solution using negative binomial model. This one allows over dispersion; interpretation of its regression coefficients is the same as the Poisson.

Model specification

$$Feqs = \beta_0 + \beta_1(Ageh) + \beta_2(Gd) + \beta_3(Educ) + \beta_4(Hhsize) + \beta_5(Fsize) + \beta_6(Sec) + \beta_7(Disp) + \beta_8(Groupm) + \beta_9(Inc) + \beta_{10}(Tgrowers) + \beta_{11}(Agrowers) + \beta_{12}(AFgrowers) + \beta_{13}(Qtp) + \beta_{14}(Qap) + \beta_{15}(Qafp) + \beta_{16}(Dism) + \beta_{17}(Ext) + \mu \dots\dots\dots(5)$$

Where,

β = coefficient of independent variable showing its effect on the dependent variable

μ = Error terms

Table 1: Description of variables used in Poisson regression model

Code variables	Variable description	Units of measurement	Expected sign
Dependent variable			
Freqs	Farmer information seeking behaviour	Number of times the farmer sought for market information per season (continuous)	+
Independent variables			
Ageh	Age of the household	Number of years (categorical)	+
Gd	Gender	1=male, 0=female (dummy)	+/-
Educ	Education level	Number of years of schooling(continuous)	+
Hhsize	Household size	Number of family members	+
Fsize	Farm size	Farm size in acres	+
Sec	Searching cost	Cost of getting market information in TZS	+
Disp	Distance to the source point	Distance from household to the market information source point in kilometres.	+
Groupm	Membership in vegetable farmers group	1= Yes, 0= No (dummy)	+/-
Inc	Farmer Income earned	Actual amount of money (TZS)	+
Ext	Extension services	Number of contacts with extension	+/-
Tgrowers	Tomato growers	1= Yes, 0= No (dummy)	+/-
Agrowers	Amaranth growers	1= Yes, 0= No (dummy)	+/-
AFgrowers	African eggplant growers	1= Yes, 0= No (dummy)	+/-
Qtp	Quantity of tomato produced	Quantity of tomato produced in kilograms	+
Qap	Quantity of amaranth produced	Quantity of amaranth produced in kilograms	+
Qaft	Quantity of African eggplant produced	Quantity of African eggplant produced in kilograms	+
Dism	Distance from farm to the market	Distance from the farm to the nearest market in kilometres.	+

Objective three: Determine the effect of access to market provided by farmer organizations to small holder vegetable farmer’s income.

Propensity Score Matching (PSM) was used to address this objective. PSM method improved on the ability of the regression to generate accurate causal estimates by the virtue of its non-parametric approach to the balancing of covariates between the “treatment” and “control”

group. Conventional approaches to assessing the impact of an intervention using with and without method, has been challenged by a problem of missing data. Due to this, the effect of intervention could not be accurately estimated by simply comparing the outcome of the treatment groups with the outcomes of control groups (Heckman *et al.*, 1998). One of the alternative techniques followed to assess the effect of discrete treatment on an outcome is the propensity score matches developed by Rosenbaum and Rubin in 1983.

In order to estimate the effect of market access provided by farm organization on farmer's income, propensity score matching (PSM) was applied, employing nearestneighbour, radius and kernel algorithms for robustness. The observations outside the common support were eliminated, in order to estimate the overall average treatment effect on the treated (ATT). In view of the limitation that propensity score matching controls for selection bias only on the basis of observed covariates, then Rosenbaum tests (2002) was conducted to gauge the sensitivity of the estimated treatment effects to hidden bias.

The study's interest is the average effect of market access on group members income, or the average effect on the 'treated' (ATT), which can be written as $E(Y_{i1} - Y_{i0})$, where $M_i = 1$ if i^{th} access market and 0 otherwise. Observing the outcome for the i^{th} farmer (Y_{i1}) if it access market through farmer organizations, but not the outcome (Y_{i0}) if it does not. Likewise, non-members were observed only when they do not access market. Thus, the counterfactual state is observed for neither group.

Estimated average effect of market access was conducted by comparing outcome (income) between group members and non-members, but there may be systematic differences among farmers that explain why some choose to sell in groups and others do not. Systematic difference would generate a 'selection bias' in the estimates of the effects of market participation.

Therefore, the propensity score was obtained using logit model to predict the probability of farmers' market access. According to Gujarati (1999), both provide similar results. The logit model was used to estimate propensity scores using vegetable smallholder farmers characteristics (Rosenbaum and Robin, 1983) and matching is then performed using propensity scores of each observable characteristic. These characteristics include covariate

variables that influence the market access and income as outcome of interest. The coefficients are used to calculate a propensity score, and group members matched with non-members.

The dependent variable in the logit model is market access, which takes the value of 1 if a farmer accesses the market and 0 otherwise. This was run for the sampled households on observables and exogenous variables that included: gender, level of education, household size, tomato price, amaranth price, African eggplant price, frequency of transaction for tomato, frequency of transaction for amaranth, frequency of transaction for African eggplant, distance to market, Transportation cost, quantity of tomato supplied, quantity of amaranth supplied, quantity of African eggplant supplied and market information. The mathematical formulation of logit model is specified as follows:

$$P_i = \frac{e^{z_i}}{1+e^{z_i}} \dots\dots\dots (6)$$

Where, P_i is the probability of market access for the i^{th} vegetable farmer and it ranges from 0-1

Z_i : is a function of N-explanatory variables which is also expressed as:

$$Z_i = \beta_0 + \sum \beta_i x_i + \mu_i \dots\dots\dots (7)$$

Where,

$i = 1, 2, 3 \dots n$

β_0 = intercept

β_i = regression coefficients to be estimated or probit parameter

μ_i = a disturbance term, and

x_i = determinants of market access

The probability that a farmer belongs to non member group is

$$1 - P_i = \frac{1}{1+e^{z_i}} \dots\dots\dots (8)$$

Therefore, the odds ratio can be written as:

$$\frac{P_i}{1-P_i} = \frac{1+e^{-z_i}}{1+e^{z_i}} = e^{-z_i} \dots\dots\dots (9)$$

Now $\frac{P_i}{1-P_i}$ is simply the odds ratio in favour of market access. It is the ratio of the probability that the farmer would access market to the probability that he/she would not access market. Finally, by taking the natural log of equation (9) the log of odds ratio can be written as:

$$L_i = \text{Ln} \left(\frac{P_i}{1-P_i} \right) = \text{Ln} \left(e^{\beta_0 + \sum_{j=1}^n \beta_j x_{ji}} \right) = Z_i = \beta_0 + \sum_{j=1}^n \beta_j x_{ji} \quad \dots\dots\dots (10)$$

Where;

P_i was probability of market access provided by farmer organization and it ranges from 0 to 1

Z_i was a function of n explanatory variables (X_i) which is expressed as:

$$Z_i = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n \quad \dots\dots\dots (11)$$

Where:

β_0 was intercept

$\beta_1 \dots \beta_n$ the slope parameters in the model

L_i the log of the odds ratio, which is not only linear in X but also linear in parameters

X_i is vector of the relevant sampled household's characteristics

If the introduction of disturbances term μ_i in the logit model it became:

$$Z_i = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n + \mu_i \quad \dots\dots\dots (12)$$

Table 2: Description of variables used in logistic regression model

Code variables	Variable description	Units of measurement	Expected sign
Dependent variable			
Market access	Household market access provided by farmer organizations	1=Yes, 0=No (dummy)	+/-
Independent variables			
Gd	Gender	1=male, 0=female (dummy)	+/-
Educ	Education level	Number of years in schooling (continuous)	+
Hhsize	Farmer's household size	Number of family members (continuous)	+
Fsize	Farm size	Farm size in acres (continuous)	+
Ext	Extension services	Number of contacts with extension	+/-
PriceT	Tomato market price	Tomato market price in TZS (continuous)	+
PriceA	Amaranth market price	Amaranth market price in TZS (continuous)	+
PriceAF	African eggplant market price	African eggplant market price in TZS (continuous)	+
TransfreqT	Frequency of transaction for tomato	Number of times a farmer sales tomato to the market (continuous)	+
TransfreqA	Frequency of transaction for amaranth	Number of times a farmer sales amaranth to the market (continuous)	+
TransfreqAF	Frequency of transaction for african eggplant	Number of times a farmer sales african eggplant to the market (continuous)	+
Transpcost	Cost incurred when transport the produce	Actual amount of money (TZS) used during transportation (continuous)	+
Dism	Distance from farm to the market	Distance from the farm to the nearest market.	+
QuantsT	Quantity of tomatoes supplied	Amount of tomatoes supplied to the market in kilograms	+
QuantsA	Quantity of amaranth supplied	Amount of amaranth supplied to the market in kilograms	+
QuantsAF	Quantity of African eggplant supplied	Amount of African eggplant supplied to the market in kilograms	+
MrktI	Access to market information	1=Household access to market information, 0=otherwise (dummy)	+/-

Estimation of the propensity score per se is not enough to estimate the ATT of interest. This is due to the fact that propensity score is a continuous variable and the probability of observing two units with exactly the same propensity score is, in principle, zero. Various matching algorithms have been proposed to overcome this problem. However, they all provide consistent estimates of the Average effect of Treatment on the Treated (ATT) under the Conditional Independence Assumption (CIA) and the overlap condition (Caliendo and Kopeinig, 2008). Hence most commonly applied matching estimators include:

Nearest Neighbour matching (NNM): Here smallholder vegetable farmers who don't access market provided by farmer organization (comparison group) is chosen as a matching partner for treated vegetable farmers who access the market that is closest in terms of propensity score (Caliendo and Kopeinig, 2008). It can be done with or without replacement options. With a single-nearest neighbour matching every treated household is matched to the control household with the closest propensity score. With a three-nearest neighbour matching every treated household is matched to three households that are closest in propensity score and outcome is calculated as the average of the three matched controls. Matching is done with replacement to assure that each treatment unit is matched to the control unit with the closest propensity score, which reduces bias.

Radius and Caliper matching: In radius matching smallholder vegetable farmer from the comparison group is chosen as a matching partner for a treated vegetable farmer that lies within a given radius and is closest in terms of propensity score (Caliendo and Kopeinig, 2008). Pairs consisting of vegetable farmer who access market and control are built. Hence control group which is similar to the participant group is generated. This results in a reduction of systematic mean differences between these groups. One problem in radius matching is that it is difficult to know priori what choice for the tolerance level will be reasonable.

Kernel matching: Here smallholder vegetable farmer who can access markets (treated units) are matched with a weighted average of all controls with weights which are inversely proportional to the distance between the propensity scores of treated and controls (Becker and Ichino, 2002). It uses a weighted average of all vegetable farmers in the control group to construct, with weights inversely proportional to the propensity score distance between treated and control units. This method uses more information to construct the counterfactual outcome which is farm income, resulting in variance reduction but increased bias in case of poorer matching. However, the drawback of this method is that possibly bad matches are used as the estimator (Caliendo and Kopeinig, 2008). Therefore, the proper imposition of the common support condition is of major importance for kernel matching method. As such the choice of a given matching estimator will thus depend on the nature of the available data set (Bryson *et al.*, 2002).

Checking overlap and common support

Imposing a common support condition ensures that any combination of characteristics observed in the treatment group can also be observed among the control group (Bryson *et al.*, 2002). The common support region is thus the area which will contain the minimum and maximum propensity scores of treatment and control group households, respectively. However, comparing the incomparable must be avoided. This can be avoided by checking the overlap and the region of common support between treatment and comparison group. One way of determining the region of common support more precisely is by comparing the minima and maxima of the propensity score in both groups. The basic criterion of this approach is to delete all observations whose propensity score is smaller than the minimum and larger than the maximum in the opposite group. As such, observations which lie outside this region are discarded from analysis (Caliendo and Kopeinig, 2008).

The performance of the matching exercise was evaluated by conducting three diagnostic tests: the balancing property test (Rosenbaum and Rubin, 1983); comparison of the value of pseudo R^2 before and after matching (Sianesi, 2004); and the likelihood ratio test for joint significance of the covariates before and after matching (Sianesi, 2004).

Effect of market access provided by farmer organization on vegetable farmers’ income

The effect of market access on income was further investigated by letting Y_{i1} and Y_{i0} be the amount of income for participants and non-participants respectively. As such, the difference in outcome between treated and control groups can be seen from the following mathematical equation:

$$\partial_i = Y_{i1} - Y_{i0} \dots\dots\dots (13)$$

Y_{i1} = Outcome of treatment (income of i^{th} household, when he or she accesses market provided by farmer organizations).

Y_{i0} = Outcome of untreated farmers (income of i^{th} household, when he or she doesn’t access market provided by farmer organization).

∂_i = Change in outcome as a result of treatment

Equation (14) is then expressed in causal effect notational form, by assigning $D_i = 1$ as a treatment variable taking the value 1 if an individual received the treatment and 0 otherwise.

Then the Average Treatment Effect of an individual i can be written as:

$$ATE = E(Y_{i1} | D_i = 1) - E(Y_{i0} | D_i = 0) \dots\dots\dots (14)$$

Where:

ATE, Average Treatment Effect: is the effect of treatment on farm income.

$E(Y_{i1} | D_i = 1)$: Average outcomes for farmer with treatment, if he or she chooses to access market through farmer organizations, ($D_i = 1$).

$E(Y_{i0} | D_i = 0)$: Average outcome of an untreated farmer, when he or she does not access market through farmer organizations, ($D_i = 0$).

Furthermore, the Average Effect of Treatment on the Treated (ATT) for the sample can be measured as:

$$ATT = E(Y_{i1} - Y_{i0} | D = 1) = E(Y_{i1} | D = 1) - E(Y_{i0} | D = 1) \dots \dots \dots (15)$$

Since PSM controls for selection bias only on the basis of observable covariates, following Dillon (2011) and Asfaw *et al.* (2012), Rosenbaum tests (Rosenbaum 2002) was conducted to gauge the sensitivity of the estimated effect of market access to hidden bias. The goal of sensitivity analysis is to provide a sense of how large an effect on omitted variable or variables would have to have in order to invalidate a finding. That is, sensitivity analysis provides a quantitative statement that in order to explain away a particular association; one would need a hidden or unobserved bias of a certain size (Rosenbaum 2002).

As indicated, the PSM approach cannot fully be controlled for unobservable characteristics. As Ichino *et al.* (2008) have suggested the presentation of matching estimates should be accompanied by sensitivity analysis. Accordingly, the sensitivity of the estimated treatment effects to selection on unobservable were checked using the bounding approach developed by Rosenbaum (2002). The *Mh* bounds procedure by Becker and Caliendo (2007) was applied in STATA programs to aid in the construction of Rosenbaum bounds for the sensitivity testing. This procedure uses the matching estimates to determine the confidence intervals of the outcome variable for different values of (γ) captures the degree of association of an unobserved characteristic with the treatment and outcome required for it (the unobserved characteristic) to explain the observed effect (Duvendack and Palmer-Jones, 2011). DiPrete and Gangl (2004) indicated that, if the lowest, which encompasses 0, is relatively small (say < 2), then one may state that the probability of such an unobserved characteristic is relatively high and the estimated effect is therefore sensitive to the existence of unobservable and vice versa.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Introduction

The main focus of the study was to contribute to improved livelihood of smallholder vegetable farmers through enhanced market access in Babati district, Tanzania. This chapter presents analyses and discusses the findings of the study. The results and discussion have been outlined with reference to the research objectives used in the study. The objectives were; to determine types of market information accessed by smallholder vegetable farmers through farmer organizations, factors influencing market information seeking behaviour of vegetables farmers and effect of access to market provided by farmer organizations on smallholder vegetable farmer's income. Mean, frequency and percentages are the main descriptive statistics used in this study. Inferential statistics such as F-test, *chi*-square test and confidence interval have been used to assess the strength of relationship between independent and dependent variables.

4.2 Socio economic characteristics of smallholder vegetable farmers

This section presents findings on the socio-economic characteristics of the respondents. Two hundred and fifty (250) vegetable farmers were interviewed. The difference in socio economic characteristics between vegetable growers who belonged to a vegetable growers group and those who did not belong to a group (non-members) are presented in order to show the comparison between the groups. The characteristics considered for analysis were age, gender, education, household size, farm size, extension services, market experience, off farm employment, occupation, distance to the market, land tenure, and farm income.

Table 3 gives results of continuous socio economic variables. The overall average household size was 5 people for the sampled households. This implies that the overall average household size in Babati is the same with the national average of 5 people according to the national census (URT, 2012). The study further revealed that the average household size for those who belonged to a vegetable growers group and those who did not belong to a vegetable growers group were 5 and 6 people respectively. This shows that respondents who belonged to a vegetable growers group in Babati have smaller household size than those who did not belong to a vegetable growers group. The results are contrary to Tolno *et al.* (2015) who found that, potato farmers who belonged to a group have larger average household size (4.61) than non-members (4.52). The survey results also revealed that a large household size was an asset to the farmers in terms of provision of labour. Mwakaje (1999) argues that, household size has implication on family

labour availability and cost. Often farmers are faced with challenges of providing social and welfare facilities such as feeding, education and other living expenses for such a large number of dependents. These expenses account for low saving at the end of every harvest season aside the fact that most farm produce are consumed by the large household members. In a related study, Babatunde *et al.* (2008) reported that the household size could have great implications for labour supply for farm work and also food security. Furthermore, the T-test results of household size show that the average household size was not statistically significant at ($p < 0.05$) vegetable growers who belonged to a group and those that did not.

Table 3: Results on Household size, Education, Farm Size, Extension contacts, Marketing experience, Distance to market and Farm Income

Characteristics	Mean			T- test	P-value
	Group member	Non member	Overall		
Household size	5.33	5.57	5.45	0.73	0.47
Education (years)	7.01	6.13	6.57	-0.65	0.52
Farm size (acres)	0.60	0.46	0.53	-2.88***	0.00
Marketing experience (years)	9.08	8.25	8.67	-0.29	0.77
Extension contacts (number)	84.02	79.30	81.77	1.00	0.31
Distance to the market	1.08	1.59	1.33	-1.85*	0.07
Farm income per season	504554.5	485140.2	494847.35	1.75*	0.08

Note: *, **, *** represents significance levels at 10%, 5% and 1% respectively

Illiteracy is one of the factors which act as an obstacle to agricultural development in Tanzania. The study found that overall average level of education was 6.57 years primary level of schooling for smallholder vegetable farmers. Moreover, the average years of schooling for vegetable growers who belonged to a group was 7 years (primary level of schooling) while those who did not belong to a vegetable growers group had an average of 6 years (primary level of schooling). The results point out that vegetable growers who belonged to a vegetable growers group had a high level of education compared to vegetable growers who did not belong to a vegetable growers group. Higher education levels influence most of the educated farmers in

the study area to engage in group membership since they are aware of its importance towards agricultural productivity. According to Schultz (1975), low education makes the farmer more vulnerable to bargaining power on crop prices and power to purchase inputs. The vegetable growers who were members of a group got support in terms of training from NGOs such as WorldVeg. In addition Sullumbe, (2004) opined that education is a major determinant of the Nigerian economy. He further argues that the level of formal education attained by an individual goes a long way in shaping his personality, attitude to life and adoption of new and improved practice. Therefore, it can be said that introduction of new ideas (motivating farmers to join groups), new innovations and technology in Babati district will be easy. The T-test results revealed that mean difference of farmers education between vegetable farmers who belong to a vegetable growers group and those who did not belong to a vegetable growers group was not statistically significant, indicating that there was no significant difference between vegetable farmers of different groups.

Results on farm size under vegetables showed that the overall average farm size under vegetables was 0.53 acres as given in Table 3. Vegetable growers who belonged to a group had 0.60 acres while the vegetable growers who did not belong to a vegetable growers group had an average farm size of 0.46 acres. This indicates that the vegetable farmers who belonged to a group had larger farm sizes than those who did not belong to a vegetable growers group. Vegetable growers who did not belong to a vegetable growers group own larger farm size for other crops and not vegetable farming. According to Mburu *et al.* (2014) smallness of landholding is one of the characteristics of small scale farmers. Furthermore, the T-test results show that the average farm size was significant at ($p < 0.01$); indicating that the average farm size was significantly different between farmers of the different groups. In other words, vegetable members have a statistically significantly higher mean score on farm size than non-members.

The findings on marketing experience revealed that vegetable growers belonging to a group had an average marketing experience of 9.08 years for while those who did not belong to a vegetable grower group had an average of 8.25 years as indicated in Table 3. This indicates that the vegetable growers belonging to a vegetable growers group had better marketing experience than vegetable growers who did not belong to a vegetable growers group. This is due to the fact that vegetable farmers who belonged to a vegetable growers group have more knowledge about vegetable production and marketing through extension services obtained from farm organization and also linkage to markets which lead them having more marketing

experience compared to vegetable growers who did not belong to a vegetable growers group. These findings concur with Korir *et al.* (2015) who find out that farmers who belonged to a vegetable growers group had more marketing experience (at 9.4 years) than those who did not belong to a vegetable growers group who had a marketing experience of 8.6 years. Marketing experience has a great effect on farmer's bargaining power and marketing network. This means that farmers with more years in marketing have a higher ability to participate and sell more in the market. However, the T-test results show that the average marketing experience was not significant.

The results in Table 3 further show that the overall average distance from the farmer's household to the nearest market was 1.33 kilometres. The average distance for vegetable farmers who belonged to a group was 1.08 kilometres while the average distance to the nearest market for farmers who did not belong to a group was about 1.59 kilometres. These results indicate that vegetable farmers who belonged to a group in Babati are nearer to the market compared to non-members. Nearness to the market enables the vegetable growers to get timely market information. Moreover, it reduces transaction costs. These findings are contrary to Korir *et al.* (2015) who reported that the distance to the market for farmers in groups covered an average of 0.85 kilometres, and non-members 0.48 kilometres in Kenya. This explains that farmers who are far from the market place are more likely to be in farmers group in order to reduce challenges encountered when marketing their produce such transportation costs. Therefore as the distance to the market increases, the cost of transport increases and the tendency for collective action among the farmers improves. In addition, the T-test results show that the average distance was statistically significant at ($p < 0.1$). Study done by Key *et al.* (2000) and Makhura *et al.* (2001) found that distance to the market influences both the decision to participate in markets and the proportion of output sold.

In relation to vegetable income, results indicate that the overall average vegetable income per month was 494,847.35 TZS. The average vegetable income for the vegetable growers who belonged to a group was 504,554.5 TZS while 485,140.2 TZS was for vegetable growers who did not belong to a group. T-test results show that the average vegetable income earned by vegetable growers belonging to a group and the income from those who did not belong to a group was statistically significant at ($p < 0.01$). This implies that vegetable farmers who belong in a vegetable growers group are benefiting more by having higher average income than non member. This is because vegetable farmer who belonged in groups have high bargaining

power in the market which lead to fair market price hence received higher income from selling vegetable. Livelihood improvement in vegetable members motivates non-members to be in the membership. The results therefore confirm those of Yang and Liu (2012) that revealed that the Chinese farmers who belonged to a farmer group had higher incomes compared to non-members.

Table 4 shows the results for categorical socio-economic variables of age, gender, occupation, off farm employment and land tenure of smallholder vegetable farmers belonging to a group and those who did not belong to a vegetable growers group.

Age is an important determinant of socio-economic status of a population since people wear in energy as they advance in age. The results show that, 42.68% and 39.27% of vegetable farmers who belonged to a vegetable growers group and those who did not belong to groups fell within the age group of 18-38 years. While the overall average for the age category of 18-38 was 41.26%. Also age of group of 39-59 years has 53.90% vegetable farmers in group and 50.49% for those who did not belong to a vegetable growers group. 3.45% and 6.25% of vegetable farmers who belong in a vegetable growers group and those who did not belong to a group respectively fell within the age group above 59 years. The overall average for the age category of above 59 was 4.84%. This shows that majority of the respondents are from the youth age group. The *chi-square* (χ^2) test indicated no significant difference in age of the household heads among farmers. The farming households can therefore be regarded as young and who according to Martey *et al.* (2012) belong to economically active group. Both production and marketing of vegetable requires younger members who are more active in adapting to new ideas and energetic for producing and carrying vegetables to the market, however older farmers are perceived to have acquired experience on farming and resources. This also agree with the finding of Windapo and Olowu (2001) and Bzugu (2005) that younger people participated more in agricultural and community development activities such as farmers group. In addition the larger percentages of the farmers were between 20 and 50 years old.

Table 4: Results for age, gender, occupation, off farm employment and land tenure

Characteristics	Percentages			χ^2	P-value
	Group member	Non member	Overall		
Age					
18-38	53.90	50.49	52.48	1.99	0.49
39-59	42.68	3.27	41.46		
Above 59	3.42	6.25	4.84		
Gender					
Female	35.04	28.91	31.98	4.06**	0.03
Male	64.96	71.09	68.03		
Occupation					
Farmer	97.44	90.63	94.04	7.75***	0.01
Employed	0.85	0	0.43		
Business person	1.71	9.38	5.55		
Off farm employment					
Yes	27.34	19.66	23.50	1.99	0.157
No	80.34	72.66	76.50		
Land tenure					
With title	78.65	72.13	75.39	0.28	0.20
Without title	27.35	21.88	24.62		

Note: ** and *** represents significance levels at 5% and 1% respectively

The findings in relation to the gender of the respondent indicated that overall 31.98% of the respondents were female and 68.03% were male. For the vegetable farmers who were members of a group, 35.04% were female while 64.96% were male. The gender distribution for vegetable farmers who were not members of a vegetable growers group indicates that 28.91% were female while 71.09% were male. The results indicate that there were more male headed households than female headed households among the vegetable growers in Babati. This indicates that vegetable production is dominated by men. Men engage more in vegetable production (Tomato, amaranth and African eggplant) due to high profit of the produce obtain at the market. The results are in line with Korir *et al.* (2015). The *chi-square* (χ^2) test shows significant difference ($p < 0.05$) in gender of the household heads. Vegetable production practices vary greatly among men and women. However, this is contrary to Matsane (2014) who found out that 40.4% of the farmers in South Africa were males and 59.6% were females. These findings indicate that the study area was female dominant in vegetable production. This may

be because vegetable production is very tedious to the extent that man cannot cope or might be because women take most responsibility of their household food security.

Three occupational options were identified amongst the vegetable growers in the study area. The results show that the respondents, whose occupation was farming, were 94.04%, those who were employed were 0.43% and those who had non-farming businesses were 5.53%. Looking at the occupational options for vegetable growers who were members of a group and those who were not, the results indicate that for the vegetable growers who belonged to a group, 97.44% were farmers by occupation while the non-members were 90.63% of the vegetable growers who are members of a group, 0.85% of them were employed while none of the vegetable farmers who did not belong to the group was employed. For the vegetable growers who belonged to a group, 9.38% had a non-farm business while 1.71% of the non-members had non-business. The *chi-square* (χ^2) test shows significant difference ($p < 0.01$) in occupation of the household heads. This confirms that the major occupation is farming. However in the survey, it was realized that farmers also engaged in other business activities and very few were employed. Farmers' engaging in other occupation apart from farming is to diversify other activities as a way to increase their income

Off-farm employment is an alternative strategy for vegetable farmer to improve income and their well being. Results from Table 4 show that the overall percent of vegetable farmers who engaged in off farm employment was 23.50% and 76.50% for vegetable farmers who did not engaged in off farm employment. 27.34% of vegetable members in groups engaged in off farm employment and 80.34% are not engaged in off farm employment. While for vegetable farmers who did not belong to a group 19.66% are in off farm employment and 72.66% are not in off-farm employment. This indicates that vegetable farmers belonging to a group engaged more in off-farm employment than those who did not belong to a vegetable growers group mainly because of their awareness through trainings on investing outside farming activities. Vegetable farming is a risky business to undertake if not properly managed; hence vegetable farmers need to invest in other activities so as to minimise the risk. Thus off farm employment helps the members of vegetable growers to spread risk across several activities hence reduce income uncertainty. The *chi-square* (χ^2) test results show no significant difference in off farm employment between two groups. Moreover, most of respondents did not engaged in off farm employment. This is due to the fact that, most farmers' especially those who did not belong to a vegetable growers group were not aware of the importance of engaging in other off-farm

activities. Therefore, since the small numbers of people are employed in the rural area, this contributes to rural- urban migration and increase the level of poverty among the people living in the rural area. Recent survey indicates that three quarters of farmers in rural areas depend on farming (Household Budget Survey, 2007). Therefore in Tanzania, farming activities continue to dominate the time of majority of its citizens particularly those living in rural areas.

The land tenure system comprised of titled and untitled ownership. The result shows that 78.65% of farmers who were members of a vegetable growers group had titles while 27.35% were untitled. On the other hand, 72.13% of the farmers who did not belong to vegetable growers group had titles while 21.88% did not. Most of the farmers who belonged to a vegetable group had title deeds to their farms and this may be due to the training provided during group meetings where members are made aware of the importance of owning land. Land is the most valuable asset on the balance sheet of most farmers. Not owning land can limit the efficiency of the resources usage and may severely limit the farmers' ability to expand your business in the future. The *chi-square* test indicated no significant difference in land tenure of the household heads. According to Korir *et al.* (2015), 87% of group members had titles while 13% were untitled. Among the non group members, 73% had titles while 27% were without. Land ownership right plays an important role in joining farmer organizations and therefore influences the level of productivity and sales amongst the farmers.

4.3: Types of market information provided by farmer organizations

Farmer groups have a great role to play in collecting and disseminating market information in association with local government and private sector. Figure 3 shows the type of market information provided by farmer organizations in Babati district. According to the survey, farmer organizations provided market information related to types of markets (43%), market trend (13%), market price (12%), quantity demanded (5%) and sales time (3%) to smallholder vegetable farmers in Babati. However, according to 24% of the respondents, farmer organizations did not provide market information.

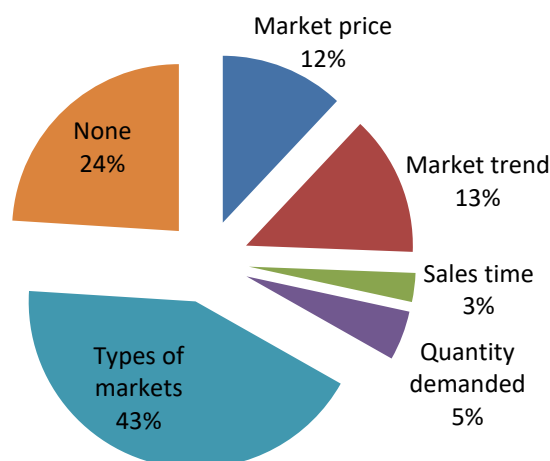


Figure 3: Types of market information provided by farmer organization

This indicates that farmer organizations in Babati have concentrated on provision of types of markets, market trend and market price information and giving little information about time to sale vegetables and quantity demanded by buyers. Hence this leads to poor farmer decisions on when to sale and how much to produce for the market, thus promoting uncompetitive market. However, most of the farmer organizations in Babati are weak and informal. Vegetable farmer group members do not entirely depend on farmer organizations for market information since there is lack of good leadership, teamwork, management and funds to support organizations activities. Due to this non-members will still be having negative attitude and low motivation rate to join in existing groups.

According to Mohamed (2004), 69.7% of the agricultural cooperatives show a low organizational effectiveness in provision of agricultural services. This indicates low benefit and farmers' satisfaction degree from agricultural services. Additionally Kimaro (2013), noted that Mkuranga farmers are not satisfied with market information provided by agriculture farmers group due to delays and little market information provision. They further elaborated that despite the other available sources of market information from village extension officers, village leaders, cooperatives, media, middlemen, and from village members, still most of the farmers in the study area do not have reliable market information. Most information is provided by market actors involved in trading. The implication is that middlemen tend to dominate and maximize profit because farmers are not aware about current market information.

4.3.1 Types of market information accessed by farmers from farmer organizations

Market information is crucial in agricultural production. It is seen as a means of increasing farmer's market efficiency and has a positive benefit for farmers and traders. Farmers are in need of getting the right market information at the right time. In view of this, the study sought to find out the types of market information accessed by farmers from farmer organization. Figure 4 gives results of the type of market information accessed by farmers from farmer organizations. The survey shows that, farmers accessed four type of market information from farmer organizations; types of markets, market trend, market price and sales time.

The results show that a type of markets is the mostly accessed type of market information. From the results, 29% vegetable farmers accessed types of market information from farmer organization. Market plays an important role in rural development, income generation, food security and developing rural market linkages. Farmers have growing interest on how they can benefit from emerging market opportunities. Thus, farmers' awareness about types of markets gives ideas of making better decisions on where to sell their produce at profit. Moreover, farmers will be at the advantage of making better plans for production and market access towards preferred market.

In addition 9% of smallholder vegetable farmers accessed market trend information from farmer organization. This is because market trend provides farmers awareness of the direction they are going in terms of vegetable farming. Market trend information also helps vegetable farmers to spot problems earlier such as a fall in price at the market place and seasons of vegetable shortage. Shepherd (2006), reported that market trend helps farmer to decide whether it would be profitable to start growing new crops, to grow existing crops out of the season or to seek to produce higher quality of crops.

In relation to information on price, 7% of vegetable farmers accessed this type of market information. This show that market information on price is not provided much by Babati farmers' organizations. This might be due poor management by groups' leaders on collecting price information and disseminate to the members at the right time. Due to farmers' exploitation by the traders at the market place, provision of price information to vegetable farmers will improve their bargaining power to higher prices. A study conducted by Nakasone (2013) indicate contrary results, whereby he reported that a group of farmers in Peru received detailed agricultural price information for the local crops in the regional markets. According to Tschirley *et al.* (1995), improving farmers awareness of prices in various markets helps farmers' decisions and confidence regarding what to plant, how much to invest, and where and

when to market their produce; and promoting a more competitive marketing system, which will benefit both producers and consumers.

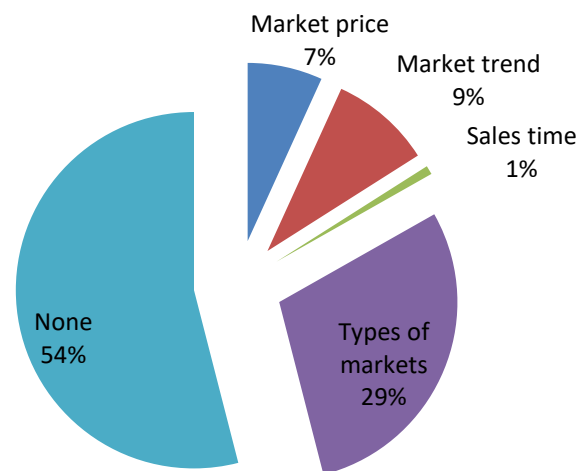


Figure 4: Types of market information accessed by farmers from farmer organizations

Further results show that 1% of vegetable farmers accessed sales time information from farmer organizations. Vegetable growers are in need of accessing sales time information because they grow highly perishable crops which need details on when to plant, harvest time and sales time. Since vegetable growers practice modern farming techniques then provision of sales time information offers the chances to harvest crops when prices are highest. Therefore, information on sales time enables smallholder farmers to know when to plant and when to sell. The study done by Magesa *et al.* (2014) revealed that market information such as sales time enables farmers plan their production more in line with market demand; schedule their harvests at the most profitable times; and decide to which markets they should send their produce and negotiate on a more even footing with traders.

Vegetable farmers who don't access any market information from the farmer organization are about 54%. This implies that, farmer organizations in Babati district have not yet played a big role in disseminating agricultural market information to farmers. This may be due to poor plans, self interest and poor management within the group. Hence, this makes farmers to rely more on fellow farmers in getting agricultural market information. Mohamed (2004) reveals that most of the agriculture cooperatives in Egypt are not playing their role in agricultural development in the desired effectiveness. This fact makes it necessary, that these farmer

organization need to be modified in order to form more efficient and self dependent economic bodies.

Farmer group approach was advanced for agricultural development by government and other agents to assist farmers in agricultural activities and market awareness (Bahigwa *et al.*, 2005; Adong *et al.*, 2013). However still farmers are not getting enough support, such as access to the desired agricultural market information from the farmer organizations. Furthermore, the efforts by government and other development agents to target the same approach for produce marketing and value additions (MAAIF, 2010a) may fail to achieve the desired outcomes. Shepherd, (2000) argues that information on marketing was one of the major things that will contribute to farmers' market access. He also pointed out that information on market price; market trend, sales time and other marketing related matters is mostly needed but rarely reach farmers in developing countries. This implies that farmers lack access to market information for their produce. In addition Kamba, (2009) suggest that no community can develop without knowledge and it can only become knowledgeable if it recognizes and uses information as the tool for development, including agriculture.

4.3.2 Major sources of market information

Access to agricultural market information is an important aspect to agricultural development. Use of accurate and timely market information enhances the performance of market actors through improving their knowledge. The results in Table 5 show that the most common source of market information for both vegetable farmers who belonged to a group and those who did not was their fellow farmers. About 34.19% and 40.16% of both group members and non-members respectively get market information from their fellow farmers respectively. These findings are supported by Mntambo, (2007) who reports that farmer to farmer contacts enable farmers to exchange news and adopt new technology, especially from experienced fellow farmers.

Table 5: Major sources of market information

Major source of market information	Percentage	
	Group member	Non member
Television	1.71	1.57
Farmer organizations	3.42	0
NGOs	1.71	0.79
Extension officer	5.12	0.79
Friend/relative	30.77	33.47
Trader/Buyer	17.95	21.16
Radio	1.71	0
Mobile phone	3.42	2.06
Other farmers	34.19	40.16
Total	100	100

Friend/relative is another major source of market information which provides 30.77% and 33.47% to members of vegetable growers and non-members respectively. Also vegetable farmers in groups and non-member received 17.95% and 21.16% respectively from traders. The study findings were similar to other studies of rural farmers in Zambia (Kalusopa 2005) and rural women in Botswana (Mooko 2005), which showed that traders, friends and relatives were the major sources of information in rural areas. The findings also suggested that farmers mainly depended on informal networks of friends/neighbors, fellow farmers, parents and formal contacts with input suppliers rather than on explicit sources of knowledge in the surveyed communities. In addition the study done by Okwoche *et al.* (2010) revealed that rural farmers heavily depend on friends in accessing agricultural market information.

Additional results indicate that 5.12% of vegetable farmers who are members of a group, sourced market information from extension officers while only 0.79% of non-members sourced market information from extension officers. Extension officers provide training and agricultural information during group meetings. Due to this members become aware of the market information than non-members. Group members also disseminate market information to their fellow members who were absent during the meeting. Therefore it is easier for the extension officer to disseminate market information in groups than to individual farmers.

Mobile phone usage in third world countries is playing a vital role for the enhancement of agribusiness. Results in Table 5 show that 3.42% of vegetable growers belonging to a group used mobile phones and farmer organizations to access market information while non-members were 2.06%. This indicates that being part of a group means that a farmer has access to market

information and other new agricultural information from farm organization. However Babati farmer groups have not played a major role in market information dissemination as shown in figure 4. Hence farmers continue to rely on other sources of information (Table 5). This finding is in line with Martinet *al.* (2009), who found out that farmers who were members of farmer groups were more likely to access new information about agriculture as well as new information about how to use mobile phones. Group membership itself also increases the need for use of mobile phones to coordinate group activities, and to support one another. This implies that due to few and weak farmer organizations most vegetable farmer deviate to other easy means of accessing marketing information. According to Gibbon and Warren, (1991) say that, by giving farmer access to a variety of information sources which are accessible, affordable, relevant and reliable is the ultimate aim of providing agricultural information services.

In Babati, television, radio and NGOs are not considered as major sources of market information. This is mainly because 80% of vegetable farmers do not own television due to affordability linked to limited income. Batcheloret *al.* (2005) suggests that, the impact of television on providing access to information and knowledge could be enhanced if access to power was improved in the rural areas. Even though, for those who can afford both television and radio are not getting the market information at the right time because most of the broadcast are not distributing market information to smallholder farmers. However NGOs have not yet come up with the continuous way of disseminating market information to smallholder vegetable farmers. Dependence on NGO, radio and television programs to get agricultural market information has not well benefited remote rural farmers.

4.4: Factors influencing market information seeking behaviour of vegetable farmers

Agriculture market information seeking behaviour is the human activity with respect to searching various sources of market information and use of that information for proper planning. Poisson regression model was used to analyze factors influencing market information seeking behaviour of vegetable farmers in Babati district. The number of times farmer sought for market information per season was used as a dependent variable against independent variables as shown below.

A goodness of fit chi-square estimated was conducted but after the regression analysis and was not statistically significant indicating that the data fitted the model well. Further a confirmation with Negative Binomial Regression presented in Appendix 2 produced the likelihood ratio test for $\alpha = 0$ not significant indicating that Poisson model was appropriate. A significant alpha

= 0 could be an indication of a potential over-dispersion problem in which case Negative Binomial Regression would be appropriate.

Table 6 results show that the likelihood ratio value which was 602.891 and confirmed that all slope coefficients are significantly different from zero. The Pseudo R² value of 0.0166 also confirmed that all the slope coefficients were not equal to zero meaning explanatory variables were significant in explaining farmers seeking behaviour in the study area.

Table 6: Results of the estimated Poisson regression model

Number of observation=250 Log likelihood = -602.891 LR chi2 (10) = 20.33 Prob > Chi-square = 0.0263 Pseudo R²= 0.0166			
Number of times farmer demand for market information	Coefficient	Standard error	P-value
Age	-0.089	0.013	0.353
Gender	0.021**	0.065	0.038
Education	0.015*	0.014	0.053
Farm size	0.031**	0.015	0.039
Information search cost	0.015	0.069	0.241
Distance to source point	-0.013**	0.064	0.002
Tomato growers	0.006	0.065	0.930
Amaranth growers	-0.035	0.000	0.599
African eggplant growers	-0.143	0.029	0.025
Quantity of tomato produce	0.034	0.060	0.619
Quantity of amaranth produce	0.078	0.000	0.225
Quantity of african eggplant produced	0.071	0.125	0.274
Transportation cost	0.134	0.071	0.568
Income	0.065***	0.067	0.023
Group membership	0.056**	0.064	0.045
Extension services	-0.035	0.081	0.153
Cons	2.027***		0.000

Note: *, **, *** represents significance levels at 10%, 5% and 1% respectively

Gender played a significant role in information seeking behaviour. Result in Table 6 show that market information seeking behaviour was 0.021 units higher for males compared to females, while holding the other variables constant in the model. This indicates significant differences between gender and market information seeking behaviour at 5% level. Gender as a variable is

useful for better understanding the behaviour of seeking market information and may have important implications for information dissemination services and systems. Therefore males seek for more market information compared to females. This is due to the fact that more males are engaged in vegetable farming compared to females as seen from the previous result (Table 4). Male engaged more in vegetable production (Tomato, amaranth and African eggplant) due to high profit of the produce obtained at the market. Therefore by them engaging more in vegetable production increases their seeking behaviour for market information for the sake of avoiding market risk. Jela (2007) found that women have 30% time constraints than men (20%) in information seeking behaviour. In another study, Halder *et al.* (2010) observed significant differences in most of the domains of information seeking behaviour with respect to gender.

Besides, one year increase in farmers' education level increases seeking behaviour for market information by 0.015 units holding other factors constant. This means that education level influences agriculture market information seeking behaviour. Education increases the analytical ability of farmers to search and process different information received from any sources. Vegetable farmers who are educated are more likely to seek for market information. They are aware of the importance of market information to their vegetable growing/ farming activities. Therefore instead of waiting for provision of market information, they directly seek it from different sources using different channels. The findings are supported by, Gunawardana and Sharma (2007) who reported that there is association between level of education and information seeking behaviour of the respondents on improved farm practices in India. Educational level of the individual in Ethiopia is one of the important factors capacitating the individual to search, absorb and utilize new ideas and knowledge to be more productive (Nugusse, 2013). Therefore, it is assumed that the level of education attained by the vegetable farmers can enhance the seeking behaviour of agricultural market information.

Results on farm size indicate that a unit increase in the farm size increases number of times a farmer sought for market information by 0.031 units while holding other variables constant. Farmers with large farm size are more likely to seek market information in order to avoid risk of losing their produce since vegetables are highly perishable. Therefore, it can be drawn that farm size was positively associated with factors affecting market information seeking behavior of vegetable farmers. The larger the farm size the more output the farmer will produce. Thus leads farmers to seek for market information through engaging into different source/channels of agriculture information in order to increase the productivity of their farming lands and

avoiding marketing risk. These findings are in line with Thamuli and Kakati (1999), who reported that farm size was positively and significantly correlated with utilization of different information sources among dairy farmers in progressive villages.

Distance from the household to the point where the farmer gets market information has a significant effect on the number of times a farmer sought for market information. A one unit increase in distance (1km) to the source point decreases number of times a farmer sought for market information by 0.013 units. These results were significant at 5% significance level while holding other variables in the model constant (Table 6). This shows that the farmer will reduce the number of times he/she seeks for information mainly because of long distance he/she has to travel in order to access market information. Long distance to different source of market information affects farmers' income since they spend more resources such as time, labour and other expenses to access market information. This is supported by a study by Gadau and Edda (2013) who indicated that farmers are facing a problem of long distance to the market information source point which led to high cost incurred. In Babati, farmers were also located very far from the district market and thus it was difficult for them to access reliable market information.

Income is also another important factor influencing agricultural market information seeking behaviour of vegetable farmers. This study found that one unit increase in income (1TZS) increases number of times a farmer sought for market information by 0.065 units as indicated in Table 6. This means that there is a positive relationship between income and information seeking behaviour. This could be due to the fact that farmer with more farm income are more likely to invest more in agricultural activities such as seeking for market information. They are able to overcome cost for seeking market information from different sources. Hence an increase in income increases their interest to seek for market information. According to Tsega and Yemane, (2014) showed that there is a positive association between annual income and agricultural information seeking status of women farmers. Furthermore, in India Babu *et al.* (2011) also shows that, farmer with higher agricultural income has higher chance and capacity of seeking, accessing and applying market information. However Tuli (2016) is contrary with the results. He reports that there is a negative (inverse) relationship between annual income and agricultural information seeking status in Ethiopia.

Membership to a group has a positive influence on farmers' information seeking behaviour. Being a member in vegetable farmer organization increases information seeking behaviour by

0.056units at 5% significance level. Vegetable farmers are assured of getting information in their groups more often compared to non-members who have a low motive to seek for market information; this may be a result of relying on interpersonal sources that are easily available. Babu *et al.*(2011) reported that being a member of a farmer based organization led to increase in seeking market information due to interaction with farmers resulting in greater awareness of potential information sources. He further reported that membership to farmer-based organizations necessitated greater interaction with other farmers who had knowledge on other sources of information hence influencing them to access and use information.

4.5: Types of markets accessed through farmer organizations

Access to markets is a challenge for smallholder farmers in most of the rural areas. Farmer organizations are often seen as key factors in enhancing farmers' access to markets. They act as a bridge between farmers and buyers by linking farmers to different market outlets. Selling collectively reduces transaction cost to farmers during exchange and gives a higher bargaining power to negotiate for better market arrangements and prices.

Table 7: Types of market outlet accessed through farmer organizations

	Frequency	Percentage
Traders	33	28.2
Urban markets	39	33.3
Schools	11	9.4
Hospitals	6	5.1
Local open-air market	4	3.4
Food vendors	24	20.6
Total	117	100.0

From Table 7 six market outlets were considered to determine the types of markets accessed through farmer organizations. These were traders, urban markets, schools, hospitals, local open-air markets and food vendors. The results indicate that the type of market mostly accessed by vegetable growers through farmer organizations is urban market (33.3%), followed by traders (28.2%), food vendors “*mama-ntilie*” (20.6%), schools (9.4%), hospital (5.1%) and the least accessed market through farmer groups is local open-air market (3.4%). Farmer organizations in Babati assisted farmers to access markets which offer better price and fair room of negotiation during the exchange. Before accessing markets farmer organizations provide producer-customer interaction and skills to participating member farmers. These help members

to discuss which market will be profitable to access. It was noted that farmer organization do not prefer much to sell their produce in hospitals and local open air market due to delay in payment and low price offered respectively.

4.6 The effect of access to market provided by farmer organizations on small holder vegetable farmer's income

Propensity score matching model was used to address this objective where income was used as the dependent variable. This procedure helps us to check the overall robustness of the study's findings and it can also control household level unobserved self-selection biases.

4.6.1 Propensity Score Matching

As explained in the methodology section, the first step of the econometric approach is to estimate the propensity score that is the probability of vegetable market access conditional on observable variables. To generate the propensity scores for the matching process, the probability of vegetable smallholder farmer to access a market provided by farmer group was estimated using the logit model. The dependent variable was market access whereby farmers who are in groups are the ones who access the market. The independent variables included in the model were gender, education, household size, farm size, tomatoes grower, amaranth grower, African eggplant, tomato price, amaranth price, african eggplant price, market information, frequency of transaction for tomatoes, frequency of transaction for amaranth, frequency of transaction of African eggplant, distance to the market, transportation cost, quantity of tomatoes supplied, quantity of amaranth supplied and quantity of african eggplant supplied.

Before proceeding to impact estimation, Variance Inflation Factor (VIF) was used to test for the presence of strong multicollinearity problem among the continuous explanatory variables (see Appendix 3). Moreover, by using contingency coefficients multicollinearity between discrete variables was checked (Appendix 4). There was no explanatory variable dropped from the estimated model since no serious problem of multicollinearity was detected from the VIF results.

The estimation results are presented in (Table 8) below. To identify the factors that affect market access of smallholder vegetable farmers in the study area, the logit model was used to generate propensity scores for the matching algorithm. The model has a pseudo R-square of 0.414. This indicates that about 41.4% of the variation in the market access model can be explained through the included explanatory variables. The overall model is statistically

significant at a p-value of 0.086. Hence, the chosen observable variables adequately explain the probability of market access.

The logit estimates indicate that gender positively and significantly affects the likelihood of market access by 10%. The male-headed households had a higher probability of market access than females by 2.9%. This implies that by being a male household head is more likely to increase the probability of vegetable market access through participation. In most cases it is the males in a family who make the decisions on whether to sell vegetables or not. This means that females are less likely to access the market in the whole process of selling vegetables. Holden *et al.* (1998) found that gender (male) positively and significantly affects smallholders' likelihood to access markets in developing countries. Also the study done by Vigneri and Hill (2014) showed that women rarely had similar access to assets and markets as men, which led to different levels of participation in cash crop markets in Sub-Saharan Africa.

The results in Table 8 reveal that an increase in farm size by one acre increased the likelihood of accessing the market by 24.1%. The results were statistically significant at the 1% level. Thus as farm size increases, the probability for market access increases. More farm land often implies more output and this can positively affect farm income leading to higher household income. According to Mahmudul (2003) farm size has a significantly positive effect on income. In addition Parvin (2012) reports that an increase in farm size, the total income would also increase. It implies that holding all other variables constant, one unit increase in farm size would lead to an increase in the household's farm income by 0.275 units. Martey *et al.* (2012) opined that farm size influences the level of agricultural commercialization in a study in Ghana. This study corroborates their result.

A unit increase in market information increases the likelihood of farmers' market access by 4.1% at the 10% significant level (Table 8), implying that vegetable farmers who have access to market information are likely to access the market. Perhaps this might be because access to market information helps in planning the marketing process of any farm business. It helps farmers to analyze the market situation especially with respect to prices and level of demand for their produce hence most likely reduces the risk of having unsold produce or selling at undesirable prices which has implications on profitability. Agricultural market information enhances market performance by improving farmers' knowledge through providing assistance in planning production to meet market demand and negotiate better on market prices hence contribute to

their income (Magesa *et al.*, 2014). According to Eskola (2005), the availability of market information is found to be significant factor in households' degree of commercialization. The statistical significance implies that access to market information matters to smallholder farmer since it brings awareness of the current market situation. Hence, assist farmer in planning production to meet market demand and negotiate better on prices traders.

From the fact that most of the farms are distant from the place where goods and services are exchanged, it was expected that the variable, distance to the market, could play an important role in determining market access by the farmers. A unit increase in distance by one kilometre decreases the likelihood of market access by 5.8%. The coefficient of the variable "distance to the market" was found to be negatively significant (1%) to market access. This could be because distance to the market increases the cost of inputs, transportation costs and reduces the effective price farmers receive for outputs. Households that were far from the market were less likely to produce vegetables for sale and more likely to produce vegetables for their own consumption. The longer the distance to the market place from a farmer's premises, the more difficult and costly it will be to access market. This is because of the existence of transaction costs which lower the effective price received by a farmer (seller) and perish-ability nature of the produce, thus discouraging the farmer from accessing the market. However, 11% and 58% of Babati vegetable farmers are in contract farming and farmers groups respectively which act as a way to minimise the risk of travelling long distances to access the market.

These findings concur with those of Bwalya *et al.* (2013) and Sebatta *et al.* (2014) in Zambia and Nigeria who found that, distance to the market was negatively related to the farmers' market access in the maize and potato markets respectively. Also the study done by Buckmaster (2012) show that as distance to the market increases, the probability of fruit and vegetable production for consumption increases and decrease the probability of fruit and vegetable production for sale at market. Additionally, Makhura *et al.* (2004) in South Africa reported that the distance from the maize farm to the market place was negatively correlated to market access resulting to reduction in sales of produce.

Table 8: Marginal effects of Logit estimation results of propensity scores for vegetable market access

Number of observations = 250
Log likelihood= -133.261
Prob> Chi² = 0.086

Pseudo-R²= 0.414			
Variable	Marginal effect (dy/dx)	Standard error	P-value
Gender	0.029*	0.056	0.091
Education	0.035	0.010	0.603
Household size	-0.001	0.000	0.760
Farm size	0.241***	0.097	0.012
Extension services	0.652	0.080	0.930
Price of tomato	-0.021	0.018	0.228
Price of amaranth	-1.311	0.000	0.944
Price of african eggplant	9.206	0.000	0.527
Market information	0.041*	0.000	0.082
Frequency of transaction for Tomato	0.024	0.203	0.723
Frequency of transaction for Amaranth	-0.011	0.012	0.381
Frequency of transaction for African eggplant	-0.05	0.078	0.488
Distance	0.078***	0.070	0.047
Transportation cost	0.116	0.058	0.267
Quantity of tomato supplied	0.049	0.063	0.438
Quantity of amaranth supplied	0.044	0.014	0.145
Quantity of african eggplant supplied	0.003	0.000	0.723
Tomato growers	0.071	0.034	0.281
Amaranth growers	0.182	-0.320	0.488
African eggplant growers	0.062	0.283	0.426

Note: *, **, *** represents significance levels at 10%, 5% and 1% respectively

4.6.2 Matching households market access (with group) and market access (without group)

Figure 3 below shows the distribution of households with respect to the estimated propensity scores. In case of treatment households, most of them were found partly in the middle and partly on the left side of the distribution. On the other hand, most of the control households were partly found on the centre and partly in the left side of the distribution. Therefore the overlap of the distribution of the propensity scores across households accessing market through farmer organization (treatment) and those who don't access market through farmer organizations (comparison groups) found the extent of overlap to be satisfactory. The households' off-support regions were not included in the matching processes. The exemption of these households has minimal effect on reliability of the matching results. In fact the common support provides adequate sample for estimating the PSM effect parameter.

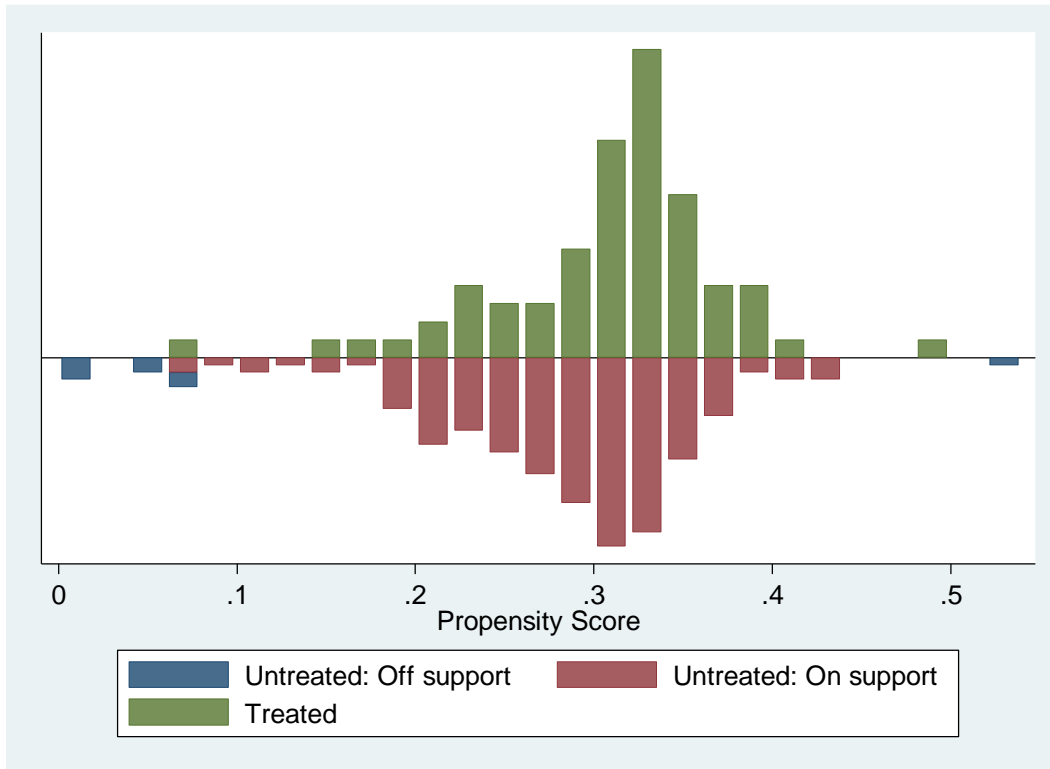


Figure 5: Propensity score distribution and common support for propensity score estimation.

In Figure 5, treated on support indicates the observations in the market access group that have a suitable comparison. Treated off support indicates the observations in the market access group that do not have a suitable comparison.

4.6.3 Choice of matching algorithm

Matching estimators were tried in matching the treatment and control of the households in the common support region. The final choice of a matching estimator was guided by different criteria such as equal means test referred to as the balancing test, pseudo- R^2 and matched sample size. A matching estimator which balances all explanatory variables that results in insignificant mean differences between the two groups, bears a low pseudo R^2 value and results in large matched sample size is preferable.

Table 9 shows the estimated results of tests of matching quality. After evaluating the results, it was found that kernel matching with a band width of 0.50 is the best estimator for the data at hand. This is because kernel matching has advantage of lower pseudo R^2 (0.006) and large sample size which is large compared to other matching method.

Table 9: Performance of different matching estimators

Matching estimator	Performance criteria		
	Balancing test	Pseudo-R ²	Matched sample size
NN			
NN(1)	6	0.019	70
NN(2)	4	0.025	70
NN(3)	4	0.058	70
Radius Caliper			
0.01	3	0.007	58
0.25	5	0.021	70
0.50	4	0.035	70
Kernel			
Band width 0.01	6	0.039	70
Band width 0.25	6	0.012	70
Band width 0.50	7	0.006	70

4.6.4 Testing the balance of propensity score and covariates

After choosing the best performing matching algorithm the next task was to check the balancing of propensity score and covariate using different procedures by applying the selected matching algorithm (in our case kernel matching). As indicated earlier, the main purpose of the propensity score estimation is not to obtain a precise prediction of selection into treatment, but rather to balance the distributions of relevant variables in both groups. The balancing powers of the estimations are ascertained by considering different test methods such as the reduction in the mean standardized bias between the matched and unmatched farmers, equality of means using t-test and chi-square test for joint significance for the variables used.

The mean standardized bias before and after matching are shown in the fifth column of Table 10, while column six reports the total bias reduction obtained by the matching procedure. In the present matching models, the standardized difference in X before matching is in the range of 0.6% and 7.3% in absolute value. After matching, the remaining standardized difference of X for almost all covariates lie between 0.1% and 5.5%, which is below the critical level of 20% suggested by Rosenbaum and Rubin (1985). In all cases, it is evident that sample differences in the unmatched data significantly exceed those in the samples of matched cases. The process of matching thus creates a high degree of covariate balance between the treatment and control samples that are ready to use in the estimation procedure. Similarly, t-values in Table 10 show that before matching half of chosen variables exhibited statistically significant differences while after matching all of the covariates are balanced.

Table 10: Propensity score, covariate balance and chi-square test for the joint significance of variables

Variables	Unmatched		% bias	t-value	Matched		% bias	t-value
	Treated	Control			Treated	Control		
Gender	0.650	0.760	0.7	0.08***	0.650	0.711	0.6	1.25
Education	6.8	6.96	-6.9	0.52	6.8	6.896	4.1	-0.24
Household size	5.333	6.356	5.8	-0.15	5.333	5.570	5.5	0.62
Farm size	0.517	0.537	-4.9	-0.35	0.517	0.508	2.4	0.15
Tomato price	345	414	-11.7	-0.81	345	339.43	0.9	0.06
Extension services	7.21	6.13	-2.3	-1.05	7.21	5.72	0.2	0.26
Amaranth price	53.846	64.143	-0.2	-0.31	53.846	58.984	0.5	0.08
African eggplant price	63.286	64.143	-0.3	-0.02	63.286	60.931	0.9	0.05
Market information	0.171	0.578	-1.7	-2.83**	0.171	0.391	0.8	0.04
Distance	0.576	0.917	-16.9	1.15	0.576	0.625	-2.4	-0.18
Transportation cost	1057.1	1048.6	0.6	0.04	1057.1	1054	0.2	0.01
Quantity of tomato supplied	826.2	745.02	3.5	0.30	826.2	784.78	1.8	0.11
Quantity of amaranth supplied	91.614	568.32	-17.4	-1.03	91.614	87.526	0.1	0.11
Quantity of African eggplant supplied	133.1	174.73	-5.5	0.35	133.1	113.78	2.6	0.21
Tomato grower	0.686	.651	7.3	0.51	0.686	0.683	0.5	0.03
Amaranth grower	0.529	0.537	-1.7		0.529	0.504	4.7	0.28
African eggplant grower	0.343	0.326	3.6	-0.12	0.343	0.329	2.9	0.17
PseudoR ²	0.031				0.001			
LR chi ²	9.07				1.27			
p>chi ²					1.000			

Note: *, **, *** represents significance levels at 10%, 5% and 1% respectively

The low pseudo-R² and the insignificant likelihood ratio tests support the hypothesis that both groups have the same distribution in covariates X after matching (see Table 10). These results clearly show that the matching procedure is able to balance the characteristics in the treated and the matched comparison groups. The results were used to determine the effect of market access on farm income. For details of Chi square test for joint significance for the three different matching algorithms (see Appendix 5). All of the above tests suggest that the matching algorithm chosen was relatively the best with the data at hand.

4.6.5 Effect of market access on smallholder vegetable farmers' income

The effect of market access provided by farmer organization on vegetable farmers' income was estimated using Average Treatment effect. To compute the ATT, three alternative matching methods (nearest neighbour matching, radius matching and kernel matching) were used (see

Table 11).The focus is on the effect of group members' income.Analysis was based on implementation of common support so that the distributions of treated and non-treated units were located in the same domain. The results show that there is a significant positive treatment effect on the treated 96,219.984 TZS. That is income for group members is higher than that of control group. Farmers who had access to the market provided by farmer organization have more income (501,691.413 TZS) than non member (405,471.429 TZS), with t value 1.15 at 10% significant level.

Therefore market access has positive effect on farm income of vegetable farmers in the study area.This could be due to the fact that farmers who belonged to farm organizations are linked to better markets through farmer groups, hence result to higher market price that vegetables farmer receive when selling the produce. This could therefore enable farmer to produce more due to market assurance.These results are similar to results by Bachke (2007) who found that farmers' organizations do contribute significantly towards higher income. Thus, farmers' organizations are a good tool to enhance small-scale farmers' welfare. In addition, Tolno *et al.* (2015) report that, group membership has thepotential to benefit farmers by increasing their incomes and that farmer organizations provide a good platformfor the provision of farm production inputs and marketing of output; this can immensely enhance farmproductivity and increase farm income thereby contributing to the reduction of poverty.

Table 11: Average Treatment Effect for smallholder vegetable farmers' income (TZS)

Matching algorithm	Treated	Control	Difference	Standard Error ^a	t-statistic
Nearestneighbour					
Matching	465428.571	384166.281	81262.290	105221.321	0.57
Radius matching	501691.413	402453.236	99238.177	83514.783	1.11*
Kernel matching	501691.413	405471.429	96219.984	83351.677	1.15*

Note: * represent significance level at 10%.

4.6.6 Sensitivity analysis of the evaluation results

Mhbounds was used to compute Mantel-Haenszel bounds to check sensitivity of estimated average treatment effects and critical hidden bias (Table 12). The different level of bounds tells us at which degree of unobserved positive or negative selection the effect would become significant. The Q_{mh}^+ statistic adjusts the MH (Mantel-Haenszel) statistic upward for the case of positive (unobserved) selection while Q_{mh}^- statistic adjusts the MH statistic downward for the case of negative (unobserved) selection.

From the results, under the assumption of no hidden bias ($\Gamma = 1$), the Q_{mh}^+ and Q_{mh}^- test statistic gave a similar result, indicating a significant treatment effect. This was also the case for the different bound of odds of differential assignment due to unobserved factors. The positive values of Q_{mh}^+ therefore indicated positive selection bias where the market participants tend to have higher income. This bias was however not significant at different bound levels both for likely underestimation of the treatment effects and overestimation of the treatment effects as indicated by p_{mh}^+ and p_{mh}^- values. Table 12 shows that critical level 1.05 (Γ) of hidden bias is insignificant going downwards. This implies that the study was insensitive to unobserved selection bias that will double or triple the odds of change in vegetable farm income. As such it was concluded that the effect estimates (ATT) are free from endogeneity problem and has presented estimates effect on farm income.

Table 12: Result of sensitivity analysis using mh bounding approach

Gamma(Γ)	Q_mh ⁺	Q_mh ⁻	p_mh ⁺	p_mh ⁻
1	0.000	0.000	0.000	0.000
1.05	-0.071	-0.071	0.528	0.528
1.1	-0.071	-0.071	0.528	0.528
1.15	-0.071	-0.071	0.528	0.528
1.2	-0.071	-0.071	0.528	0.528
1.25	-0.071	-0.071	0.528	0.528
1.3	0.325	0.325	0.325	0.325
1.35	-0.071	-0.071	0.528	0.528
1.4	0.325	-0.071	0.325	0.325
1.45	0.325	0.325	0.325	0.528
1.5	-0.071	-0.071	0.528	0.528

Gamma: odds of differential assignment due to unobserved factors; Q_mh⁺: Mantel-Haenszel statistic (assumption: overestimation of treatment effect); Q_mh⁻: Mantel-Haenszel statistic (assumption: underestimation of treatment effect); p_mh⁺: significance level (assumption: overestimation of treatment effect); p_mh⁻: significance level (assumption: underestimation of treatment effect).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The aim of this study was to determine the influence of farmer organizations as a market information system on market access and income of smallholder vegetable farmers in Babati district. Specifically, it focused on determining types of market information accessed by farmers through farmer organizations, factors influencing market information seeking behaviour and determining the effect of access to market provided by farmer organizations on income.

Data were collected using multistage sampling technique where by 250 smallholders vegetable farmers were interviewed using structured questionnaire. The study had employed descriptive statistic to analyze types of market information accessed by farmers through farmer organization. *Chi-square* and T-test were used in the socio-economic characteristics of smallholder vegetable farmers. To determine factors influencing market information seeking behaviour, the Poisson regression model was used. Propensity Score Matching was used to determine the effect of market access provided by farmer organizations on income.

Agricultural market information that farmer accessed from farmer organization were determined; whereby the findings shows that, types of markets (29%) is the major market information vegetables farmers accessed from farmer organizations followed by market trend (9%), market price (7%) and sales time (1%). The results also revealed that gender, education, farm size, income and group membership were significantly influencing number of times a farmer sought for market information, while distance to the source point decreases number of times a farmer sought for agricultural market information. Lastly the study found that farmers who had access to the market provided by farmer organization have more income (501691.413 TZS) than non member (405471.429 TZS). This is due to the fact that vegetable farmers who belonged in farm organization are linked to better markets through farmer groups. This motivates farmer to produce at large, selling at higher market prices and hence increase their farm income.

5.2 Conclusions

Types of markets is the major market information vegetables farmers accessed more from farmer organizations followed by market trend, market price, sales time and quantity

demand. However vegetable members are still complaining about the role of farmer organizations in disseminating market information at the right time. As indicated in the analysis that farmer organizations were not major source of market information to members rather they were proactive in their community delivery and communal access to training and provision of inputs for agriculture production. This led vegetable farmers to rely on other sources of market information.

The study found that number of times vegetable farmers demand for agricultural market information is strong influenced by socio economic characteristics of vegetable farmers. The results indicate that gender, education, farm size, income and group membership have positive significant influence on vegetable farmer information seeking behaviour, while distance has negative significant influence on vegetable farmers' seeking behaviour. Therefore agricultural market information seeking behaviour was influenced by socio economic characteristics of vegetable farmers.

Vegetable farmers in groups were benefiting more in vegetable farming since they can access market hence higher farm income. Despite the fact that vegetable farmer who belonged to a group were fewer than those who did not belong to a vegetable growers group still the analysis indicates that vegetable farmers who are in groups earn better income than non-members. Group membership has the potential to benefit farmers by increasing their incomes and that farmer organizations provide a good platform for the provision of farm production inputs and marketing of output; this can immensely enhance farm productivity and increase farm income thereby contributing to the reduction of poverty. Therefore farmer organization can be an important pathway for smallholder vegetable farmers in Babati to increase their farm income.

5.3 Policy recommendations

Farmer organizations play an important role in dissemination of agricultural market information and market access. It provides services to Babati smallholder vegetable farmers in different aspects concerning agricultural development such as: Providing market information, providing marketing skills, linking farmers to cooperatives and market access. These have resulted to improve livelihood of smallholder vegetable farmers. In this regards the following recommendations can be made:

Government should develop strategies that give more priority to farmer organization. This is by facilitating and promoting the formation of farmer groups as institution vehicle where farmer

can access accurate agricultural market information at the right time. Also the existing farmer organization need to source different types of market information which will be available when needed by smallholder vegetable farmers.

Furthermore, in order to influence market information seeking behaviour of vegetable farmers, interaction between farmer organization as source of market information and vegetable farmers is highly recommended. And in order to be effective, farmer organizations should know farmer market information needs. This will reduce number of sources of market information needed to access and also reducing the time and effort the farmer had to spend on market information seeking behaviour. Farmer may lack motivation and interest in agriculture but by improving the timely delivery and reliability of market information at the farmer organizations will encourage small landholder vegetable farmers to improve their market information search strategies and consequently could have important farm outcomes.

There is need o establish policies that will strengthen farmer organizations' capacity in sourcing, disseminating agricultural market information and market access. A strong farm organization which effectively plays its roles will motivate other farmers to join groups. Collective action is also encouraged because it strengthens smallholders' market position and bargaining power. Thus, through farmer organizations, smallholder vegetable farmer will be able to improve product quality, quantity, ensuring market availability and increased household incomes while reducing rural poverty.

5.4 Area of further research

This study focused more on types of market information, farmer information seeking behaviour and the influence of farmer organization on market access and income. Further research is therefore proposed on:

An analysis of constraints facing farmer organizations in sourcing different agricultural market information in Babati district, Tanzania.

REFERENCE

- Aker, J. (2010). Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger. *American Economic Journal: Applied Economics*, 2(3), 46-59.
- Al-Hassan, R. M., Sarpong, D. B., and Mensah-Bonsu, A. (2006). *Linking smallholders to markets*. International Food Policy Research Institute, Ghana Strategy Support Program.
- Anastasios, M., Koutsouris, A., and Konstadinos, M. (2010). Information and communication technologies as agricultural extension tools: a survey among farmers in west Macedonia, Greece. *The Journal of Agricultural Education and Extension*, 16(3), 249-263.
- Antwi, M., and Seahlodi, P. (2011). Marketing constraints facing emerging small-scale pig farmers in Gauteng province, South Africa. *Journal of Human Ecology*, 36(1), 37-42.
- Asfaw, S., Kassie, M., Simtowe, F., and Lipper, L. (2012). Poverty reduction effects of agricultural technology adoption: a micro-evidence from rural Tanzania. *Journal of Development Studies*, 48(9), 1288-1305.
- Ashimogo, G., Mbiha, E., Nyange D., and Temu, A. (2001). A Review of Agricultural Marketing Information Services in Tanzania, The Changing Role of Market Information System. *FOODNET Project*.
- Assael, H. (1998). Consumer behaviour and marketing action, South-Western College Pub. *Atilgan, E*, 237-248.
- Babatunde, R.O., Omotosho, O.A., Ololunsanya, E. O., and Owoloki, G. M. (2008). Determinants of vulnerability to food insecurity: A gender analysis of farming household in Nigeria. *Journal of Agricultural Economics*, 63(1), 116 – 125.
- Babu, S. C., Glendenning, C. J., Asenso-Okyere, K., and Govindarajan, S. K. (2011). Farmers' Information Needs and Search Behaviors. *International Food Policy Research Institute, Paper, 1165*, 1-37.
- Bachke, M. E. (2009). Are farmers' organizations a good tool to improve small-scale farmers' welfare?
- Balarane A., and Oladele O. (2012). Awareness and use of agricultural market information among small scale farmers in Ngaka-Modiri-Molema District of North West Province. *Life Science Journal*, 9(3), 57 – 62.

- Barham J., and Chitemi C. (2009). Collective action initiatives to improve marketing performance: Lessons from farmer groups in Tanzania. *Journal of Food Policy*, 34, 53–59.
- Barrett, C. B. (2005). Rural poverty dynamics: development policy implications. *Agricultural Economics*, 32(s1), 45-60.
- Batchelor, S., Scott, N., and Eastwick, G. (2005). Community television for the poor: a scoping study, available at: http://www.tv4d.org/commtele_final_report_vs_97.pdf (accessed 12 June 2010).
- Becker, S.O., and Caliendo, M. (2007). Sensitivity analysis for average treatment effects. *Stata Journal*, 7(1), 71-83.
- Becker, S. O., and Ichino, A. (2002). Estimation of average treatment effects based on propensity scores. *The stata journal*, 2(4), 358-377.
- Buckmaster, A.D. (2012). Going the Distance: The Impact of Distance to Market on Smallholders Crop and Technology Choices. An unpublished Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University.
- Bwalya, R., Mugisha, J., and Hyuha, J. (2013). Transaction Costs and Smallholder household access to Maize markets in Zambia. *Journal of Development and Agricultural Economics*, 8(9), 328– 336.
- Bzugu, P. M., Gwary, M. M., and Idrisa, Y. L. (2005). Impact of extension services on rural poverty alleviation among farmers in Askira Local Government Area, Borno State. *Sahel analyst*, 7(1-2), 94-102.
- Caliendo, M., and Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys*, 22, 31-72.
- Carter, B., and Batte, M. (1993). Identifying needs and audiences in farm management outreach education. *Review of Agricultural Economics*, 15(3), 403-415.
- Dillon, A. (2011). The Effect of Irrigation on Poverty Reduction, Asset Accumulation, and Informal Insurance: Evidence from Northern Mali, *World Development*, 39, 2165–2175.
- DiPrete, T. A., and Gangl, M. (2004). Assessing bias in the estimation of causal effects: Rosenbaum bounds on matching estimators and instrumental variables estimation with imperfect instruments. *Sociological methodology*, 34(1), 271-310.

- Dolan, C., and Humphrey, J. (2000). Governance and Trade in Fresh Vegetables: The Impact of UK Supermarkets on the African Horticulture Industry, *Journal of Development Studies*, 37(2), 147-176.
- Dorward, A., Kydd, J., Morrison, J. and Urey, I. (2004), A policy agenda for pro-poor agricultural growth, *World Development*,32(1), 73-89.
- Duvendack, M., and Palmer-Jones, R. (2011). High Noon for Microfinance Impact Evaluations: Re-investigating the Evidence from Bangladesh. MPRA Paper No. 27902, University of East Anglia, Norwich, UK.
- Economic Commission for Africa (2004).Africa Review Report on Agriculture and Rural Development.*Fifth Meeting of the Africa Committee on Sustainable Development, Addis Ababa 22- 25 October.*
- Ellis, F. and Godfrey B. (2003).Livelihoods and rural poverty reduction in Uganda.*World Development*, 31(6), 997-1013.
- Engle, L.M., and Altoveros, N. (2000).Collection, conservation and utilization of indigenous vegetables.Proceeding of a work shop AVRDC, Shanhua, Tainan, Taiwan, 16-18. August 1999. Shanhua.Asian Vegetable Research and Development Centre.
- Eskola, E. (2005). *Commercialisation and poverty in Tanzania: Household-level analysis* (No. 05-27).
- Food and Agriculture Organization of the United Nations.(2017). FAOSTAT statistics database.Retrieved from www.faostat.com
- Fischer, E., and Qaim, M. (2012).Linking smallholders to markets: Determinants and impact of farmer collection action in Kenya.*World Development*, 40(6), 1255-1268.
- Gadau, L. N., and Edda T. L. (2013).Information seeking behavior of physicians in Tanzania.*Information Development*,29(2), 172-182.
- Gibbon, J. and M.F. Warren, (1991).Barriers toAdoption of on-farm Computers in England. *Farm Management*, 8(1), 7-15.
- Gujarati, D. (1992). *Essentials of Econometrics*. McGraw–Hill, New York.
- Gujarati, D.N., (2005). *Basic Econometrics*, (4th edition). New Delhi, India: Tata McGrwa-Hall.
- Gunawardana,A.M.A. P. G., and Sharma V.P. (2007).Personal Characteristics of Farmers Affecting the Information Seeking Behaviour on Improved Agricultural Practices in Udaipur District Rajasthan, India. *Tropical Agricultural Research*, 19, 359 – 366.

- Halder, S., Ray, A., and Chakrabarty, P. K. (2010). Gender differences in information seeking behavior in three universities in West Bengal, India. *The International Information & Library Review*, 42(4), 242-251.
- Heckman, J., Ichimura, H., and Todd, P. (1998). Matching as an econometric evaluation estimator. *Review of Economic Studies*, 65, 261-294.
- Helen Keller International (HKI). (2004). *Improving nutrition and food security through homestead food production in Bangladesh*. Intl Food Policy Res Inst.
- Helen Keller International, Bangladesh. 2006. Improving nutrition and food security through homestead food production in the riverine islands and floodplains of Bangladesh (HKI Char Project 2). Progress Report for project BAN-501107-0006006, July–December 2005. Helen Keller Worldwide, New York
- Helen, D., Franck, G., Federic, L., Johny, E., and Gerdien, M. (2011). Market Information System: Using information to improve farmers' market power and farmers organizations' voice. Policy brief- ESFIM, 7.
- Hillbur, P. (2013). The Africa Research In Sustainable Intensification in the Next Generation research sites in Tanzania: Opportunities and challenges to sustainable intensification and institutional innovation.
- Holden, S. T., and Binswanger, H. P. (1998). Small-farmer decision making, market imperfections, and natural resource management in developing countries. *Agriculture and the environment: perspectives on sustainable rural development*, 50-71.
- Horticulture Development Council of Tanzania (2010). Tanzania horticultural development strategy 2012-2010.
- Household Budget Survey (HBC), (2007). Available at www.nbs.go.tz/HBS/Main_Report_2007.htm.
- Hugo, S., Squalli, J., and Wilson, K. (2006). What Explains Market Access? Working Paper No. 06-08.
- Ichino A, Mealli F., and Nannicini T. (2008). From temporary help jobs to permanent employment: What can we learn from matching estimators and their sensitivity? *Journal of Applied Econometrics*. 23, 305–327.
- Jagwe, J. N. (2011). *The impact of transaction costs on the participation of smallholder farmers and intermediaries in the banana markets of Burundi, Democratic Republic of Congo and Rwanda* (Doctoral dissertation).

- Jaleta, M., Gebremedhin, B., and Hoekstra, D. (2009). Smallholder commercialization: Processes, determinants and impact.
- Jha, P. K., and Chauhan, J. P. S. (1999). Correlates of interpersonal communication behavior of dairy farmers. *J. Dairying, Foods and Home Sci*, 18(1), 55-57.
- Kaganzi, E., Ferris, S., Barham, J., Abenakyo, A., Sanginga, P., and Njuki, J. (2009). Sustaining linkages to high value markets through collective action in Uganda. *Food policy*, 34(1), 23-30.
- Kalusopa, T. (2005). The Challenges of Utilizing Information Communication Technologies (ICTs) for the Small-Scale Farmers in Zambia. *Library High Technology*, 23(3), 414-424.
- Kamba, M. A. (2009). Access to information: The dilemma for rural community development in Africa. Georgia Institute of Technology.
- Kariuki, G., and Place, F. (2005). Initiatives for rural development through collective action: The case of household participation in group activities in the highlands of central Kenya. CAPRI Working Paper No. 43. Washington D.C.: International Food and Policy Research Institute.
- Key, N., Sadoulet, E., and Janvry, A. (2000). Transaction Cost and Agricultural Household Supply Response. *American Journal of Agricultural Economics*, 82(1), 245–259.
- Kherallah, M., Delgado, C. L., Gabre-Madhin, E., Minot, N., and Johnson, M. (2000). *The road half traveled: Agricultural market reform in Sub-Saharan Africa*. Intl Food Policy Res Inst.
- Kilima, F., Chung, C., Kenkel, P. and Mbiha E. (2007). Impacts of Market Reform on Spatial Volatility of Maize Prices in Tanzania. *Journal of Agricultural Economics*, 59(2), 257-270.
- Kimaro, A. E. (2013). *The role of NGOs in lobbying and advocacy for market access by smallholder farmers: a case of Mkuranga district* (Doctoral dissertation).
- Korir, H.C., Lagat, J.K., Mutai, M.C. and Ali, W.O. (2015). Influence of Social Capital on Producer Groups' Performance and Market Access Amongst Smallholder French beans Farmers in Kirinyaga County, Kenya. *Journal of Economics and Sustainable Development*, 6(2).
- Llewellyn, R. S. (2007). Information quality and effectiveness for more rapid adoption decisions by farmers. *Field Crops Research*, 104(1), 148-156.
- Löfstrand, F. (2005). *Conservation agriculture in Babati District, Tanzania* (Doctoral dissertation, slu).

- Lokshin, M., and Sajaia, Z. (2011). Impact of interventions on discrete outcomes: Maximum likelihood estimation of the binary choice models with binary endogenous regressors. *Stata Journal*, 11(3), 368–385.
- Longenecker, J., Petty, C., Moore, J., and Palich, L. (2006). *Small Business Management: An entrepreneurial emphasis*. London: Thomson South Western.
- Lundy, M., OstertagGálvez, C. F., and Best, R. (2002). Value adding, agro-enterprise and poverty reduction: A territorial approach for rural business development. *Rural Agro-enterprise Development Project, Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia, South America*.
- Magesa, M. M., Michael, K., and Ko, J. (2014). Access to Agricultural Market Information by Rural Farmers in Tanzania. *International Journal of Information and Communication Technology Research*, 4(7), 264-273.
- Magnus H., Mats M., and Maureen M. (2010). What are innovative opportunities? *Industry and Innovation*, 14(1):27–45.
- Mangnus, E., and Piters, B. (2010). *Dealing with small scale producers: linking buyers and producers*. Royal tropical institute (KIT).
- Magnus, O.A., and Omanukwue P.N. (2009). Financial rural agriculture for sustainable development in Nigeria: The missing role of State. Proceedings of the Association of Nigeria, Dec. 14-17, Faculty of Agriculture, UsmanuDanfodiyo University, Sokoto, Nigeria, 769-769
- Mahmudul, H. A., Ishida, A., and Taniguchi, K. (2003). The role of farmers' education on income in Bangladesh. *Bulletin of Education and Research Centre for Lifelong Learning*. 29-35.
- Makhura M., Kirsten J. and Delgado C. (2004). Transaction Cost and Smallholder Participation in the Maize Market in the Limpopo Province of South Africa. In *Seventh Eastern and Southern African Regional Maize Conference*. Pretoria, 11-15 February.
- Makhura, M., Kirsten, J., and Delgado, C. (2001). Transaction costs and smallholder participation in the maize market in the Northern Province of South Africa. In *Seventh Eastern and Southern African Regional Maize Conference* (pp. 463-462).
- Mancur, O. (2009). *The logic of collective action* (Vol. 124). Harvard University Press.
- Markelova, H., and Mwangi, E. (2010). Collective action for smallholder market access: evidence and implications for Africa. *Review of policy research*, 27(5), 621-640.
- Marshall, G. (1988). *A dictionary of sociology*. New York: Oxford University Press.

- Martey, E., Al-Hassan, R., and Kuwornu, J. (2012). Commercialization of Smallholder Agriculture in Ghana: A Tobit regression analysis. *African Journal of Agricultural Research*, 7(14), 2131-2141.
- Martin, B. L. (2009). *Mobile phones and rural livelihoods: An exploration of mobile phone diffusion, uses, and perceived impacts of uses among small-to medium-size farm holders in Kamuli District, Uganda*. Iowa State University.
- Matsane, S.H., and Oyekale, A.S. (2014). Factor Affecting Marketing of Vegetables among Small-Scale Farmers in Mahikeng Local Municipality, North West Province, South Africa. *Mediterranean Journal of Social Science*, 5(20).
- Mburu, S., Ackello-Ogutu, C., and Mulwa, R. (2014). Analysis of economic efficiency and farm size: a case study of wheat farmers in Nakuru District, Kenya. *Economics Research International*, 2014
- Meinzen-Dick, R., Pandolfelli, L., Dohrn, S., and Athens, J. (2005). Gender and collective action: A conceptual framework for analysis. In *International research workshop on gender and collective action* (pp. 17-21).
- Mgeni, C.P., and Temu, A.E. (2010). Economic analysis of fresh fruit and vegetables export marketing channels by small scale farmer in Tanzania: The case of Meru district. *Tanzania Journal of Agricultural Science*, 10(1), 46-54.
- Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) (2010a) Agriculture for food and income security: Agriculture Sector Development Strategy and Investment Plan: 2010/11-2014/15. MAAIF, Kampala, Uganda.
- Mntambo, B. D. (2007). Socio-Economic, Institutional and Behavioural Determinants of Accessibility and Utilization of Agricultural Information by Women Farmers in Korogwe District. Sokoine University of Agriculture. Unpublished MA in Rural Development Dissertation
- Mohamed, F. A. S. (2004). Role of Agricultural Cooperatives in Agricultural Development—The Case of Menoufiya Governorate, Egypt. Unpublished PhD Thesis, Faculty of Land Development. Rheinischen Friedrich-Wilhelms University: Mansoura.
- Mooko, N. P. (2005). The information behaviors of rural women in Botswana. *Library and Information Science Research*, 27(1), 115-127.
- Mugenda, O., and Mugenda, G. (2003). *Research Methods: Quantitative and qualitative approaches*. Nairobi: Acts press.
- Mugenda, O.M., and Mugenda, A.G. (2003). *Research Methods, Quantitative and Qualitative Approaches*. ACT, Nairobi.

- Mukwevho R., and Anim, F.D.K (2014). Factors Affecting Small Scale Farmers in Accessing Markets: A Case Study of Cabbage Producers in the Vhembe District, Limpopo Province of South Africa. *Journal of Human Ecology*, 48(2), 219-225.
- Mwakaje A.G. (1999). Traders' Response to Traditional Agricultural Export Commodities Market Reform in Tanzania.A study of Contractual Arrangements in the Smallholder Coffee Industry in Rungwe Southwest Tanzania.Unpublished Ph.D. Dissertion, London University.
- Mwaura, F. M., Tungani, J. O., Sikuku, D., and Woomer, P. L. (2012). Acceptability of cereal banks as a marketing intervention among smallholders in western Kenya. *Outlook on Agriculture*, 41(1), 35-40.
- Mwaura, M., and Ngugi, K. (2014). Factors affecting performance of community-based organizations projects in Kisii County Kenya.*International Journal of Social Sciences Management and Entrepreneurship*, 1(2), 51- 67.
- Netherlands Enterprise Agency (2017).*HOLTICULTURE STUDY: Synthesis of phase one of the study on the sourcing of fruits and vegetables from Tanzania-Kenya*. Commission by the embassy of the Kingdom of Netherlands.
- Ngathou, I., Bukonya, J., and Chembezi, D. (2006).Managing agricultural risk: examining information sources preferred by limited resource farmers.*Journal of Extension*.44(6).
- Ngugi, I. K., Gitau, R., nadNyoro, J. (2007). Access to high value markets by smallholder farmers of African indigenous vegetables in Kenya.*Regoverning Markets Innovative Practice Series, IIED, London*.
- Okello, J. J., Ofwona-Adera, E., Mbatia, O. L., and Okello, R. M. (2010).Using ICT to integrate smallholder farmers into agricultural value Chain: The case of DrumNet project in Kenya.*International Journal of ICT Research and Development in Africa (IJICTRDA)*, 1(1), 23-37
- Olukosi, J. O., Isitor, S. U., and Ode, M. O. (2005). Introduction to Agricultural Marketing and Prices: Principles and Applications: Living Book Series Abuja.
- Parvin, M. T., and Akteruzzaman, M. (2013).Factors Affecting Farm and Non-Farm Income of Haor Inhabitants of Bangladesh.*Progressive Agriculture*, 23(1-2), 143-150.
- Pettigrew, K. E., Leckie, G. J., and Sylvain, C. (1996). Modeling the information seeking of professionals: A general model derived from research on engineers, health care professionals, and lawyers.*The Library Quarterly*, 66(2), 161-193.

- Pokhrel, D. M., and Thapa, G. B. (2007). Are marketing intermediaries exploiting mountain farmers in Nepal? A study based on market price, marketing margin and income distribution analyses. *Agricultural Systems*, 94(2), 151-164.
- Poulton, C, Dorward, A. and Kydd, J. (2005). The future of small farms: New directions for services, institutions and intermediations. *World Development*, 33(10), 1413-1428
- Rahman, S. (2010). Women's labour contribution to productivity and efficiency in agriculture: empirical evidence from Bangladesh. *Journal of Agricultural Economics*, 61(2), 318–342.
- Rezvanfer, A., and Uaisy, H. (2003). Communication behavior among farmers in east Azerbaijan province, Iran. *Journal of Science and Technology of Agriculture and Natural Resources*, 6(4).
- Rosenbaum, P. R. (2002). *Observational Studies*. 2nd edition. New York, NY: Springer.
- Rosenbaum, P., and Rubin, D. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects, *Biometrika*, 70, 41–50.
- Schnitkey, G., Batte, M., Jones, E., and Botomogno, J. (1992). Information preferences of Ohio commercial farmers: Implications for extension. *American Agricultural Economics Association*, 74, 486-497.
- Schultz, T.W. (1975). The Value of Ability to deal with disequilibria. *Journal of Economic Literature*. 13, 827-846.
- Sebatta, C., Mugisha, J., Katungi, E., Kashaaru, A. and Kyomugisha, H. (2014). Smallholder Farmers Decision and Level of Participation in the Potato Market in Uganda. *Modern Economy*, 5, 895-906.
- Shaun F., Peter R., Rupert B., Don S., Abbi B., Jeferson S. and Emily W. (2014). Linking smallholder farmer for markets and the implication for Extension and Advisory Services. MEAS discussion paper 4.
- Shepherd A.W. (2006). Approaches to Linking Producers to Markets: Enhancing Capacities of NGOs and Farmer Groups to Link Farmers to Markets, Bali, Indonesia. Paper FAO, Rome.
- Shepherd, A. W. (1997). *Market Information Services: Theory and Practice*, FAO Rome.
- Shepherd, A. W. (2000). Understanding and using market information. *Marketing Extension Guide (FAO)*.
- Sianesi, B. (2004). An Evaluation of the Active Labour Market Programmes in Sweden, *The Review of Economics and Statistics*, 86(1), 133–155.

- Skjöldevald, M. (2012). *Small scale farmers' access to and participation in markets – The case of P4P program in western Kenya*. Human Geography, advanced level, master thesis for master exam in Human Geography.
- Solano C., Leon, H., Perez, E., and Herrero, M. (2003). The role of personal information sources on the decision-making process of Costa Rican dairy farmers. *Agricultural Systems*, 76, 3-18.
- Staatz, J., Dembele, N., and Aldridge, K. (1992). The role of market information systems in strengthening food security: lessons from Mali. *Department of Agricultural Economics Staff Paper*, (92-60).
- Stockbridge M., (2003). Farmer organization for market access: learning for success. Literature review. London: Wye College.
- Sullumbe, I. M. (2004). *Resources use efficiency in cotton production under sole cropping system in Adamawa State of Nigeria* (Doctoral dissertation, A Dissertation submitted to the school of Post graduate studies Maiduguri, Nigeria).
- Svensson, J. and Yanagizawa, D. (2009). Getting Prices Right: The Impact of the Market Information Service in Uganda. *Journal of the European Economic Association*, 7(2-3), 435-445.
- Thamuli, U.R. and Kakati, H.N. (1999). Relationship between utilization of information sources and socio-economic and psychological characteristics of dairy farmers. *Rural India*. 62(7), 83.
- Tolno, E., Kobanashi, H., Lehizen, M., Esham, M., and Balde, B. (2015). Economic analysis of the Role of Farmer Organizations in Enhancing Smallholder potato Farmer's Income in Middle Guinea. *Journal of agricultural science*, 7(3), 123.
- Ton, G. (2008). Challenges for smallholder market access: a review of literature on institutional arrangements in collective marketing.
- Torero, M. (2011, January). A framework for linking small farmers to markets. In *IFAD Conference on New Directions for Smallholder Agriculture* (Vol. 24, p. 25)
- Tschirley, D. L., Diskin, P. K., Molla, D., and Clay, D. C. (1995). *Improving information and performance in grain marketing: An assessment of current market information systems, and recommendations for developing a public grain MIS* (No. 55590). Michigan State University, Department of Agricultural, Food, and Resource Economics.
- Tucker, M., and Napier, T. L. (2002). Preferred sources and channels of soil and water conservation information among farmers in three Midwestern US watersheds. *Agriculture, Ecosystems and Environment*, 92(2), 297-313.

- Tuli, M. (2016). *Agricultural Information Seeking Behavior of Women Farmers: The Case of Haramaya District, Eastern Hararge Zone, Oromiya Regional State, Ethiopia* (Doctoral dissertation, Haramaya University).
- Uchezuba, I. D., Moshabele, E., and Digopo, D. (2009). Logistical estimation of the probability of mainstream market participation among small-scale livestock farmers: a case study of the Northern Cape province. *Agrekon*, 48(2), 171-183.
- United Republic of Tanzania (URT) (2012). *Population and Housing Census*, National Bureau of Statistics, Dar es Salaam.
- URT (2013). *Population and housing census Tanzania*. The United Republic of Tanzania.
- Vigneri, M., and Hill, R. V. (2014). Mainstreaming gender sensitivity in cash crop market supply chains. In *Gender in Agriculture* (pp. 315-341). Springer Netherlands.
- Waller, B. E., Hoy, C. W., Henderson, J. L., Stinner, B., and Welty, C. (1998). Matching innovations with potential users, a case study of potato IPM practices. *Agriculture, ecosystems and environment*, 70(2), 203-215.
- Weinberger K., and Lumpkin T. (2007). Diversification into Horticulture and Poverty Reduction: A Research Agenda. *World Development*, 35(8), 1464–1480.
- Wildt, M.D., Elliott, D., and Hitchins, R. (2006). *Making Markets Work for the Poor: Comparative Approaches to Private Sector Development*, the Springfield Centre.
- Wilson, T. (1981). On user studies and information needs. *The Journal of Documentation*, 37(1), 3-15.
- Windapo, O., and Olowu, T. (2001). The Relationship Between Extension Agents “Personal and Job-Related Characteristics of Contact Farmers” Knowledge-Implication Accuracy of Maize and Cassava Technology in Oyo State. *Journal of Agricultural Extension*, 5, 36-44.
- Xaba, B. G., and Masuku, M. B. (2012). Factors affecting the choice of marketing channel by vegetable farmers in Swaziland. *Sustainable Agriculture Research*, 2(1), 112.
- Yang, D., and Liu, Z. (2012). Does farmer economic organization and agricultural specialization improve rural income? Evidence from China. *Economic Modelling*, 29(3), 990-993.

APPENDICES

Appendix 1: Goodness of fit results using poisgof command

Pearson goodness-of-fit	372.2161
Prob>chi2(250)	1.000

Appendix 2: Negative binomial using nbreg command

Likelihood-ratio test of alpha	0
chibar2(01)	0.00
Prob>=chibar2	1.000

Appendix 3: Multicollinearity test for continuous explanatory variables

Covariates	VIF
Tomatoes price	1.35
Amaranth price	1.10
African eggplant price	1.10
Farm size	1.32
Extension services	1.27
Frequency of transaction for tomatoes	1.24
Frequency of transaction for amaranth	1.20
Frequency of transaction for african eggplant	1.18
Quantity of tomatoes supplied	1.23
Quantity of amaranth supplied	1.03
Quantity of African eggplant supplied	1.11
Transportation cost	1.14
Distance to the market	1.10
Education	1.09
Household size	1.09
Mean VIF	1.16

Appendix 4: Contingency coefficient for discrete variables

Variable	VIF
Gender	1.08
Tomato grower	1.31
Amaranth grower	1.23
African eggplant grower	1.01
Mean VIF	1.16

Appendix 5: Joint significance test (likelihood ratio test)

Matching algorithms	Sample	Pseudo R2	LR chi2	p>chi2
	Unmatched	0.031	9.07	0.067
NN(1)	Matched	0.058	11.20	0.511
	Unmatched	0.031	9.07	0.067
NN(2)	Matched	0.019	3.66	0.989
	Unmatched	0.031	9.07	0.067
NN(3)	Matched	0.025	4.83	0.963
	Unmatched	0.031	9.07	0.067
Caliper (0.01)	Matched	0.007	1.39	0.043
	Unmatched	0.031	9.07	0.067
Caliper (0.25)	Matched	0.021	4.07	0.982
	Unmatched	0.031	9.07	0.067
Caliper (0.50)	Matched	0.035	6.83	0.869
	Unmatched	0.031	9.07	0.067
Kernel (0.01)	Matched	0.006	1.24	1.000
	Unmatched	0.031	9.07	0.067
Kernel (0.25)	Matched	0.012	2.36	0.999
	Unmatched	0.031	9.07	0.067
Kernel (0.50)	Matched	0.001	1.27	1.000

Appendix 6: Survey questionnaire

THE INFLUENCE OF FARMER ORGANIZATION AS MARKET INFORMATION SYSTEM ON MARKET ACCESS AND INCOME EARNING OPPORTUNITIES OF SMALLHOLDER VEGETABLE FARMERS IN BABATI DISTRICT, TANZANIA

You are one among several smallholder farmers under Africa RISING action research who have been selected for this study. The study aims determining types of market information accessed by smallholder vegetable farmer through farmer organization, factors influencing market information seeking behaviour and determining the effect of access to market provided by farmer organizations to smallholder vegetable farmer’s income in Babati district, Tanzania. The outcome will enhance knowledge on the role of Farmer Organization as an agent of market information system towards improving income earning opportunities of vegetable farmer’s.

The information you give will be very useful towards this end. Your identity however will be strictly confidential.

Questionnaire Number

Enumerator name.....

Date (day/month/year) ____/___/2016

SECTION A. DEMOGRAPHIC DETAILS

A.1. Name of respondent.....

A.2. Village: 1. Gallapo () 2. Matufa () 3. Bermi () 4. Seloto () 5. Babati town ()

A.3. District.....

A.4. Tel no. of respondent

A.5. Sex of the household head? 1. Male () 2. Female () (*Tick where appropriate*)

A.6. Household type (*Tick where appropriate*)

1. Nuclear	2. Extended	3. De jure female headed (widow, never married, divorced)	4. De facto female headed (husband absent)	5. Not yet married males	6. Do not know
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A.7. (a)

Respondent	Age (Years) (HH)	Marital Status(HH)	Educ. Level (HH)	Occupation
Position in the family	AGE	MRTS	EDL (YRS)	

Codes:

Position in the family: 1. Head 2. Wife 3. Grown up child 4. Relatives

4. Others (specify)

Marital status: 1. Married 2. Single 3. Divorced

4. Separated 5. Widowed

Age: 1. 18-38 years 2. 39- 59 years 3. Above 59 years

Occupation: 1. Farmer 2. Employed 3. Business person 4. Others, please specify

(b) If there is a partner in the household, please tick where appropriate (husband/ wife)

Partner	Age (Years) (HH)	Marital Status(HH)	Educ. Level (HH)	Occupation
Position in the family	AGE	MRTS	EDL (YRS)	

A.8.(a) Household size (*number of people living and eating together*)? 1. Men (adult)

2. Women (adult)..... 3. Children..... 4. Total

SECTION B. HOUSEHOLD ASSETS

B.1.(a) Which asset(s) do you own?

Bicycle	Motorbike	Phone	Television	Radio	Other (specify)

Codes: 1. Yes 2. No 3. Don't know/Missing

(b) Who is using the asset? (Tick where appropriate)

	Husband	Wife	Both	None	Not applicable
1. Bicycle					
2. Motorbike					
3. Phone					
4. Television					
5. Radio					
6. Other					

Codes: 1. Husband 2. Wife 3. Both 4. None 5. Not applicable

(c) Apart from that, is any other household member using the asset? Yes () No () Not applicable ()

(d) If yes, please specify:

	Other	Other
1. Bicycle		
2. Motorbike		
3. Phone		
4. Television		
5. Radio		
6. Other		

B.2.(a) Under which income class (Tanzanian shillings) do you fall for the past three seasons (in average)?

	No Income	<10,000	10,000 - 50,000	50,001 - 100,000	100,001 - 500,000	500,001 - 1,000,000	>1,000,000	Not applicable
Total								
Husband								
Wife								
Other								
If yes, Specify								

Codes: 1. No income 2. < 10,000 3. 10,000-50,000 4. 50,001-100,000 5. 100,001-500,000 6. 500,001-1,000,000 7. >1,000,000 8. Not applicable

(b) What is the major source of income in the course of last year? (Tick where appropriate)

	SOV	SOF	SONC	SOA	NSE	NFB	RI	PENS	REM
Household									
Husband									
Wife									
Other, please specify									

Abbreviations;

- 1.SOV: Sale of vegetable
- 2.SOF: Sale of other food crops
- 4.SOA: Sale of animal/animal produce
- 6.NFB:Non-farm business
- 9.REM:Remittances
- 3.SONC: Sale of non food cash crop
- 5.NSE:Non-farm salaried employment
- 7.RI: Rent, Interest
- 8.PENS: Pensions

(c) If it's SOV, how much income did you get for the past three seasons (in average).....?

- Codes:** 1. No income 2. < 10,000 3. 10,000- 4. 50,001- 5. 100,001-
50,000 100,000 500,000
6. 500,001- 7.>1,000,000 8. Not
1,000,000 applicable

SECTION C. VEGETABLE PRODUCTION AND MARKETING

C.1 (a) What is your total farm size?acres

(b) How do you categorize the ownership of the household land? (Tick where appropriate)

	Own	Rental	Community	Borrow	Other, please specify

Codes: 1= Own 2= Rental 3= Community 4= Borrow 5= Other

(c) Which household members hold a right on the land? 1. Husband () 2. Wife ()
3.Both () 4. Other (), please specify:

(d) Do you hold an official land title? 1. Yes () 2.No ()

- (e) If yes, whose name(s) is in the document? 1. Husband () 2. Wife () 3. Both ()
4. Other (), please specify:

C.2 (a) Which types of vegetable did you grow in the last season?

1. Tomatoes	2. Amaranth	3. African eggplant

Codes: 1= Yes 2= No 3= Don't know/missing

(b) What is your cultivated land area for vegetables (acres) in the last season?

1. Tomatoes	2. Amaranthus	3. African eggplant

(c) How many times in the last season, did you harvest?

	Once	Twice	Three times	More than three times
1. Tomatoes				
2. Amaranthus				
3. Africa eggplant				

Codes: 1= Once 2= Twice 3= Three times 4= More than three times

(d) Indicate the number of employees who assist with farm work

Type of employee	Full time	Casual (part time)	Family member	Total
Number				

(e) How does the household utilize vegetable produce? (Tick the appropriate)

Type of vegetable	Ways of utilization		Kg of vegetable produced
1. Tomatoes	Food		
	Selling		
	Others		
2. Amaranth	Food		
	Selling		
	Others		
3. African egg plant	Food		
	Selling		
	Others		

(f) Do you sell your vegetable produce?

1. Tomatoes	2. Amaranth	3. African Eggplant

Codes: 1. Yes 2. No 3. Don't know/Missing

(g) If No, give reasons

(h) If yes, which major market do you sell vegetables?

Type of vegetables	Farm gate	Village	Town
1. Tomatoes			
2. Amaranth			
3. African eggplant			

Codes: 1. Yes 2. No 3. Don't know/Missing

(i) What is the cost and price for vegetables?

Type of Vegetables	Farm gate ()				Village ()				Town ()				
	Low Season		High Season		Low Season		High Season		Low Season		High Season		
	Cost	Price/Kg	Cost	Price/Kg	Kg	Kg	Kg	Kg	Kg	Kg			
1. Tomatoes													
2. Amaranth													
3. African egg plant													

(j) Who determine the price of the vegetable? (Tick where appropriate)

	Middleman	Yourself	Customers	Others
1. Tomatoes				

2.Amaranth				
3.African eggplant				

Codes: 1= Yes 2= No 3= Don't know/Missing

(k)Do you sell your produce as a group? 1. Yes () 2.No ()

(l)If yes, how much return did you get in last season? (tsh)

C.3.How many years have you been marketing vegetables?

	Years
1.Tomatoes	
2.Amaranth	
3.African Eggplant	

C. 4 (a) How is your produce moved to the marketing point?

Type of transport				
1.Bicycle	2.Motorbike	3.Truck	4.Foot	5.Others (specify)

Codes: 1. Yes 2. No 3. Don't know/Missing

C.5How far is the marketing point from the farm? (Hrs)

C. 6How much do you pay for a single trip to the market? (Tshs)

C. 7 How many times do you sales the produce on the market in the last season?

	Once	Twice	Three times	More than three times	Other, please specify
1.Tomatoes					
2.Amaranth					
3.Africa eggplant					

Code: 1. Once 2. Twice 3. Three times 4. More than three times 5. Other times

C.8 What are the major problems do you experience in moving your produce to the market?

Lack of transport	High transport cost	Time constrains	High labor cost	Other, please specify

Codes: 1. Yes 2.No 3.Dont know/Missing

C.9. (a) Are you in contract farming 1. Yes () 2. No ()

(b) If no why?

C.10. (a) Do you participate in any off-farm employment 1.Yes () 2.No ()

(b) If yes, how much does it contribute to the income per month?

C.11. (a) Who is in charge of the below areas along the vegetable value chain?

Activity	1.Tomatoes	2.Amaranthus	3.African Eggplant
Production			
Harvesting			
Marketing			

Code: 1. Husband 2. Wife 3. Both

(b) Apart from them, is any other household member in charge? Yes () No ()

(c) If yes, please specify:

Activity	1.Tomatoes	2.Amaranths	3.African Eggplant
Production			
Harvesting			
Marketing			

(d) Please tick where appropriate:

	1.Husband	2.Wife	3.Both	4.Other, please specify
1. Who in the household decides how the household's land is used?				
2. Who in the household decide which type of vegetables to grow?				
3. Who in the household decides how the vegetable produce is used?				
4. Who in the household has				

control over the income from vegetable produce?				
5. Who in the household decides on how the produce is marketed?				
6. Who in the household decide on the timing of marketing?				
7. Who in the household is carrying out marketing activities (e.g. selling on the market)?				
8. Who is dealing with market information in the household?				

SECTION D. RESPONDENT DETAILS ABOUT FARMER ORGANIZATION’S

D.1 (a) Is there any agricultural based farmer organization’s in your community? 1. Yes ()

2. No ()

(b) If yes, are you in any agricultural based farmer organizations? 1. Yes () 2. No ()

(c) If no, why?

Not interested	No time	Unable to raise entrance fees	Group meeting location not convenient	Not allowed because of sex	Family Dispute/ unable to join	Others, please specify

Codes: 1. Yes 2. No 3. Don’t know/Missing

(d) Which household members are member in a Farmer Organizations?

1.Husband	2.Wife	3.Both	4. Other, specify	5.Not applicable

Codes: 1. Husband 2. Wife 3. Both 4. Other, please specify 5. Not applicable

(e) Apart from them, is any other household member involved in Farmer Organizations?
1. Yes () 2. No ()

(f) If yes, please specify:

(g) Please name the Farmer Organizations? 1. Husband 2. Wife.....

3. Otherplease specify:

(h) What is the major reason for joining Farmer Organizations?

	Credit access	Extension services	Market access	Generate income	Market information	Other (specify)	Not applicable
Husband							
Wife							
Other(specify)							

Codes: 1. Credit 2. Extension 3. Market access 4. Generate income services
 5. Market 6. Other
 information

(i) Which type of market information provided by Farmer Organizations?

1. Market price	2. Market trend	3. Sales time	4. Quantity demanded	5. Types of market	5. Other, specify

Codes: 1. Market price 2. Market trend 3. Sales time 4. Quantity demanded
 5. Types of market 6. Other

(j) How frequent the group meets?

Weekly	After one week	After two weeks	Monthly	Quarterly	Other, please specify

Codes: 1. Weekly 2. After one week 3. After two weeks 4. Monthly
 5. Quarterly 6. Other

(k) How often do you attend group meetings? 1. Never () 2. Sometimes () 3. Always ()

(l) How are decisions made in your group?

By voting	Leaders	Influential person	Other, please specify

Codes: 1. Yes 2. No 3. Don't know/Missing

(m) How is the group composed in term of gender?

1. Mixed () 2. Women () 3. Men () 4. Youth ()

SECTION E. MARKET INFORMATION AND MARKET ACCESS

E.1 (a) Do you have access to market information? 1. Yes 2. No.....?

(b) Which type(s) of market information do you prefer or need?

.....

(c) Are you getting any marketing information support from anywhere? 1. Yes () 2. No

()

(d) If no why?

(e) If yes, name the sources of your market information?

Sources	Type of market information						
	Market price	Market trend	Sales time	Quantity demanded	Product planning	Types of market	Other (specify)
1. Television							
2. FOs							
3. NGOs							
4. Extension officer							
5. Friends							
6. Traders/Buyer							
7. Radio							
8. Mobile phone							
9. Newspaper							

Codes: 1= Market price 2= Market trend 3= Sales time 4= Product planning

5= Standards 6= Other

(f) If is Farmer Organizations, which type of market information do you receive?

.....

1. Market price	2. Market trend	3. Sales time	4. Quantity demanded	5. Types of market	5. Other, specify

Codes: 1. Market price 2. Market trend 3. Sales time 4. Quantity demanded
5. Types of market 6. Other

(g) Who is accessing market information in the household? 1. Husband () 2. Wife ()
3. Both () 4. Other (), please specify:

(h) If its extension officer, how often do you contact with the extensions officer?

Daily	Weekly	Monthly	Annually	Others (specify)

Codes: 1= Daily 2= Weekly 3= Monthly 4= Annually 5= Other

(i) Which household member(s) engaged with the extension officer? 1. Husband ()
2. Wife () 3. Both () 4. Other () (Specify)

(j) How many times do you seek for market information per season?

(k) If it's Farmer Organizations, do you seek for market information or you wait till the meeting to get it? 1. Yes () 2. No ()

(l) If no, why?

(m) If yes, Does Farmer Organizations provide you with market information your where seeking? 1. Yes () 2. No ()

(n) If no, why?

(o) If yes, how often do you receive the market information from Farmer Organizations?

Daily	Weekly	Monthly	Annually	Others (specify)

Codes: 1. Daily 2. Weekly 3. Monthly 4. Annually 5. Other

(p) Who provide the training?

(q) How far is the distance to the source point and how much does it cost you to search for market information per month Tsh?

Sources	Cost (Tsh)	Distance (hours)
1. Television		
2. FOs		

3.NGOs		
4.Extension officer		
5.Friends		
6.Traders/Buyer		
7. Radio		
8.Mobile phone		
9. Newspaper		

(r) How much vegetable do you supply to the market for last season (kg)?

Tomatoes	Amaranth	African eggplant

E. 2(a) DoesFarmer Organizations help in access market? 1. Yes () 2.No ()

(b) If yes, How?.....

(c) What are the major types of market accessed through Farmer Organizations?

Traders	Local open-air market	Urban market	Food vendors	Schools	Hospitals

(d) If no, why?

E.3 According to you, what are the challenges in general about Farmer Organizations?

.....

E.4 Do you have any other additional comments/ suggestions?

.....

Thank you