CAN ORGANIC FAR MING BE AN ALTERNATIVE TO IMPROVE WELL-BEING OF SMALLHOLDER FARMERS IN DISADVANTAGED AREAS? A CASE STUDY OF MOROGORO REGION, TANZANIA

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ABSTRACT

This research was done to assess contribution of organic farming on improving well-being of smallholder farmers through crop productivity, profit and food security among 324 smallholder farmers in Morogoro Region, Tanzania. The specific objectives were to: examine how farmers implement organic farming practices and sell their products; compare productivity, profit and food security between conventional/traditional farmers and organic farmers; determine factors affecting productivity, profit and food security; determine challenges of organic farming; and determine communities' attitude towards organic products. The results showed that organic farmers had diversified crops and availability of water for irrigation, and they had better selling situation of their crop products. Productivity of maize, cow peas and pumpkins did not show significant differences between organic and conventional/traditional farmers, but profit and food security did. Food security was analysed using food consumption score and dietary energy consumed by organic farmers and showed significantly better results compared to that of conventional/traditional farmers. The factors which influenced productivity significantly were sex of a household head, number of people in a household, constant markets and livestock keeping. Years of practicing organic farming showed significant association with profit, and livestock keeping and age of a household head had significant impacts on food security. It was revealed that there were challenges of land preparation, markets, getting premium price, and contamination with other farms. Customers of a normal market place had similar attitude to that of customers of an organic shop. In conclusion, organic farming has a potential to improve well-being of smallholder farmers in disadvantaged areas especially from the aspects of profit and food security. Therefore, it is recommended that more emphasis should be put on promotion of organic farming by agricultural stakeholders such as the government, agricultural institutions, development institutions and organic farming organizations.

DECLARATION

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

Chie Miyashita	Date
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The above declaration is confirmed by:

Prof. Kim A. Kayunze	Date
(Supervisor)	

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DEDICATION

I dedicate this dissertation to my beloved parents Mr. and Mrs. Miyashita who always supported me during studies in Tanzania.

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CA	Conservation Agriculture
CVM	*Comunità Volontari per il Mondo*
EPOPA	Export Promotion of Organic Products from Africa
FAO	Food and Agriculture Organization
IFOAM	International Federation of Organic Agriculture
MVIWATA	National Networks of Farmers' Groups in Tanzania
NBS	National Bureau of Statistics
OECD	Organization for Economic Cooperation and Development
ORCA	Organic and Resource Conserving Agriculture
SAT	Sustainable Agriculture Tanzania
UMADEP	The Uluguru Mountains Agricultural Development Project
UN	United Nations
URT	United Republic of Tanzania
WB	World Bank
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

1.1.1 World rural poverty

There are always people who are in the shade of development, but they are actually the ones who should be targeted. A country's developments sometimes skip the people at the lower levels, and it lets them stay in poverty. In the world, there are about 2 billion smallholder farmers who depend on themselves for their livelihood (IFAD, 2011). Rural poverty is a problem that people have been discussing for decades. However, generally, it is said that peasants have not benefitted from development efforts thrust upon them by governments, multinational corporations, and international agencies (Leonard, 2006). It seems that development happens somewhere different from the bottom of the social ladder, and this may be the reason why the poor persist across space and time.

In urbanized countries, where agriculture itself contributes only 6% of countries' GDP, they have done poverty reduction by the employment of unskilled labour. However, because of strong existence of food retailing and agribusiness, it is a challenge for smallholder farmers to manage supplying modern food markets (WB, 2007). Japan, for example, the third largest-economy-country, built dynamic growth by manufacturing, technology and exports. Meanwhile, the growth in demand for non-farm sectors has stimulated young people to leave aged people at farms. Between 1960 and 2006, farm household declined by 50% and farm labour by 80% (OECD, 2009). In transforming countries, where countries are shifting from agriculture to urbanization, the non-farm sector is rapidly rising, and it expands rural-urban disparity. Therefore, rural poverty remains a national problem (WB, 2007). Green revolution in the 1960s brought historical increase in grain yields in Mexico, India

and the Philippines. However, since this tremendous success depends on the use of chemical fertilizers and pesticides, irrigation and other inputs that poor farmers cannot afford, there are questions to the value of Green revolution to peasants (Leonard, 2006, Sebby, 2010).

Agriculture-based countries have more than half a billion people in the world. More than four-fifths of agriculture-based countries are in Sub-Saharan Africa. About a half of them live on less than $1.25 per day, and 68% of them are in rural areas. Their access to modern inputs is quite limited. Only 4% of total arable and cropland is irrigated in Sub-Saharan Africa while it is 39% in South Asia. Fertilizer use in Sub-Saharan Africa is 13 kg per ha, which is less than one fourteenth of that of South Africa. According to World Bank (2008), public spending on agriculture in agricultural-based countries is lower than that of transforming and urbanized countries even though their share of agriculture in GDP is higher.

In Tanzania, one of the agriculture-based countries, agriculture is the primary economic activity for about 80% of Tanzania's population (WB, 2012). In terms of GDP, Tanzania is soundly developing by more than 7% (WB, 2014). However, it seems economic development does not include rural people, and rural people still do not see the improvement in their lives from the views of economy and food security (NBS, 2014). Smallholder agricultural households occupy 98% of the total rural households. More than half of the total households growing crops only operate between 0.01 and 1.5 ha. The percentage of rural crops farming households using tractor is 0.8%, and 0.3% to power tiller (NBS, 2012). The use of insecticides is limited to only 9% (NBS, 2012). Because of these limited opportunities to agricultural modernization and inactive public support, organic farming has been promoted as one of alternative development ways in

agriculture-based countries to improve smallholder farmers' well-being.

1.1.2 Organic agriculture as a poverty reduction strategy

Organic farming is one type of agriculture, which is becoming popular in the world. Organic farming is defined and explained in so many different ways, but the common understanding among them is that it is a system that relies on ecosystem management rather than external agricultural inputs (FAO, 2014a). The ecosystem management refers to all kinds of skill which improve the condition of farming naturally, such as mulching for conserving the moisture of soil, growing leguminous cover crops to improve the soil, making compost to improve the soil nutrients, and intercropping and crop rotation to preserve the soil. External agricultural inputs refer to the use of chemical pesticides to control pests, diseases and weeds, and the use of chemical fertilizers and genetically modified seeds and breeds to have higher yields with less energy (SAT, 2013). The advantages of conducting organic farming could be: 1) less costs for input, 2) less vulnerability, and 3) better outputs. In other words, they are able to reduce expenditure by avoiding agrochemicals, to reduce risks of crops failure caused by climate conditions and the fluctuation in prices of inputs, and to have higher quantity and quality of products which leads to higher income and better food security (Pimentel, 2005, cited by Leu, 2012; Eyhorn*et al*., 2007; Sudheer, 2013; Aher *et al*., 2012; Andersson *et al*., 2012). Therefore, organic farming is expected to be an alternative way of development for smallholder farmers.

There are at least 43 organic agricultural groups in Tanzania (See Appendix 1). According to Tanzanian Organic Agriculture Movement (TOAM), the umbrella organization of Tanzanian organic agriculture, there are 89 subscribed institutional members including farmer associations and cooperatives, NGOs and CBOs, organic operators, researchers and trainers (TOAM, 2014). It implies that organic agriculture is getting attention in Tanzania, and more and more organic producers are expected to appear in the future in Tanzania.

Most of them tend to depend on monoculture and exporting their products.

The United Nations Conference and Trade and Development (UNTAD) and United Nations Environmental Programme (UNEP) professed that 114 organic agricultural projects from 24 African countries showed 116% increase in average change in crop yields. In Tanzania, 9 projects showed 67% increase (UN, 2008). This remark has truly increased the future expectation of organic farming in Tanzania. The latest National Agriculture Policy of Tanzania mentioned organic farming as "another window of opportunity that can be exploited towards enhancing national and farm incomes" (URT, 2013). It states that organic farming shall be more promoted to increase household incomes. For smallholder farmers in disadvantaged areas, where people are geographically, politically and relationally limited to external advantages, organic farming could be promoted as an alternative way to improve their farm life conditions.

1.2 Problem Statement

Although organic farming has a potential to help smallholder farmers improve their well-being, such agriculture has hardly been practised for smallholder farmers in disadvantaged areas in Tanzania (UN, 2008; Malaki, 2010; Aher *et al*., 2012; Andersson *et al*., 2012; Sudheer, 2013; FAO, 2014b; CHEMA, 2014). There are some researches showing the contribution of export-oriented organic farmers and mono-cropping organic farmers (UN, 2008; Malaki, 2010; CHEMA, 2014). However, the potential of non-contract multi cropping organic farming has not been surely confirmed on-site. For smallholder farmers to take advantage of contract farming is demanding because of a chance of contracts, quantity and quality of crops. Moreover, export-oriented organic farming and mono-cropping organic farming still keep farmers vulnerable in many cases. First, they make the farmers depend on a premium price of a single crop production which is easily fluctuated by global market situation. Second, unfavourable agricultural conditions such as climate and insect problems could damage them because of their dependence on

monoculture (Eyhorn *et al*., 2007). Therefore, the study for this dissertation attempted to assess the contribution of organic farming to improve "well-being" which is indicated by crop productivity, profitability and food security of smallholder farmers in disadvantaged areas where farmers live geographically, politically and relationally under un conducive environment. Smallholder farmers in disadvantaged areas were targeted since they are the majority of the rural poor who do not have external advantages such as good markets, financial services and export contracts (Hansen, 2011; URT, 2009; WB, 2007; Minot, 2009)

1.3 Research Justification

The aim of the study was to show the contribution of organic farming to smallholders' well-being in disadvantaged areas who do not have the chance to export contract, and who grow multi crops for their local consumption, because such information is scarce among past researches of organic farming (Malaki, 2010; Sudheer, 2013; UN, 2008). If the potential of organic farming could be shown against low productivity, income poverty and food insecurity, which have been discussed as major problems of poverty, it could generate empirical information on which to base efforts to promote organic farming with the aim to improve well-being of smallholder farmers. Hence, the findings would contribute to improvements of national development policies and strategies which seem to have failed to involve smallholder farmers. It is also hoped to be a new global model of sustainable rural development which accomplishes poverty reduction from the bottom of the society where changes are really needed.

1.4 Objectives and Hypotheses

1.4.1 General objective

To determine the contribution of organic farming to well-being of smallholder farmers.

1.4.2 Specific objectives

(i) To examine how farmers implement organic farming practices

(ii) To examine how farmers sell their products

(iii) To compare productivity, profit and food security between conventional/traditional farmers and organic farmers

(iv) To determine impacts of some elements of characteristics of households, those of agricultural environment and market conditions on crop productivity, profit and food security

(v) To determine challenges for smallholder farmers to conduct organic farming

(vi) To determine communities' attitude towards organic products

1.4.3Research questions

(i) How are farmers implementing organic farming practices?

(ii) How are farmers selling their products?

(iii) What kind of challenges are organic farmers facing?

(iv) What is the communities' attitude toward organic products?

1.4.4 Null hypotheses

(i) Productivity, profit and food security do not differ significantly between conventional/traditional and organic farmers

(ii) Elements of characteristics of households, those of agricultural environment and market conditions do not have significant impacts on crop productivity, profit and food

security among organic farmers and conventional/traditional farmers

1.5 Conceptual Framework

The variables that were studied are summarised in Fig. 1, and the hypothetical relationships among them are explained thereafter.

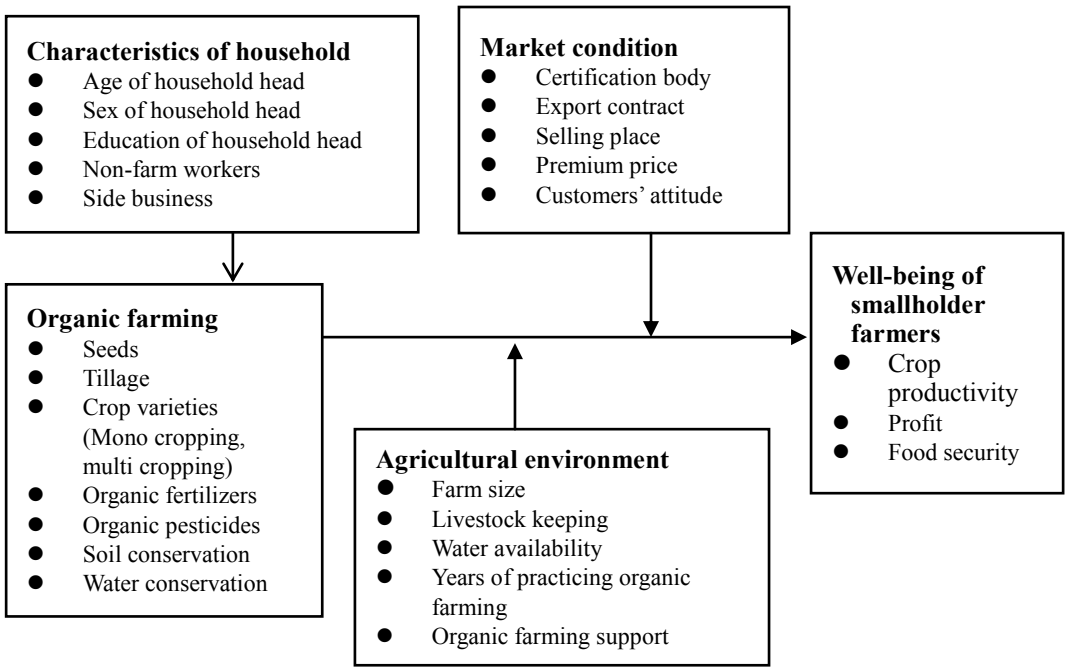

Figure 1: Conceptual framework for the research

The primary independent variable is organic farming. The dependent variable is well-being, which was measured in terms of crop productivity, profit and food security. Crop productivity was measured by calculating each crop's production per ha. Profit was measured by net margin. Food security was measured by food consumption score, food sufficiency level, dietary energy consumed and percentage of a household's total expenditure on food. The other variables in the conceptual framework are characteristics of household as background variable and secondary independent variables. The secondary independent variables are grouped into agricultural environment and market conditions. The indicators of the three categories of secondary independent variables are as seen in Fig. 1.

It is hypothesised that variation in well-being is affected by variation in the characteristics of household head and independent variables. For instance, sex of household head affects food security because women usually care about food more than men. Livestock keeping, which is one of farming activities, may cause higher profit, because availability of animal manure may influence a crop's growth and lead to higher productivity. If there is a good market condition such as export contract, it directly helps farmers get higher profit, because of premium prices from the buyers. Organic farming supporters such as NGOs can give knowledge and skills of organic farmers, and it could involve productivity.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Rural Poverty in Tanzania

Tanzania is located in East Africa with a population of about 48 million. The GDP is $28.24 billion as of 2012, and Tanzania is soundly developing in terms of GDP by more than 7% as of 2013 and 2014. However, poverty is still a big national concern. The poverty headcount ratio at national poverty line is 28.2% as of 2012 (WB, 2014). There are many limitations in rural areas compared to urban areas. The proportion of households connected to electricity grid in rural areas is only 10%, while it is 59% in Dar es Salaam and 30% in other urban areas. Rural people have long distances to important services. Average distance to a bank is 37 km, and 18km to a police post. About water supply, only 49% of rural households have their supply within 1km, while 84% and 73% of households in Dar es Salaam and in other urban areas respectively have the supply within 1km. Hygienic and safe drinking water also differs. Some 53% of rural households depend on unprotected water supply such as unprotected wells, springs, rivers and lakes, while 76% in other urban areas have piped water. Some 65% of household consumption expenditure is on food, and this proportion is higher in rural areas (NBS, 2012).

2.2 Agriculture in Tanzania

2.2.1 General information

According to Tanzania National Agriculture Policy (URT, 2013), the agricultural sector is comprised of crops, livestock and forestry and hunting sub sectors. Tanzanian agricultural sector is an important sector as a source of food, employment, raw materials, and foreign exchange. This sector provides livelihood for more than two-thirds of the population in Tanzania. Although the number of people working in agriculture is decreasing little by little,

agriculture is still the most important economic activity. Some 70% of households are headed by individuals who work in agriculture. The sale of agricultural products is the main source of cash income for 62% of households (NBS, 2012). Arable land which is defined as land under temporary crops is 13% as of 2011 (WB, 2014). Crop production is the major sub-sector which contributed about 17.8% of GDP in 2010 while livestock production contributed about 3.8% of the GDP, and forestry and hunting contributed about 2.4% (Economic Survey 2010 cited by URT, 2013).

Most of the regions in Tanzania depend on the long rainy season, since few regions receive substantial rain in both long and short rainy seasons. During 2002/03, the total area planted with annual crops was 7,818,620 ha in the short rainy season, and 6,349,707 ha were planted during the long rainy season (NBS, 2012). The main staple foods are maize and paddy. The main cash crops are cashews, coffee, cotton, sisal, sugar, tea and tobacco, as well as spices from Zanzibar. Generally, food crop producers are poorer than cash crop producers. But both farmers are frequently exposed to cyclical and structural constraints, such as drought and flooding.

2.2.2 Agricultural modernization

Generally, Tanzania makes minimum use of mechanization. The percentage of rural crops farming households using tractors is 0.8%, and 0.3% to power tillers. According to National Census of Agriculture 2007/08 (NBS, 2012), the use of oxen is categorized as mechanization. Ox-plow is the leading method, and it is used by 14.4% of the total rural crop farming households. Ox-planter is used by 0.6%, and oxcart is used by 4.4% (NBS, 2012).

Agricultural inputs do not seem to be common for large population. According to National Census of Agriculture 2007/08 (NBS, 2012), 18.2% out of all households planted with fertilizer, out of which 11.0% used organic fertilizer and 7.2% used inorganic fertilizer. During the long rainy season, 19.8% out of all households used fertilizers, out of which 9.9% used organic fertilizers and 9.9% used inorganic fertilizers. These data show low use of purchased inputs as other African countries' smallholder farmers sectors do (NBS, 2012; Hillocks, 2002). Moreover, the data tell that the use of organic fertilizers is not common. With regard to technology, crop growing smallholder farmers' access to improved seeds is 24.3%, 14.0% to insecticides/fungicides, and 7% to irrigation (UTR, 2010).

Even though Tanzanian agriculture policy states that its aim is to achieve modernized, commercial, productive and profitable agriculture in a sustainable manner, it seems that national development direction is promoting more chemical inputs with less consideration about their availability (URT, 2013). KILIMO KWANZA[1]was launched as new assistance for smallholder farmers to reach agricultural transformation. However, there are still difficulties for most of smallholder farmers to access several sources such as financial support and mechanical support promoted in this policy, because minimum requirements to access those sources are financially still high (URT, 2009;Ngaiza, 2012).

2.3 Smallholder Farmers in Tanzania

Smallholder agricultural households occupy 98% of the total rural households (NBS, 2012). The population of rural agricultural smallholder households in Tanzania is 31,013,026 (30,264,358 Mainland and 748,668 Zanzibar), of which 15,487,217 are males (15,114,238 Mainland and 372,978 Zanzibar) and 15,525,810 are females (15,150,120 Mainland and

[1]KILIMO KWANZA, which means Agriculture First in Swahili is a national resolve formulated under patronage of Tanzania National Business Council Forum in 2009 to accelerate Tanzanian agricultural transformation. It is a central pillar to achieve Tanizania's Development Vision 2025 (Ngaiza, 2012).

375,690 Zanzibar). The total number of smallholder agricultural households is 5,838,523 (NBS, 2012).The region with the largest number of smallholder Agricultural Households in Tanzania Mainland is Shinyanga (9%) followed by Mbeya (8%). More than half of crop growing households hold less than 2 ha, and 36.1% hold less than 1 ha. About half of crop and livestock growing households hold less than 2 ha and 22.7% for less than 1 ha (NBS, 2012).

2.4 Food Security

2.4.1 Definition of food security

The World Food Summit of 1996 defined food security as “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life”. WHO states that the concept of food security is commonly “defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences” (WHO, 2014).

Commonly, there are four parameters of food security: Availability, access, utilization and stability on a consistent basis. The availability addresses sufficient quantity of food which is physically available. The access refers to physical and economic access to food concerning incomes, markets and prices. The utilization is nutritious status of individuals by diet diversity and intra-household distribution. The stability considers stabilities of those three dimensions over time. Unstable situation such as adverse weather conditions, political instability, unemployment or rising food prices contribute to food insecurity (FAO, 2008;WHO, 2014).

Food sufficiency is one of the factors composing food security. Since food is the most important means of subsistence, food sufficiency is often said that it is strong especially

when market economy is bad. This is because people are self-supported for basic food. Food security at individual and community level could be secured by food sufficiency. In this paper, therefore, the word “food security” is used as food security from individual to community level, and distinguishes from national food security.

2.4.2 Food security in Tanzania

Statistics show that over 70% of world food insecure population in Africa lives in rural areas. Ironically, smallholder farmers who produce over 90% of the continent’s food supply make up half of this hungry population (Leu, 2013). Tanzania is not considered a severe food-deficit country, and normally produces over 90% of food requirement of the population (IFAD, 2011). However, there are some factors contributing to food insecurity such as dependence on rain especially in semi-arid areas .In Tanzania Mainland, 21.5% of the population is considered that they are under the poverty line based on Basic Needs Poverty Line which is TZS 36,482 per adult per month in 2012 prices. From the view of Food Poverty Line which is TZS 26,085, 7.2% is considered that they are under the poverty line (NBS, 2014).

2.5 Organic Farming

2.5.1 Definition of organic farming

FAO/WHO Codex Alimentarius Commission of 1999 stated the definition of organic agriculture as follows:

“Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted

systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system" (FAO, 2014a).

Organic farming applies this definition to the farming sector. In short, organic farming is a system that relies on ecosystem management rather than external agricultural inputs.

2.5.2 Organic farming position among agricultural systems

Fig. 1 explains the organic farming position among agricultural system. According to the figure, organic farming stands at low synthetic chemical use and high ecosystem management position. Development of organic farming method comes from two sides: Input-intensive agriculture using the Green Revolution method or possibly agro-genetic engineering and organic by default (See Fig. 1). From Input-intensive agriculture side, it goes to lower use of chemical inputs in modern culture as a counter movement of techniques of Green Revolution. This anti-conventional farming movement has risen from developed countries because of a concern about the food production method impacts on human health. From organic farming by default, it goes to integrate modern ecological insights into traditional method. Developing countries in many cases entered organic agriculture with the big goal of supporting smallholder farmers' livelihoods (Johannsen *et al*., 2005).In developing countries, many farmers conduct organic farming by default. Since smallholder farmers cannot afford agricultural inputs, they end up not using any modern agricultural technology. This situation does not come from smallholder farmers' intention but from their financial limitation. This is why they are called organic farmers by default.

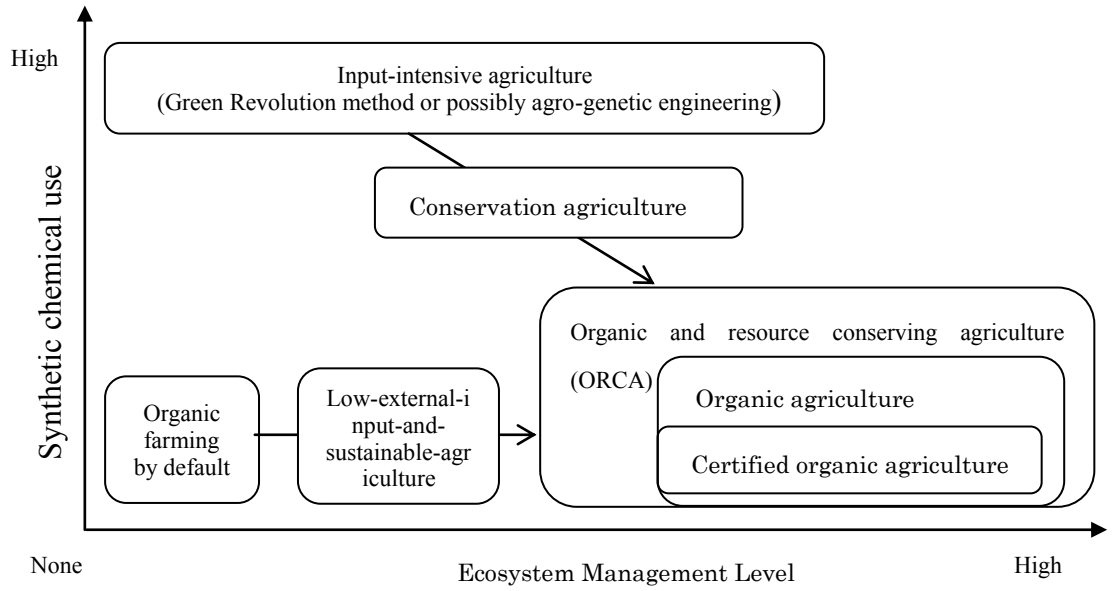

Figure 2: Simplified organic farming position among agricultural systems

Source: Compiled from literature including Bennett and Franze (2013) and Johannsen *et al*. (2005).

Organic and resource conserving agriculture (ORCA) is agriculture which "makes the best use of natural goods and services without compromising their future use, and promotes social, environmental and health goals along with productivity gains" (Bennett and Franzel, 2013). It clearly shows the distinction between organic farming and organic farming by default. ORCA literally explains that organic farming is together with resource conservation such as preservation and enhancement of soil fertility. Conservation agriculture (CA) is one of sustainable agriculture which comes as a counter movement to the Green Revolution techniques. FAO defines that conservation agriculture "aims to achieve sustainable and profitable agriculture and subsequently aims at improved livelihoods of farmers through the application of the three CA principles: minimal soil disturbance, permanent soil cover and crop rotations" (FAO, 2014b). Low-external-input-and- sustainable-agriculture is another variation which does not

entirely rule out pesticides and synthetic fertilizer (Johannsen, 2005).

Certified organic farming is a type of farming which ensures that organic products are indeed grown according to certain organic standards. Fundamental differences are found among countries. These differences in standards are acceptable, because ecological management needs to depend on countries' or regions' conditions (FAO, 2014b). According to Reddy (2010), there are three types of certification of the system. The first one is a third party certification for an individual, and this is an internationally recognized certification system. The second scheme is a third party certification for a group in which individuals are certified using Internal Control System (ICS). The third system is a Participatory Guarantee System (PGS), which involves participation of smallholder farmers, small entrepreneurs, traders and consumers in the certification process.

2.5.3 Organic agriculture organizations

Organic agriculture organizations are mainly divided into three types: research institutions, network organizations and certification organizations. Research institutions support to make a sound methodology which explains why and how the organic system works. For example, Kenyan Institute of Organic Agriculture and *Gami Seva Sevana* in Sri Lanka were established in order to supplement the methodology with their research (FAO, 2014b). The aim of network organizations is to make a sound board of organic agricultural network in order to promote it properly. International Federation of Organic Agriculture (IFOAM) is the biggest and the oldest umbrella organization which has over 710 member organizations in 115 countries. It has been working to promote organic agriculture and to educate organic organizations since 1972 (IFOAM, 2014). Certification organizations work to certify organic products according to a certain organic standard in order to ensure the products are grown organically. There are more than 100 national or regional organic standards in the world. These certification bodies are important to avoid inadequate organic producers who

are only interested in getting premium prices (FAO, 2014b, IFOAM, 2014).

2.5.4 Organic farming ways

At the forefront of organic farming consideration is a holistic ecosystem management. This idea came from numerous demerits from conventional agricultural technologies such as chemical pesticides, diseases and weeds, and the use of chemical fertilizers and genetically modified seeds to have higher yields. They are usually associated with greenhouse gas emissions, pesticide residues, reduced biodiversity, soil erosion, declining fertility and salt built-ups (Bennett and Franze, 2013). However, the ecosystem management improves the condition of farms naturally, and it goes along well with surrounding environmental situations. Several main techniques are mentioned below.

Ecosystem surely gets damaged when external agricultural inputs are used such as chemical pesticides for controlling pests, diseases and weeds, chemical fertilizers and genetically modified seeds and breeds for having higher yields with less energy. In order not to destroy natural system, genetically modified seeds and breeds are kept out of this type of agriculture. Instead of chemical pesticides and fertilizers, organic fertilizers and pesticides are applied. Examples of organic fertilizers are farmyard manure, organic manure, vermiform compost, crop residues and green manure. These natural fertilizers help increase bulk density and maximum water holding capacity (Bhanuvally, 2006). Organic pesticides have several ways to control pests, such as coordinating planting dates, row covers, plastic tunnels, mulch and chemical pesticides approved for use in organic agriculture. In addition, organic farming enables biological control, and it builds up large numbers of beneficial parasites and predators that help control pests in many crops (Fouche *et al.*, 2000). These natural pest management methods are called integrated pest

management (IPM[2]).Soil conservation is the heart of the ecosystem. There are several ways to conserve nutritious soil such as mulching, compost, cover crops, intercropping and crop rotation. Mulching is to cover soil with vinyl sheet or organic materials. It helps to maintain moisture in soil by reducing the amount of water lost thorough evaporation, to maintain a uniform soil temperature, to minimize soil erosion from heavy rain, and to reduce weed problem. Moreover, since plant materials progressively stimulate decomposition by biological effects from microorganisms, cultivation workforce may decrease. Several local materials can be used as organic mulch such as leaves, compost, straw, wood chips and hulls (Williams, 2014).

Composting is a natural process of decomposition of organic matters by microorganisms. Compost is made from rotten organic matter, and farm compost which is especially made from farm waste such as crop residues and weed. This raw feedstock, through composting process, becomes a concentrated form of nutrients, and it helps build a fertile soil structure. Good compost which is balanced with carbon and nitrogen and other nutrients can manage microorganisms in a soil. Humic substances, increased by composting make a soil more resistant to erosion (Biernbaum and Fogiel, 2006).

Cover crops such as grasses and legumes improve soil health and structure as mulch and composting do. Soil will have better micro biotic activities, stronger structure against soil erosion and higher water infiltration rate. Some cover crops have been proved to contain double nitrogen as that of compost. Therefore, cover crops are used to avoid nitrogen deficiency. Moreover, nitrogen from cover crops does neither readily run off nor leach as inorganic nitrogen fertilizer does (Mikkelsen and Hartz, 2008).

[2] IPM is defined as "a decision support system for the selection and use of pest control tactics, singly or harmoniously coordinated into a management strategy that takes into account the interests of and impact upon producers, society and the environment" (Kogan, 1998 cited by Hillocks, 2002).

Intercropping is defined as an agricultural practice of growing two or more crops within the same place at the same time (Andrews and Kassam, 1976, cited by Hunady and Hochman, 2014). Intercropping has benefits in terms of pest control and nutrient control. Several kinds of plants would decrease pest damage. Considering crops' nutrient consuming degree is also important, since each crop has different nutrient requirements. Planting only nutrient consuming crops such as fruiting vegetables depletes nutrition especially nitrogen. Mixing with low nutrient consuming crops such as roots or nitrogen fixing legumes will be good for soil fertility (Hunady and Hochman, 2014). Therefore, mono cropping creates a weak system whereby pests or high nutrient consuming crops may destroy a farm. Moreover, mono cropping has weak resistance to unfavourable weather condition and price decrease in a market.

Crop rotation is to rotate crop species at a farm for certain duration. Many studies have shown a decrease of microbial activities in farm soils which continuously grow single species. Two general biological and physical benefits of crop rotation are improvement of soil quality and pests management. As intercropping has a benefit by mixing crops which consume nutrient differently, crop rotation has a merit of controlling soil nutrition. Mohler and Johnson (2009) say that when the land is in grass, legume sod and cover crops, the soil tends to improve. For pest management, crop rotation is a key component, since it can control host-specific pests which specialize on a particular species (Mohler and Johnson, 2009).

2.6 Theoretical Literature Review

Sustainability of organic farming can be explained in a theory of sufficiency economy which was introduced by His Majesty King Bhumibol Adulyadej in Thailand. Its aim is to live in moderation and being self-sufficient in order to be strong against shocks and changes instead of being characterized as a newly industrialized country. Before putting

emphasis on industrial expansion, basic economic stability should be established first to assure that the majority of rural people have enough to subsist. By producing enough to eat as a first priority, farmers can avoid several risks such as price fluctuation, unproductive conditions and natural disasters. Therefore, this sufficiency economy enables people to think of adequate development with adequate size and technology without necessities of excessive external intervention. This approach is applicable at every level, from individual through community to national level (The Chaipattana Foundation, 2014; UN, 2014). Smallholders' multi cropping organic farming follows this ideology of sufficiency economy with accessible local resources. Risk management idea of this theory also matches the merit of organic farming.

2.7 World Attention to Organic Farming as Poverty Reduction Strategy

2.7.1 Possibility of organic farming

Organic farming is an environment friendly farming strategy because of its less greenhouse gases (Aher *et al*., 2012). Besides such an environmental impact, the advantages of conducting organic farming are: 1) less costs for input, 2) less vulnerability, and 3) better outputs as poverty reduction. Organic farming is a feasible agricultural way by any smallholder farmer because of less cash inputs. Avoiding agrochemicals helps conventional farmers to reduce extra expenditure. Traditional farmers who are not using agrochemicals could get advantages of organic farming without money for external inputs (Eyhorn *et al*., 2007).

Organic farming is expected to be less vulnerable to several unfavourable factors. One of them is its strength against unfavourable climate conditions such as drought and damaging rainfall (Khanal, 2009). Rodale Institute showed more maize production from the organic system than from the conventional one in drought years. The average maize yields during

the drought years were about 30% higher in organic legume systems. The yields were 7,235 kg per ha compared to 5,333 kg per ha in the conventional system (Pimentel, 2005, cited by Leu, 2012; Eyhorn et *al*., 2007).

Another unfavourable factor is price fluctuation because of dependence on world markets. Conventional farmers depending on world markets easily get economic damages caused by world price decrease. Even organic farmers exporting products have the same risks (Eyhorn *et al*., 2007). Depending on a single buyer is also risky, because farmers would be hit when they get some trouble on their market connection. However, organic farmers who grow crops for local consumption are stronger than others against these problems, because they do not really depend on externals for making their lives. Multi cropping organic farming also contributes to tackle food insecurity in terms of crop varieties, because crop variety is one of the factors which lead to food sufficiency.

Better outputs are mainly achieved as better products and higher profit (Sudheer, 2013; Aher *et al*., 2012; Andersson *et al*., 2012). Moreover, in Tanzania, since more than 80% of households use neither organic fertilizer nor chemical fertilizers, organic agricultural inputs would help them have higher yields (NBS, 2012). This higher quantity of products leads to higher profit. This higher profit is sometimes seen because of subsidies (FAO, 2014b). In addition, organic products have premium prices because of their high quality and high demand (van Elzakker and Tulip, 2000, cited by FAO, 2014b). These better outputs also lead to food security.

2.7.2 Success of world organic farming

There are several researches about income increase from organic farming all over the world. In Uganda, where organic agriculture is leading in East Africa nowadays, organic cotton farming achieved higher yields compared to that of conventional farmers in the same case

study site. Economic performance of organic cotton was much higher due to 20% of premium price on export (van Elzakker and Tulip, 2000, cited by FAO, 2014b). A research of economics of organic farmers in India also showed a higher gross income than that of conventional farmers with lower input costs. Since the target organic farmers were not certified, these profits were brought without any premium price. This result was seen in paddy, red gram and groundnuts in Andhra Pradesh, a south eastern coastal state (Sudheer, 2013).

Yields increase on organic farms has also been found in several researches. In the UK, 150-year-trial proved that organic wheat farms had higher yields than those of conventional farms (Leigh, 1997 cited by Aher *et al*., 2012). Other organic wheat and soybean farms in the US brought 3.5% and 4.8% higher yields respectively than conventional farms (Welsh, 1990 cited by Aher *et al*., 2012). Since organic farming is one of the means to enhance biodiversity in agricultural landscapes, it leads to higher pollination success. Andersson *et al*. (2012) found that organic strawberry farms have higher pollination success and the proportion of fully pollinated strawberries in the southernmost part of Sweden.

2.7.3 Limitations of organic farming

There are many obstacles to succeed in organic farming. For producers, lack of available knowledge and skills is often a reason for low adoption of organic farming and low outputs (Khaledi, 2007 and Svotwa *et al*., 2009). Weak organic market development also leads to difficulties of introducing organic food, and organic farmers end up giving up premium prices of organic products. There are also some certification constraints. Understanding export market regulations is a task. These regulations are often too difficult for smallholder farmers to follow. In addition, certification fee by external bodies are often expensive (UN,

2006).From the view of consumers, their awareness of organic products has been increasing due to ravage of HIV/AIDS, health concerns and taste quality. However, such awareness is not prevalent enough to create a big demand for organic products (UN, 2006). Higher price of organic products often limits consumers, especially in developing countries. Therefore, co-operative model of organic farming including market environment, consumers' awareness and farmers' skills is normally used (IFOAM and FiBL, 2008).

Yield decrease has been seen during conversion period from conventional to organic farming (Eyhorn *et al*., 2007). Especially conversion from external-input-intensive farming to organic farming shows yield decrease, because such farms depend on only functions of artificial fertilizers to make good crops, and it takes time until the soil becomes fertile enough to produce crops (Reddy, 2010). One research conducted in California showed yields decrease in tomato production in initial three years, but it increased later (Clark, 1990 cited by Aher *et al*., 2012). Another research of corn and soybean production showed lower yields for three years, but it increased in the fourth year (Delate, 2004 cited by Aher *et al*., 2012).

Yields increase has not been achieved in several cases. A survey conducted in California showed that yields of tomato between organic and conventional farmers were similar even though the organic farms had higher microbial abundance, nitrogen and carbon in soils (Drink water *et al*., 1995). Another survey also showed the same yields between organic and conventional farming for 22 years (Primentel, 2005 cited by Aher *et al*., 2012).

2.7.4 Organic farming in Tanzania

In Tanzania, organic farming history started in 1898 with Peramiho Organic Garden in Ruvuma Region which produced various vegetables (UN, 2006). Now, there are several organic farming organizations such as Participatory Ecological Land Use Management

(PELUM) Tanzania and Tanzanian Organic Agriculture Movement (TOAM). Organic products are normally confirmed by Tanzanian standards, TanCert and PELUM Tanzania, or international standards offered by IMO, EcoCert and Bio Inspector. Besides these certification bodies, there are organic farmers using European countries' organic standards where they are exporting to.

There are a few researches about the impact of organic farming. United Nations Conference and Trade and Development (UNTAD) and United Nations Environmental Program (UNEP) collected several results of organic farming impacts in Tanzania. In Meatu district, Shinyanga Region, 45 contracted cotton farmers agreed organic cultivation as project farmers in the 1994/5 agricultural season, and showed increased food security. In Mkuranga district, Pwani Region, with facilitation of EPOPA[3], Premier Cashews Industry Ltd. worked with 480 farmers to export organic cashew nuts. Because of changes of world market prices, they could not bring good results. However, women in the villages grew some fruits and vegetables using organic farming practices, and helped to diversify sources of food and income. It was good improvement because people in that area had neglected food crops since they had been benefited from good cashew prices. Besides increase of available food, they also developed social capitals such as opening savings accounts and making local processing groups (UN, 2008).

In cotton production in Meatu and Kishapu Districts, Sinyanga Region, farmers supported by private companies Biore Tanzania Limited [4] and Busangwa Organic Farming Association[5] were researched. The results showed that organic cotton exporters had lower

[3] EPOPA is a Swedish supported programme called Export Promotion of Organic Products from Africa. Organic projects were started in Tanzania, Uganda and Zambia (EPOPA, 2014).
[4] Biore Tanzania Limited is a subsidiary of Swiss Company Remei, formed with an objective of improving living conditions for rural people (Malaki, 2010).
[5] Busangwa Organic Farming Association is a nongovernmental organization facilitating organic farming in Shinyanga Region (Malaki, 2010).

gross margin, and this implies a need for another utilization of cotton rather than dependence on foreign market (Malaki, 2010). In Karagwe District, Kagera Region, about 300 farmers are growing organic pineapples, papayas and sweet bananas with support of Community Habitat Environmental Management (CHEMA). An organic product exporter, Matunda Mema, dries them and exports them to Germany. They succeeded to have higher yields and higher income including premium price from Germany (CHEMA, 2014). In Kilombero District, Morogoro Region, 44 organic cocoa farmers showed TZS 50,438,400 of total gross margin which implies quite good payment. However, the research revealed several constraints of organic cocoa production such as insufficient supply of recommended organic inputs, price fluctuation and high certification costs.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of Study Area

This study was done in Morogoro Region which is located in the Eastern part of Tanzania. In the region, the number of rural households involved in agriculture is 298,421, but only few of them make use of mechanization and technology. Ox-plough is used by 2.9% of the total rural crop farming households, ox-planter by 0.2%, and ox-cart by 1.2%. Tractor is utilized by 2.3%, and power tiller is used by 0.3%. During the short rainy season, 12.1% of households apply fertilizer, out of which 2.0% apply organic and 10.1% apply inorganic fertilizer. During the long rainy season, 3% of households apply fertilizer, out of which 1.5% apply organic and 1.5% apply inorganic fertilizer (URT, 2013).

In Morogoro Region, there are organisations dealing with organic agriculture. They are Sustainable Agriculture Tanzania (SAT) which supports production of various kinds of crops, Kimango Farm Enterprises Ltd which produces spices, Mbingu Farmers Association (MOCOA) which supports production of cocoa beans, Mikese Organic Farm which produces fruits, and Tanzania Organic Products Ltd (TAZOP) which produces spices. Most of them, except for SAT, depend on monoculture for exporting their products. The region is divided into six districts namely Morogoro Urban, Morogoro Rural, Mvomero, Kilosa, Kilombero and Ulanga. The study was conducted in Morogoro Municipality, Morogoro Rural district and Mvomero district which have 120,021 agricultural households in total (NBS and OCGS, 2013; Mella *et al.*, 2007 and ESRC, 2015). Smallholder farmers were selected from Morogoro Municipality, Morogoro Rural District and Mvomero District in Morogoro Region, since these are the areas where there are smallholders farmers conducting organic farming for local consumption. Most of the organic farmers are trained by Tanzanian organic farming organization named SAT.

3.2 Research Design

Cross-sectional research design was used in this study since it allows collection of data to make inferences about a target population at one time (Kothari, 2014). The study was a comparative one whereby an impact assessment was done to compare organic farmers and conventional/traditional farmers. This was done because a comparative study is used when they aim to explain differences and the assumptions they make about the underlying causal patterns present (Pickvance, 2001).

3.3 Sampling

Morogoro Municipality, Morogoro Rural district and Mvomero district which have small scale organic farmers who are conducting multi crop organic farming for their local consumption were selected purposively. For conventional/traditional farmers, four villages named Misongeni, Langali, Lukobe and Mkambalani from the 3 target districts were chosen purposively, and random sampling was done to get households of smallholder farmers. For organic farmers, purposive sampling was done to have the target farmers, and 20 villages were chosen (Mgambazi, Kauzeni, Langali, Lukobe, Konga, Ruvuma, Msowelo, Kinole, Banba, Tulo, Choma, Mwanzo mgumu, Kireka, Tandai, Ka;undwa, Tegerero, Rugala, Bagiro, Hewa, Amini). A total of 362households were selected from the areas comprising 181 organic farmers and 181 conventional/traditional farmers. The sample size was calculated using the following

Formula:

$$n = \frac{N\, z^2\, p\, (1-p)}{E^2\, (N-1) + z^2\, p\, (1-p)}$$

n = required sample size
N = the population size
z = confidence level
p = the population proportions
E = the margin of error
(Krejcie, 1970)

For this research, the population size was 120,021, and the confidence level was set at 95%, 50% for the population proportions and 5% for the margin of error. Since the population proportion was not known, the maximum possible proportion, 0.5, was used. The required sample size was 362 from the calculation, $120{,}021 \times 1.96^2 \times 0.5\ (0.5) / 0.05^2\ (120{,}021 - 1) + 1.96^2\ 0.5\ (0.5)$. However, a sample of 324 farmers comprising 160 organic farmers and 164 conventional/traditional farmers was used since some of the farmers were not available.

For qualitative data, 24 respondents including 8 organic farmers from 3 villages, who were available, were chosen purposively in order to conduct focus group discussions. Sixty (60) customers including 30 occasional consumers of organic agricultural products at an organic shop and 30 customers who went to normal market places were selected to administer the questionnaire about communities' attitude towards organic products. However, a total of 49 customers comprising 32 customers of the normal market place and 18 customers of the organic shop were available.

3.4 Data Collection

The study used mixed method, which collects quantitative and qualitative data, since this method helps the researcher to understand the problem deeply by using closed-ended measures and open-ended observations (Creswell, 2003). The information of farmers about organic farming practices, product selling, and productivity, profit and food security was collected through a structured questionnaire. Copies of the questionnaire were administered by the researcher to the households.

The information about communities' attitude towards organic products was collected through another type of questionnaire for customers who went to normal market places and occasional customers who often went to an organic shop. The organic shop established by SAT in Morogoro town and Soko Kubwa (literally means a big market place) were chosen

to administer the questionnaire. In order to obtain information about organic farmers' challenges, focus group discussions (FGDs) were conducted.

A total of 3 focus groups were selected from 3 villages with different environmental conditions. In each of the focus groups, the number of discussants was about 8, which was in line with the suggestion by Morgan (1998 cited by Bryman, 2004) that a typical focus group size should have 6 to 10 members. The explanation for this is that with fewer discussants difficult topics may not be discussed effectively, while with more discussants some participants do not give their opinions. Available organic farmers were selected purposively as participants of the FDGs. The discussions were conducted using open-ended questions, and audio-recording was done after getting consent of the participants in the research. The discussion topics mainly focused on reasons to start organic farming, strengths of organic farming and difficulties of conducting organic farming.

3.5 Data Analysis

Questions about organic farming practices and products selling were asked through the questionnaire copies to know their ways of farming and selling. Frequencies and percentages were used to summarise the data. Adoption of 9 selected farming practices (See Table 1) was assessed through the structured questionnaire in order to assess adoption level of organic farming practices. The responses were separated into: i) In use of practice now and ii) Not in use of practice now. The frequencies and percentages of adoption for each farming practice were compared between two faring groups. For calculation of overall adoption of organic farming practices, the responses were scored as shown in Table 2, and the total scores were compared using independent samples T test.

Table 1: Selected farming practices for assessment of adoption of farming practices for assessment of adoption of organic farming practices

Selected practices	Explanation of each practices
Chemical fertilizers	Using synthetic fertilizers which provide certain nutrients into soil.
Chemical pesticides	Spraying synthetic pesticides which decrease pests coming to eat crops.
Organic fertilizers	Using natural materials such as animal waste, plants and farm waste on a farm for improving soil nutrients.
Organic pesticides	Using plants or trees which have strong smell in order to avoid pests coming to eat crops.
Crop rotation	Growing a series of dissimilar types of crops in the same area in sequential seasons in order to avoid excessive depletion of soil nutrients.
Intercropping	Planting several crops together on the same land in order to avoid whole land damage by a certain type of pest and excessive depletion of soil.
Terracing	Creating terraces on a hill to control nutrients' leaching and soil erosion.
Mulching	Placing loose materials such as dry grasses or leaves around plant stems to protect soil from over-drying and to improve soil structure.
Cover crops	Growing crops which cover soil such as legumes in order to improve soil's health.

Productivity levels of crops grown by both farming groups were compared by using independent samples T test. The top three crops of maize, cow peas and pumpkins were chosen. Means of productivity of those crops per 1 ha were compared by using independent samples T test. Profit was calculated in order to compare between organic farmers and conventional/traditional farmers. Profit was calculated as follows:

Profit = Gross income – Total costs

Gross income was total sales from crop products. Total costs were total expenditure on land

clearance, seeds, farm equipment, manure application, fertilizer application, pesticide application, wage of labourers, transportation for selling and land rental fees.

Table 2: Score for calculation of adoption of organic farming practices

Farming practice	Score	
	In use	Not in use
Chemical fertilizers	-1	1
Chemical pesticides	-1	1
Organic fertilizers	1	0
Organic pesticides	1	0
Crop rotation	1	0
Intercropping	1	0
Terracing	1	0
Mulching	1	0
Cover crops	1	0

Food security was analysed with indicators of food consumption score, dietary energy consumed and percentage of expenditure on food. In this paper, the word "food security" is used as food security at the household level, and distinguishes from national food security. Food consumption score is defined as "a composite score based on dietary diversity, food frequency, and relative nutritional importance of different food groups" (WFP, 2008). Each respondent was asked about food items consumed at home over a period of previous 7 days. Food items were grouped into 10 food groups with weights assigned for each group (See Table 3).

Table 3: Food consumption score

Food group		Food items	Weight
1	Cereals	Maize, maize porridge, rice, sorghum, millet, pasta and bread	2
2	Tubers	Cassava and potatoes	2
3	Pulses	Beans, peas, groundnuts and cashew nuts	3
4	Vegetables	Vegetables and leaves	1
5	Fruits	Fruit	1
6	Meat and fish	Beef, goat, poultry, pork, eggs and fish	4
7	Milk	Milk, yogurt and other dairy	4
8	Sugar	Sugar and sugar products	0.5
9	Oil	Oils, fats and butter	0.5
10	Condiments	Condiments	0

Source: Compiled from literature including WFP (2008) and Vhurumuku (2014)

Food consumption score was calculated as follows:

$$FCS = a_{cereals}x_{cereals} + a_{tubers}x_{tubers} + a_{pulses}x_{pulses} + a_{vegetables}x_{vegetables} + a_{fruits}x_{fruits} + a_{meat\ and\ fish}x_{meat\ and\ fish} + a_{milk}x_{milk} + a_{sugar}x_{sugar} + a_{oil}x_{oil} + a_{condiments}x_{condiments}$$

Where FCS = Food consumption score

a = Frequencies of food group consumed during the previous 7 days

x = Weight of each food group

(WFP, 2008)

According to WFP (2008), the calculated scores were categorized as poor food consumption if the score was 0 – 28, borderline food consumption if the score was 28.5 - 42, and acceptable food consumption if the score was more than 42.

The data of items and weight of food consumed by each household over a period of previous 7 days was used to calculate kCal. Food consumption table by Lukmanji and Hertzmark (2008) was used to obtain the kCal of each food item and dish. Dietary energy consumed was calculated per adult equivalent per day. Each household member was

assigned an appropriate adult equivalent unit (See Table 4), in order to consider the fact that children, women and old people need fewer resources. After getting Adult Equivalent Units (AEUs), they were multiplied by relevant average costs of the household economies of scale (See Table 5) to get Adjusted Adult Equivalent Units (AAEUs), because larger households need fewer resources per person due to sharing some facilities. Total calories consumed at home for the previous 7 days were divided by the number of days and AAEUs. The cut-point of 2200 kCal per adult equivalent per day was used to group the surveyed households into food insecure (those who consumed less than 2200 kCal per adult equivalent per day) and food secure (those who consumed 2200 kCal and more per adult equivalent per day). Score of 1 for the group of food insecure and score of 2 for the group of food secure were provided in order to compare mean.

Table 4: Adult equivalent scales for East Africa

Age group	Male	Female
0 - 2	0.40	0.40
3 – 4	0.48	0.48
5 – 6	0.56	0.56
7 – 8	0.64	0.64
9 – 10	0.76	0.76
11 – 12	0.80	0.88
13 – 14	1.00	1.00
15 – 18	1.20	1.00
19 – 59	1.00	0.88
60+	0.88	0.72

Source: Latham (1965), cited by Collier *et al.* (1990)

Table 5: Household economies of scale

Number of adults	Marginal cost	Average cost
1	1.000	1.000
2	0.892	0.946
3	0.798	0.897
4	0.713	0.851
5	0.632	0.807
6	0.632	0.778
7	0.632	0.757
8	0.632	0.741
9	0.632	0.729
10≤	0.632	0.719

Source: Deaton (1980), cited by Collier *et al.* (1990)

About percentage of expenditure on food, total expenditure per household was calculated by asking the amount of money they had spent during the previous month on food, farm, medical care, education[6], electricity, water, fuels, taxes and housing. Percentage of expenditure on food was calculated as follows:

$$\text{Percentage of expenditure on food} = \frac{\text{expenditure on food}}{\text{total expenditure}} \times 100$$

Households spending more than 75% of their total expenditure on food are defined that their food insecure level is very high. High food insecurity is denoted by 65 – 75% expenditure on food, while 50 – 65% indicates moderate food insecurity, and 50% indicates low food insecurity(Smith and Subandoro, 2007)

Multiple linear regression was used to determine impacts of some variables on productivity, profit and food security among organic farmers and conventional/traditional farmers. The regression was run with 13 independent variables for each of the dependent variables. The model was specified as follows:

[6] Education cost was calculated by dividing annual costs by 12 to get the costs per month.

$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \mu$

(Petrie *et al,* 2002; Landau and Everitt, 2004),

where: Y = predicted value of the dependent variable, which are productivity, profit and food security in this study

α = constant term

β = regression coefficient

x_1 = farm size

x_2 = age of a household head

x_3 = sex of a household head

x_4 = education of a household head

x_5 = years of practicing organic farming

x_6 = number of people in a household

x_7 = livestock keeping

x_8 = water availability

x_9 = distance from water source

x_{10} = casual labourers

x_{11} = constant market

x_{12} = crops' status

x_{13} = premium price

μ = error term

Content analysis was used to analyse the challenges of organic farming. Transcript was made from the records of FGDs, and the transcript data was examined by grouping the information into categories. A Likert scale with 12 statements was used to determine the communities' attitude towards organic products. The statements used for the Likert scale regarding to customers' attitude are shown in Table6. Six (6) of the statements had positive connotations while 6 statements had negative connotations.

Table 6: Questions regarding customers' attitude

Aspect		Connotation	Statement
Socio-cultural aspects	1	+	There are organic farmers in your area
	2	+	When buying food products, considering the process how the products were grown
	3	+	You want to eat (or want your family eat) healthy food
	4	+	Preferring organic products to normal products
Economic aspects	5	-	Prices of organic products are not reasonable
	6	-	Prices of organic products are not affordable
	7	+	Organic products are worth of buying regardless its price
	8	+	When getting extra money for food, you want to change crop products to organic
	9	-	When getting extra money for food, you want to buy something which is not crop products (such as meat and fish)
	10	-	When getting extra money, budget of food is not the first to increase
	11	-	When buying food products, price is the most important thing to consider
	12	-	Quantity of food is more important than quality of food

For each of the 12 statements, the respondents were asked to respond Not at all = 1, Not really = 2, Undecided = 3, somewhat= 4, or Very much = 5.The scores were grouped into favourable, neutral and unfavourable. Favourable attitude was denoted by the score of more than 37, while 36 indicated a neutral attitude, and the score which was less than 35 indicated unfavourable attitude. Independent samples T test was used to determine whether there were significant differences in scores on Likert scale between customers of normal market places and customers of an organic shop.

3.6 Limitations of the Study

There were language barriers since the researcher is not a native user of the Swahili language. During data collection, translators were needed to proceed with FGDs. This might have broken atmosphere to get more information from the participants since the process of using a translator sometimes stopped a flow of the FDGs. Moreover, the situation that the researcher sometimes could not talk directly to the participants may have caused difficulties to make good atmosphere that the farmers could speak comfortably.

Some information became difficult to identify if it was attributed to organic farming or not, since longitudinal research questions were not prepared. For instance, the differences of selling situation between organic farmers and conventional/traditional farmers would have been explained more clearly if comparison of before and after starting organic farming had been done.

There were limitations of accuracy of collected data about farmers, since information is based on their memories. Especially information of productivity and profit was asked about the year of 2013. This might have some misinformation.

With regard to information of productivity, accuracy would have been improved if the situation of intercropping had been considered. Since many farmers were intercropping in the same field, farm size for each crop should have been calculated by considering how many crops and what kinds of crops were intercropped in the same farm. Moreover, data which show whether or not methods of organic farming were applied to certain crops would have brought deeper discussions.

Communities' attitude towards organic products was analysed in this study with a final sample of 32 customers of a normal market place and 18 customers of an organic shop.

Since there were more occasional customers of the organic shop, this analysis would have been better if the study had involved all customers. In addition, it was realized that some statements used for the Likert scale were not well answered by people who did not know organic products. Since it decreased the number of sample of the normal market place for some statements, the results for some statements came only from the views of people who knew or had heard of organic products. The statements which could be answered by every people should have been made in order to gain more overall insight including various people's opinions.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-Demographic Characteristics of the Respondents

The socio-demographic characteristics of the smallholder farmers' households are summarized in Table 7. More than 60% of the households had 4 up to 7 members living together, and more than two-thirds of the households were male-headed. The majority of the household heads had ages ranging from 31 to70. The highest education level of a household head shows that more than 60% of household heads interviewed had primary education. More than 90% of household heads of the surveyed households were producing crops as their main occupation. The proportion of people having salaried employment shows that more than 80% of households in the study areas did not have any person having employment. The proportion of the households with people having a side business was more than one-third.

Table 7: Socio-demographic characteristics of the households surveyed

Socio-demographic characteristics	Amounts/levels of the characteristics	District of the respondent		
		Morogoro U* (n = 177)	Morogoro R** (n = 124)	Mvomero (n = 23)
Household size	1 – 3	47 (26.6)***	36 (29.0)***	2 (8.7)***
	4 – 7	110(62.1)	80 (64.5)	21 (91.3)
	8 – above	20 (11.3)	8 (6.5)	0 (0)
Sex of a household head	Male	121 (68.4)	99 (79.8)	19 (82.6)
	Female	56 (31.6)	25 (20.2)	4 (17.4)
Age of a household head	Younger than 30	9 (5.1)	15 (12.1)	1 (4.3)
	31 – 50	81 (45.8)	57 (46.0)	11 (47.8)
	51 – 70	71 (40.1)	43 (34.7)	9 (39.1)
	71 – above	16 (9.0)	9 (7.3)	2 (8.7)
Highest level of education of a household head	Not completed primary	33 (18.6)	28 (22.6)	1 (4.3)
	Primary school	135 (76.3)	84 (67.7)	17 (73.9)
	Secondary school	8 (4.5)	8 (6.5)	5 (21.7)
	Higher than above	1 (0.6)	3 (2.4)	0 (0)
	Non formal education	0 (0)	1 (0.8)	0 (0)
Occupation of a household head	Farmer	163 (92.1)	116 (93.5)	21 (91.3)
	Another occupation	13 (7.3)	8 (6.5)	2 (8.7)
	She/he does not have a job	1 (0.6)	0 (0)	0 (0)
Number of people having employed	None	150 (84.7)	101 (81.5)	20 (87.0)
	1 – 2	25 (14.1)	22 (17.7)	3 (13.0)
	3 – above	2 (1.1)	1 (0.8)	0 (0)
Number of people having side business	Non0065	114 (64.4)	74 (59.7)	7 (30.4)
	1 – 2	59 (33.3)	49 (39.5)	16 (69.6)
	3 – above	4 (2.3)	1 (0.8)	0 (0)

***U stands for urban; **R stands for rural**

*****The numbers in brackets for percentages**

The socio-demographic characteristics of the customers at market places are summarized in Table 8.From nationality, it tells that almost a quarter of the customers of the organic shop (23.5%) were foreigners. About sex of respondents, there was larger percentage of male in the organic shop (35.3% in the organic shop and 3.1% in the normal market place). Other profiles were similar between customers of the organic shop and customers of the normal market place.

Table 8: Socio-demographic characteristics of the respondents

Socio-demographic characteristics	Responses	Organic shop (n = 32)	Normal market place (n = 16)
Nationality	Tanzanian	13 (76.5)*	32 (100)*
	Foreigner	4 (23.5)	0 (0)
Age	Younger than 30	8 (25.5)	3 (18.8)
	30 – 59	22 (68.8)	8 (50.0)
	60 – above	2 (6.2)	5 (31.2)
Sex	Female	11 (64.7)	31 (96.9)
	Male	6 (35.3)	1 (3.1)
Marital Status	Married	10 (58.8)	25 (78.1)
	Single	6 (35.3)	6 (18.8)
	Divorced	1 (5.9)	1 (3.1)
Children	Yes	11 (64.7)	26 (81.2)
	No	6 (35.3)	6 (18.8)
Whether they have a farm	Yes	7 (41.2)	11 (34.4)
	No	10 (58.8)	21 (65.6)

*** The numbers in brackets for percentages**

4.2 Implemented Organic Farming

The findings presented in this section meet the first objective of examining how farmers implement organic farming. In order to meet the objective, agricultural environment and farming practices implemented by farmers were analysed and compared between organic farmers and conventional/traditional farmers.

4.2.1 Agricultural Environment

Crops grown by farmers in the study areas were categorized into seven crop groups of cereals, vegetables, tubers, pulses and seeds, fruits, and cash crops. Numerous types of vegetables were grown, but many of them were only grown by organic farmers and not by conventional/traditional farmers. Most of cash crops were also grown by only organic farmers. They grew various spices and coffee beans. Among the crops, the top three crops grown by both organic farmers and conventional/traditional farmers were maize, cow peas and pumpkins (See Table9). Those three crops were the crops grown most by both of organic farmers and conventional/traditional farmers, but there were other crops grown by a large proportion of organic farmers such as cassava (51.2%), banana (63.1%), beans (53.8%) and Chinese cabbage (41.2%). The average number of crops grown by organic farmers was 8.54 while that of the crops grown by conventional/traditional farmers was4.70. It was revealed that organic farmers covered a variety of crops while conventional/traditional farmers were mainly growing: maize, cow peas and pumpkins.

Table 9: Crops grown by more than half of each farming group

Crop	Organic farmers (n = 160)	Conventional/traditional farmers (n = 164)
Maize	143 (89.4)*	163 (99.4)*
Cow peas	88 (55.0)	107 (65.2)
Pumpkins	102 (63.8)	102 (62.2)

*** The numbers in brackets for percentages**

The size of farm land owned by more than half of the study sample was less than 1 ha (See Fig. 3). For organic farmers, the largest proportion (31.2%) owned farm land of 0.5 up to 1 ha. For conventional/traditional farmers, farm land of less than 0.5 ha and farm land of 0.5 up to 1 ha were owned most (both size are owned by 33.5%).

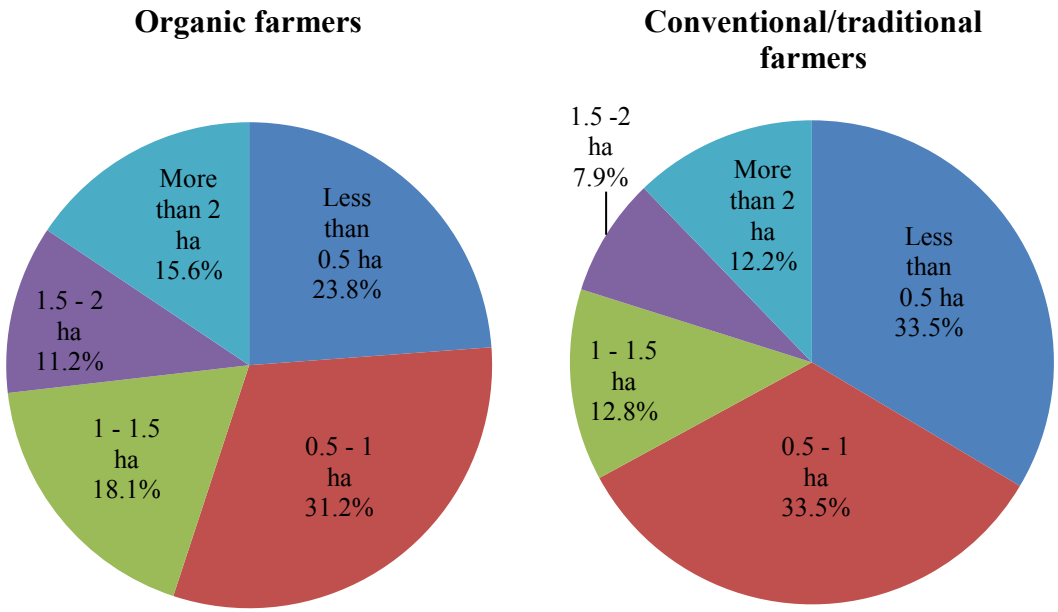

Figure 3: Size of farm land owned by the households (ha)

The most common livestock owned by farmers was chicken. More than 40% of organic farmers' owned10 to 49 chickens, and 46.3% of conventional/traditional farmers owned at least one chicken. Goats were owned especially by organic farmers. Some 23.1% of organic farmers and 13.4% of conventional/traditional farmers owned goats. Farmers owning more than 50 of one livestock were not so many as shown in Table10. There were only two farmers owning more than 50 goats, 19 farmers owning more than 50 chickens, and 1 farmer owning more than 50 ducks.

Table 10: Livestock owned by the households

Types of Livestock	Number of Livestock	Organic farmers (160)	Conventional/traditional farmers (164)
Cattle	None	156(97.5)*	150(91.5)*
	1 – 9	3(1.9)	8(4.9)
	10 – 49	1(0.6)	6(3.7)
	50 – above	0(0)	0(0)
Goat	None	123(76.9)	140(85.4)
	1 – 9	29(18.1)	15(9.1)
	10 – 49	8(5.0)	7(4.3)
	50 – above	0(0)	2(1.2)
Chicken	None	51(31.9)	79(48.2)
	1 – 9	35(21.9)	31(18.9)
	10 – 49	64(40.0)	45(27.4)
	50 – above	10(6.2)	9(5.5)
Duck	None	145(90.6)	140(85.4)
	1 – 9	12(7.5)	15(9.1)
	10 – 49	3(1.9)	8(4.9)
	50 – above	0(0)	1(0.6)
Pig	None	146(91.2)	137(83.5)
	1 – 9	9(5.6)	23(14.0)
	10 – 49	5(3.1)	4(2.4)
	50 – above	0(0)	0(0)

***The numbers in brackets for percentages**

Information on water for irrigation is summarized in Table11. It was found that more than 70% of organic farmers had available water for their farms, while more than 80% of conventional/traditional farmers depended on rain. Therefore, there was huge advantage for organic farmers compared to conventional/traditional farmers. River was the most used water source for irrigation. Furthermore, more than half of organic farmers who had available water for irrigation stated that it took less than 5 minutes for fetching water, Those organic farmers not taking time for irrigation were making use of equipment such as sprinkler and hose pipe. This favourable situation for organic farmers was probably due to geographical reasons. Since many of organic farmers in this study were living in

mountainous areas, they were able to make advantages of existence of rivers there. Moreover, it seems that organic farming organizations chose good localities with good water sources for starting up organic farming training. Mountainous areas are among disadvantaged areas from the views of transportation and marketing, but this geography brought benefit of water availability for irrigation in organic farming.

Table 11: Information of water for irrigation

Information of water for irrigation	Organic farmers	Conventional/traditional farmers
Water availability	**(n = 160)**	**(n = 164)**
Available	114(71.2)*	16 (9.8)*
Depends on a farm	10 (6.2)	6 (3.7)
Depends on rain	36 (22.5)	142 (86.6)
Water source	**(n = 124)**	**(n = 22)**
River	117 (94.4)*	12 (54.5)
Lower land	2 (1.6)	4 (18.2)
Tap water	3 (2.4)	2 (9.1)
Dam	0 (0)	1 (4.5)
Well	2 (1.6)	3 (13.6)
Time required for fetching water	**(n = 123)**	**(n = 20)**
Less than 5 mins	102 (63.8)*	13 (7.9)*
Less than 30 mins	18 (11.2)	5 (3.0)
More than 30 mins	3 (1.9)	2 (1.2)

*** The numbers in brackets for percentages**

Information on labourer is presented in Table 12. The Table shows that about half of both farming groups hired labourers, and there were no farmers employing permanent labourers. More than four-fifths of farmers employed labourers for less than one week (84.4% of organic farmers and 84.8% of conventional/traditional farmers). One up to five labourers was the most common number to employ, and expenditure on labourers of less than TZS 100,000 was the most common. Since target farmers are smallholder farmers, more than 80% of whom own less than 2 ha; labourers are usually needed only during farm land

preparation for planting various types of crops. This is why they have only casual labourers with durations of less than 7 days and expenditure of less than TZS 100,000.

Table 12: Labourers employed by farmers in 2013

Labourer's information	Response	Organic farmers (n = 160)	Conventional/traditional farmers(n = 164)
Casual labourers	Yes	86 (53.6)*	80 (48.8)*
	No	74 (46.2)	84 (51.2)
Permanent labourers	Yes	0 (0)	0 (0)
	No	160 (100)	164 (100)
Total duration of casual labourers	1 - 7 days	135 (84.4)	139 (84.8)
	8 – 30 days	18 (11.2)	24 (14.6)
	31 – above	7 (4.4)	1 (0.6)
Total number of casual labourers	1 – 5	134 (83.8)	125 (76.2)
	6 – 15	23 (14.4)	28 (17.1)
	16 – above	3 (1.9)	11 (6.7)
Total expenditure on casual labourers	Less than 100,000	121 (75.6)	116 (70.7)
	100,000 – 200,000	26 (16.2)	27 (16.5)
	More than 200,000	13 (8.1)	21 (12.8)

*** The numbers in brackets for percentages**

About years of practicing organic farming, more than half of organic farmers (56.3%) had conducted organic farming for less than three years. The percentage of organic farmers who had conducted organic farming for three to five years was 28.5%, and only 15.2% of organic farmers had conducted organic farming for more than six years. This is resulted from the fact that most of target organic farmers in this study are supported by organic farming organization, SAT, because SAT started the first organic training in 2010. Farmers conducting organic farming for more than six years were not scattered in several areas.

There were three in Mgambazi, one in Ruvuma and 20 in Kinole, and occupied 15.2% of total organic farmers. Especially in Kinole, the majority of the farmers surveyed (20 out of 24 farmers) had conducted organic farming for more than six years. This result of large proportion of long term organic farmers might be due to differences in understanding how to undertake organic farming. Kinole has been having chances to take training on organic farming since 2002

By UMADEP[7], and there are also big cooperative movements to try to certify their organic pineapple by TanCert. This situation that farmers are aware of organic farming seemed to make farmers understand that they are organic. There were several farmers in Kinole who mentioned "We have been conducting organic farming since my parents' generation, because my parents and I have never used agrochemicals". Thus, especially in Kinole, there are several farmers who do not have organic farming supporters and never took any organic training, but they are able to categorize themselves as organic farmers because of not using agrochemicals.

Types of organic farming support are summarized in Table13. It revealed that more than 90% of organic farmers had organic supporters. Except for one farmer, all of them had support from organic farming organizations such as Sustainable Agriculture Tanzania (SAT), *Comunità Volontari per il Mondo* (CVM) and National Networks of Farmers' Groups in Tanzania (MVIWATA). There were no organic farmers supported by a private company, the government and an export company in the study areas. More than two-thirds of organic farmers mentioned that they had occasional training on organic farming, and about half of them had attended training for more than 12 times.

[7] UMADEP stands for the Uluguru Mountains Agricultural Development Project, which aims to create awareness on safe use of industrial pesticides by developing and promoting local knowledge specifically around Uluguru Mountains in Morogoro Region (Mgumia, 2004).

Table 13: Organic farming support

Organic farming support	Percentage
Whether they have organic farming supporters(n = 160)	145 (90.6)
Organic farming supporters (n = 145)	
Organic farming organization	144 (99.3)*
Private company	0 (0)
Government	0 (0)
Export company	0 (0)
Individual farmers	2 (1.4)*
Whether they have occasional training on organic farming (n = 160)	111 (69.4)
Number of times they attended training within a year(n = 111)	
More than 12 times	54 (48.6)
More than 3 times	28 (25.2)
Less than twice	29 (26.1)

***Farmers were able to choose more than one answer. One farmer had support from organic farming organization and an individual farmer. Hence, total percentage exceeds 100%**

Farm equipment used (Fig. 4) shows that the most common farm equipment used were a hand hoe and a machete. Equipment for irrigation such as manual sprinkler, automatic sprinkler, and plastic bucket and hose pipe was highly used by organic farmers compared to conventional/traditional farmers. More than one-third of organic farmers (36.2%) used manual sprinklers while only 1.8% of conventional/traditional farmers used it. Automatic sprinkler was used by 11.9% of organic farmers, but there was no conventional/traditional farmers using it. On the other hand, tractor was used more by conventional/traditional farmers. There were only 6.2% of organic farmers using tractor while there were 36.6% of conventional/traditional farmers using tractor.

Differences in uses of farm equipment could result from differences in cropping style and existence of organic farming supporters. Many of conventional/traditional farmers grew very few crops, and their top three crops grown were maize, cow peas and pumpkins with percentages of 99.4%, 65.2% and 62.2% respectively. Those three crops are in most cases

intercropped. Therefore, conventional/traditional farmers growing fewer varieties of crops which are mostly intercropped easily utilize tractors for preparing farms at once. Since the average number of crops grown by organic farmers was 8.54, which implies that they had several crops that they grew in different seasons, they rarely were able to utilize tractors for shortening the period of preparing farm lands. Existence of farming supporters also caused differences of uses of farm equipment, since a large proportion of organic farmers were given important agricultural tools by organic farming organizations when they started organic farming.

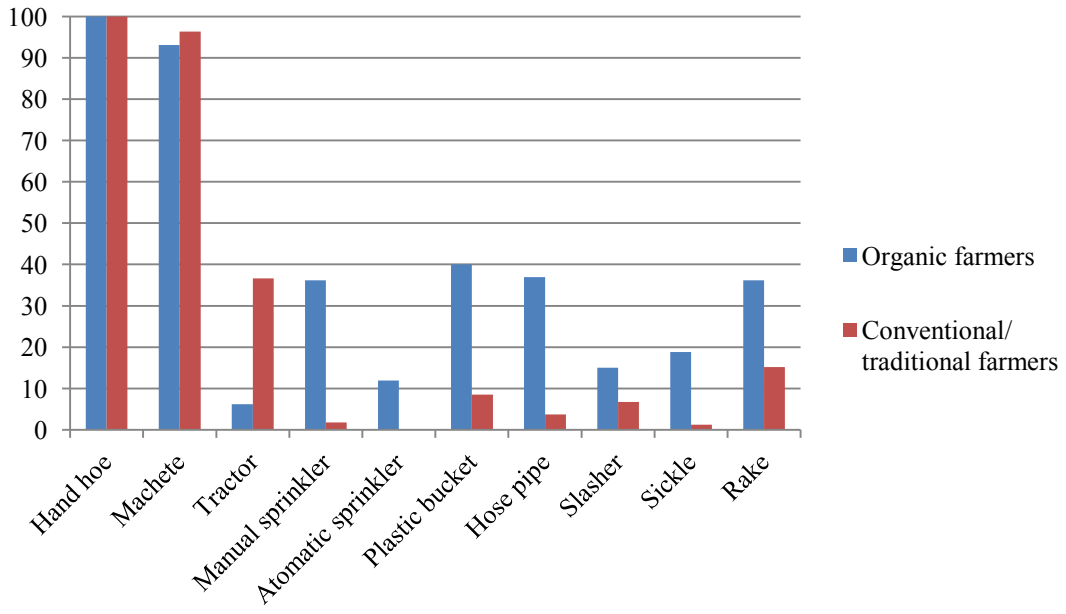

Figure 4: Farm equipment used

4.2.2 Adoption level of farming practices

Farming practices implemented by farmers are summarized in Table 14. With regard to synthetic fertilizers and pesticides, which are against the principle of organic farming, 13.8% of organic farmers were using both chemical fertilizers and pesticides. There were several reasons for this situation that there are some organic farmers using those synthetic fertilizers and pesticides. Some organic farmers divide their farms into an organic farm and

conventional farm such as some organic farmers of Langali village in Mvomero district and Kireka village in Morogoro Municipality. One old man conducting organic farming in Langali village said that “When we started organic farming as a group, I made one of my farms as an organic farm for family uses, because I want my family to eat non-harmful food. I left other farms as conventional for commercial uses”. One young girl in Kireka village mentioned that “My family is not applying organic farming to a maize farm, because organic farming works well for a vegetable farm. We were taught so by CVM (which is their supporter)”. In another case, some organic farmers learnt organic farming in a group farm, but they had not applied it to their family farm yet.

In a group of conventional/traditional farmers, 21.3% used those chemical fertilizers and pesticides. This result proved that many of conventional/traditional farmers do not use agrochemicals as researched in national statistics. According to NBS (2012), only 7.2% of the total area planted was applied with chemical fertilizers in Tanzania Mainland. The low per cent of uses agrochemicals by conventional/traditional farmers which was 21.3% tells that most of the conventional/traditional farmers targeted in this study were traditional farmers who did not utilize synthetic fertilizers and pesticides. This is why in this dissertation farmers are categorized into organic farmers and “conventional/traditional farmers”.

Big differences were seen in the use of organic fertilizers and organic pesticides. Over 90% of organic farmers used organic fertilizers, and 71.9% used organic pesticides. On the other hand, conventional/traditional farmers using organic fertilizers and pesticides were 35.4% and 3.0% respectively. The uses of crop rotation, terracing and mulching also showed differences between them. The results in Table 19 show that 81.9% of organic farmers used

crop rotation while 25.6% of conventional/traditional farmers used this farming practice. For terracing, 63.1% of organic farmers used it while 34.1% of conventional/traditional farmers used it. Mulching was used by 81.2% of organic farmers and 19.5% of conventional/traditional farmers. There were not so big differences in the uses of intercropping and cover crops even though the percentage of organic farmers was slightly higher. Both of the farming groups applied those two practices at high percentages. Conventional/traditional farmers' high adaptation level of the two farming practices may have resulted from the trend of the crops grown. The top three crops grown by both organic farmers and conventional/traditional farmers were maize, cow peas and pumpkins, and many farmers tended to intercrop those crops. This trend of crops grown explains small differences in percentages of the used of intercropping and cover crops.

Table 14: The use of farming practices among the farmers

Farming practices	Organic farmers (n = 160)(%)	Conventional/traditional farmers (n = 164)(%)
Chemical fertilizers	13.8	21.3
Chemical pesticides	13.8	21.3
Organic fertilizers	90.0	35.4
Organic pesticides	71.9	3.0
Crop rotation	81.9	25.6
Intercropping	75.0	74.4
Terracing	63.1	34.1
Mulching	81.2	19.5
Cover crops	88.8	78.0

Scores of overall adaptation of organic farming practices are summarized in Table 15. The minimum score was 2 from organic farmers and -1 from conventional/traditional farmers. The maximum score was 9 from organic farmers and 8 from conventional/traditional farmers. The mean scores showed big difference; organic farmers had a mean of 6.97 while conventional/traditional farmers had 3.85. The score on overall adaptation of organic

farming practices was analysed with independent samples T test, and the difference was significant at 95% confidence level (F = 8.343, p ≤0.001).Therefore, even though some organic farmers of this study's sample used agrochemicals, and some conventional/traditional farmers used most of organic farming practices, this result proved that this study can continue distinguishing those two groups of organic farmers and conventional/traditional farmers. Besides, the minimum score of organic farmers, which is 2, means that there was no even single organic farmer who used agrochemicals and did not use any of organic farming practices.

Table 15: Score of overall adaptation of organic farming practices

Farming group	Min	Max	Mean	F-value	p-value
Organic farmers (n = 160)	2	9	6.97	8.343	0.000
Conventional/traditional farmers (n = 164)	-1	8	3.85		

4.3Situation of Crop Products' Selling

The second objective was analysed in this section. The situation of crop products' selling varied among organic farmers and conventional/traditional farmers (See Table16).Constant markets and regular customers were many on the side of organic farmers. More than two-fifths (43.1%) of organic farmers had constant markets, while only 8.5% of conventional/traditional farmers had constant markets. Among those organic farmers having constant markets, 75% went to market places more than once a week. About regular customers, 44.4% of organic farmers had regular customers while 7.9% of conventional/traditional farmers had them. More than two-thirds of organic farmers (69%) sold the crop products to the customers more than once a week. It was found that 7.5% of organic farmers mentioned that they had a contract with traders/buyers, but no conventional/traditional farmers had a contract like them.

This situation that organic farmers had better selling conditions may come from some

reasons. First, a trend of crops grown by each farming groups influences the selling situation. Since conventional/traditional farmers grow fewer crops compared to organic farmers, they do not really have various crops to sell. Conventional/traditional farmers' most grown crops were maize, cow peas and pumpkins, which are typically consumed at home. However, a quite large proportion of organic farmers grew several crops which commonly bring sales such as banana and Chinese cabbage. Those differences led to the result that the percentage of organic farmers having constant markets and regular customers were more than four times the percentage of conventional/traditional farmers. Second, organic farmers seemed to be more motivated to sell their crop products as organic products since when they started organic farming. Farmers' unwillingness to participate in the market is reported as one of the reasons of low rate of commercialization in Tanzania (Morisset, 2013). However, one old man in Langali village mentioned that "I had an expectation that organic market would grow, and we would get premium price". Another old man in Ruvuma village also said that "We expected that organic products would be different from normal ones, and prices would be higher". Even though not so many organic farmers got premium prices, that motivation possibly led to the higher number of crops to sell.

Table 16: Crop products' selling ways

Information of crop products' selling	Response	Organic farmers (n =160)	Conventional/traditional farmers (n = 164)
Whether they have a constant market	Yes	69 (43.1)*	14 (8.5%)*
	No	91 (56.9)	150 (91.5%)
Whether they have a contract with trader/buyers	Yes	12 (7.5)	0 (0)
	No	147 (91.9)	164 (100)
How often they go to a market	More than once a week	51 (75.0)	8 (57.1)
	More than once month	14 (20.6)	1 (7.1)
	Less than once month	3 (4.4)	5 (35.7)
Whether they have a regular customers	Yes	71 (44.4)	13 (7.9)
	No	89 (55.6)	151 (92.1)
How often they sell the crop products to the customers	More than once a week	49 (69.0)	9 (69.2)
	More than once a month	16 (22.5)	4 (30.8)
	Less than once a month	6 (8.5)	0 (0)

*** The numbers in brackets for percentages**

About the percentages of crop products sold by farmers, it was revealed that except for maize, sunflower, millet, pigeon pea leaves, green gram, orange and watermelon, every crop product was sold more by organic farmers (among those, green gram, orange and watermelon are not grown by any organic farmers). There were several crop products that no conventional/traditional farmers sold; especially vegetables, fruits and cash crops.

The top five crop products sold most by each farming group are shown with average income of each crop in Table 17. The most common staple crop in Tanzania, which is maize, was the first crop product sold most by conventional/traditional farmers, but it was not in

the top five crop products sold by organic farmers. Instead of maize, the crop products sold most by organic farmers started with banana (58.8%) and Chinese cabbage (34.4%). Those two crops (leaf vegetable and banana) are often said to be easy to be adapted for organic farming and easy to show the effect of organic farming (University of Kentucky, 2007).The top four crops sold by organic farmers showed high average income, and those four crops were rarely grown by conventional/traditional farmers.

Table 17: Top five crop products sold by each farming group

	Organic farmers (n =160)			Conventional/traditional farmers (n = 164)		
	Crop	**Frequency**	**Average income**(TZS)**	**Crop**	**Frequency**	**Average income **(TZS)**
1	Banana	94 (58.8)*	1000542***	Maize	40 (24.4)*	404052***
2	Chinese cabbage	55 (34.4)	91505	Pumpkins	20 (12.2)	48366
3	Beans	54 (33.8)	364321	Cow pea	19 (11.6)	8137
4	Cassava	49 (30.6)	147446	Sweet potato	17 (10.4)	10225
5	Tomato	44 (27.5)	193340	Tomato	13 (7.9)	309115

*** The numbers in brackets for percentages**

****The average was calculated among farmers who sold those crops**

*****The average income was rounded off to the whole number**

Information about selling status of crop products is summarized in Table18. More than one-third of organic farmers (38.1%) sold their crop products or at least some of them as organic products. Among them, 18.1% sold their crop products or at least some of them for higher price as premium price of organic products. Most of organic farmers sold their crop products as normal products without letting customers know that they were organic. While 38.1% of organic farmers sold their crop products as organic products, only 18.1% of them succeeded to lead to premium price. It implies that the difficulties of gaining attentions of customers and buyers for crops status, and connecting those attentions to premium price.

Table 18: Selling price of crop products of organic farmers

Information of selling price	Response	Organic farmers(n=160)
Status of crop products at market	Organic crop products	42 (26.2)*
	Normal crop products	99 (61.9)
	Organic and normal crop products	19 (11.9)
Whether crop products have premium price due to being organic	Yes	11 (6.9)
	No	131 (81.9)
	It depends on a crop product	18 (11.2)

*** The numbers in brackets for percentages**

The crops that gave organic farmers premium prices are seen in Table 19. Prices of three staple food (maize, rice and banana), two more crops grown most by conventional/traditional farmers (cow pea and pumpkins), and some vegetable grown by both farming groups (Chinese cabbage, tomato, cabbage) are summarized. Average prices of crop products of organic farmers were higher than those of conventional/traditional farmers, except for cow pea and pumpkins. Big differences in average prices were seen in the price of rice (745.12 by organic farmers and 530 by conventional/traditional farmers). Some differences in average prices resulted from selling places. In the case of rice which showed the biggest differences in the price between organic farmers and conventional/traditional farmers, some organic farmers sold rice in the organic shop of SAT for higher price. That is the maximum price of TZS 1500 (per 1 kg) in Table 19.

Table 19: Average price of 1kg of crop products sold (TZS)

Crop	Organic farmers				Conventional/traditional farmers			
	N	Min	Max	Average	N	Min	Max	Average
Maize	31	150	1400	526.45	40	30	750	490.02
Rice	16	100	1500	745.12	3	400	700	530
Banana	95	80	1080	304.38	7	100	450	202.00
Cow pea	13	70	2910	920.00	19	320	2000	1070.95
Pumpkins	25	114	700	304.92	19	100	1800	516.47
Chinese cabbage	53	400	2000	1241.51	8	50	1200	407.12
Tomato	44	150	1000	497.66	13	125	1800	490
Cabbage	28	70	1600	342.25	80	100	666	214.12

4.4 Comparison of Productivity, Profit and Food Security between Organic Farmers and Conventional/traditional Farmers

The findings presented in this section meet the third objective. In order to meet the objective, data of productivity, profit and food security were compared between organic farmers and conventional/traditional farmers.

4.4.1 Productivity

Average crop productivity from 1 ha for each crop is summarized in Table 20. The crops grown most by both farming groups; which are maize, cow pea and pumpkins; showed higher means of productivity among organic farmers, but the differences between organic farmers and conventional/traditional farmers' outputs were not significant ($p > 0.05$).However, significant differences were seen in some other crops. For instance, tomato (Number of organic farmers = 53, Number of conventional/traditional farmers = 16), Chinese cabbage (Number of organic farmers = 65, Number of conventional/traditional farmers = 12) and amaranths (Number of organic farmers = 37, Number of conventional/traditional farmers = 8) showed significantly higher productivity among organic farmers at 95% confident level. Those three crops are often said that they can show

immediate changes along with organic farming practice such as organic fertilizers and pesticides, and they are often used in organic farming training sessions (University of Kentucky, 2007). Therefore, those results imply that crops that farmers are taught on how to grow more likely show higher productivity. Two reasons could be the causes of the high productivity. First, organic farming practices simply promote high productivity by making richer environment for crops (Yadav, 2005). Second, normal farming knowledge taught in organic farming training such as farm arrangement helps high productivity. One farmer in Bamba explained that they did not know how to arrange crops in a farm, and used to plant crops very roughly. After training on organic farming, they got to know the necessary length between crops in a seed bed, and many of them had feelings that productivity had increased. Thus, it could be said that taking training on organic farming increases productivity.

Table 20: Means of productivity from 1 ha

Crops	Farming style	N	Mean	F	Sig.
Maize	Organic	141	1156.3	1.251	0.264
	Conventional/traditional	162	1039.44		
Cow pea	Organic	80	207.77	0.25	0.875
	Conventional/traditional	92	186.31		
Pumpkins	Organic	95	409.62	2.436	0.120
	Conventional/traditional	81	261.83		

4.4.2 Profit

The minimum, maximum and mean gross incomes are summarized in Table 21. Both maximum and mean of organic farmers were higher than those among conventional/traditional farmers. The mean profit among organic farmers was more than four times that of conventional/traditional farmers. This could have resulted from the distorted distribution of income among conventional/traditional farmers. Among

conventional/traditional farmers, 44.5% did not have any income from their crop production, while there were only 5.6% of organic farmers who did not have any income. This low rate of commercialization of Tanzanian farmers is also reported by Morisset (2013) that 26% of all farmers did not sell any of their crop products. Besides, as FAO (1999) stated that "diversity in production increases income-generating opportunities", organic farmers' diversification of crops also contributed to the higher income. The minimum, maximum and mean total costs are summarized in Table 28. Even though the percentage of conventional/traditional farmers who did not spend any money for agricultural expenditure was higher than that of organic farmers (12.8% of conventional/traditional farmers and 5.6% of organic farmers), mean costs of conventional/traditional farmers were higher than those of organic farmers.

Table 21: Descriptive information of gross income, total costs and profits among organic farmers and conventional/traditional farmers

Variable described	n	Min	Max	Mean
Gross income of organic farmers	160	0	56005000	1842657.20
Gross income of conventional/traditional farmers	164	0	17255000	378872.99
Total costs of organic farmers	160	0	1269000	206049
Total costs of conventional/traditional farmers	164	0	2382500	231902

Descriptive information of profit of farmers is summarized in Table 22. The mean profit among organic farmers was higher than that among conventional/traditional farmers with smaller minimum amount and bigger maximum amount. The mean of profit of 2013 of organic farmers was TZS 1,636,608.14 and TZS 146,970.55 for conventional/traditional farmers, which is less than one-tenth of that of organic farmers. Independent sample T test showed significant difference between profits of organic farmers and those of conventional/traditional farmers ($F = 13.652$, $p \leq 0.001$). This big difference stemmed from deficit of a large proportion of conventional/traditional farmers. There were 58.5% of

conventional/traditional farmers who had deficit, while only 13.1% of organic farmers had deficit. Less income and higher expenditure of conventional/traditional farmers made up this situation. On the other hand, organic farmers can lower farm expenditure and increase income. This combination of less expenditure and higher income of organic farming is supported by several researches which showed reduction of input costs and increase of incomes in organic system (Peramaiyan *et al.*, 2009 and IFOAM, 2006)

Table 22: Profit (TZS) among organic farmers and conventional/traditional farmers

Framing group	n	Min	Max	Mean	F	Sig.
Organic farmers	160	-391000	54736000	1636608.14	13.652	0.000*
Conventional/traditional farmers	164	-1879000	16625500	146970.55		

***significant at 0.001 level**

4.4.3 Food security

The mean of food consumption score of organic farmers was 51.17, and was higher than that of conventional/traditional farmers, which was 49.45. Scores calculated according to the categories of poor (1), borderline (2) and acceptable (3) were compared between two farming groups, and it showed higher mean of organic farmers (See Table23). The difference between organic farmers and conventional/traditional farmers was significant ($F = 6.514$, $p < 0.05$).

In terms of dietary energy consumed, households of organic farmers had higher mean of dietary energy consumed (2976.53kCal per adult equivalent per day) than the kCal consumed by households of conventional/traditional farmers (2912.25 per adult equivalent per day).As shown in Table 23, the difference of the mean dietary energy consumed was not significant ($F = 1.414$, $p > 0.05$). Households were grouped into food insecure and food secure based on the cut-point of 2200 kCal, which is the national caloric poverty line per

adult equivalent per day in Tanzania. There were 24.4% of households of conventional/traditional farmers that were below the cut-point, while the proportion of households of organic farmers that were below the cut-point was less than 19.4%. It implies that there were more households having secured dietary energy consumed The score of the group of food insecure which consumed below 2200 kCal (1) and the score of the group of food secure which consumed more than 2200 kCal (2) were compared between organic farmers and conventional/traditional farmers (See Table30). The difference between organic farmers and conventional/traditional farmers was significant ($F = 4.793$, $p \leq 0.001$).

The percentage of expenditure on food showed opposite results from other food security information. The mean percentage of expenditure on food of organic farmers (65.9%) was higher than that of conventional/traditional farmers (54.3%) when higher percentage means more vulnerable to food insecurity. From the view of categories of food insecure level, the score in Table 23showed significant difference between them ($F = 5.438$, $p \leq 0.001$). Therefore, the result tells that organic farmers were more vulnerable to food security according to this indicator. This result might be related to the fact that organic farmers had lower average of expenditure on farming activities than that of conventional/traditional farmers. When the total expenditure is low because of the low costs for farming activities, the percentage of expenditure on food becomes higher. This could explain why the percentages of expenditure on food of organic farmers are higher than that of conventional/traditional farmers. When considering this background, it is difficult to simply say that organic farmers were more vulnerable to food security.

Table 23: Independent sample T test comparing food security between organic farmers and conventional/traditional farmers

Variable compared	n	Mean	F	Sig.
Food consumption score of organic farmers	160	2.77	6.514	0.011*
Food consumption score of conventional/traditional farmers	164	2.70		
Dietary energy consumed of organic farmers	160	2976.53	1.414	0.235
Dietary energy consumed of conventional/traditional farmers	164	2912.25		
Scores of dietary energy consumed of organic farmers	160	1.81	4.793	0.029*
Scores of dietary energy consumed of conventional/traditional farmers	164	1.76		
Scores of percentage of expenditure on food of organic farmers	160	2.72	5.438	0.000**
Scores of percentage of expenditure on food of conventional/traditional farmers	164	2.15		

***significant at 0.05 level; **significant at 0.001 level**

From food security perspective, organic farmers showed better results on food consumption score and dietary energy consumed. Even though the percentage of expenditure on food, which considers economic situation, showed more vulnerability of organic farmers, simple food security indicators still support the better condition of organic farmers. Therefore, it could be said that food security of household level can be secured by organic farming. There are two possible reasons for this better household' food security according to UN (2008). First, increased quantity of food produced on farm led to higher accessibility to enough food. Second, organic farmers' higher incomes increased their purchasing power.

4.5 Factors Influencing Crop Productivity, Profit and Food Security

The findings presented in this section meet the fourth objective of the research. In order to meet the objective, factors which have possibility to affect productivity, profit and food security were analysed using multiple linear regression.

4.5.1 Crop Productivity

The multiple linear regression was run for productivity of maize, cow pea and pumpkins. The results of multiple linear regression analysis of maize productivity showed that sex of a household head, number of people in a household and whether they had a constant market had significant impact on productivity of maize (See Table24). Since the B coefficient for sex of a household head was negative, it tells inverse relationship with productivity of maize. Since coding of sex of a household head was 0 = Female and 1 = Male, this result implies that female headed household had higher productivity of maize. About the number of people in a household, it implies that households with the higher number of household members had higher productivity of maize. At last, it was shown that households having a constant market had higher productivity of maize. Multiple linear regression of productivity of cow peas showed that there was no any factor which affected productivity of cow peas significantly.

The result that female-headed households had higher maize productivity became opposite to a number of studies. For instance, one research about difference in maize productivity between male- and female-headed households in Uganda revealed that productivity was significantly lower for female-headed households (Koru and Holden, 2010). Another research in rural Zimbabwe also revealed that productivity of cotton of female-headed households is lower than that found for male-headed households (Horrell and Krishnan, 2006). Those unfavourable situations for female-headed households are often explained by education and accessibility of farm assets such as equipment and fertilizers (FAO, 2015, Takane, 2007). Therefore, this study revealed that female-headed households no longer suffer from their traditional disadvantages which have been discussed. While there is no noticeable support for female-headed households from the government and education of a

household head did not have significant impact on maize productivity, this result could be explained by women's high commitment to maize production activities. However, more research on gender roles in agricultural practices could bring deeper explanation for this higher productivity of maize by female-headed households.

The factor of the number of people in a household tells that households with a larger number of people had higher productivity. It could be said that large number of household members leads to bigger labour force at farm. Since maize is the most important crop which is consumed at home, most of households allocate a large space of farm to maize. Thus, having enough number of workers from a household is a quite big help for a family. The result also shows that having a constant market leads to higher productivity of maize. There may be a difference of motivation for production of maize. Households having constant markets could care more about their farm because of motivation for selling.

The variable of whether they owned livestock showed significant association with productivity of pumpkins. Impact of organic fertilizer could be expected first since they could utilize animal manure from livestock, but the variable of whether they applied organic fertilizers did not show significant impact ($p > 0.05$),while whether they owned livestock did ($p = 0.001$) on productivity of pumpkins in regression. Therefore, adaptation of organic fertilizers did not contribute to high productivity of pumpkins. It was found that total income from livestock keeping had significant impact on productivity of maize in regression ($p \leq 0.05$). This income from livestock could help farmers buy farm inputs or equipment, and lead to higher productivity. Additionally, higher income added by livestock keeping may make households to be able to have a separate farm for pumpkins. Since maize, cow pea and pumpkins are the crops used most for intercropping, many households did not have a separate farm of pumpkins. It may cause lower productivity of pumpkins in

this study, since the study did not consider whether they intercropped or not when calculating productivity. Therefore, this relationship between productivity of pumpkins and whether they owned livestock implies livestock owners' ability of making separate farms. The result for productivity of pumpkins showed inverse relationship between productivity of pumpkins and whether they owned livestock (See Table24). Since the coding of livestock was 0 = Yes and 1 = No, it implies that livestock owners tended to have higher productivity of pumpkins.

4.5.2 Profit

Empirical analysis between profit and some of the dependent variables were conducted. According to the results shown in Table24, profit was attributed to years of practicing organic farming. It implies that more experienced organic farmers tend to get higher profit. Two main reasons can explain this observation. First, experienced organic farmers easily take advantages of organic fertilizers and pesticides which they can prepare with local materials without purchasing. Some new organic farmers have not adapted such practices. Some have not found the reasonable purchasing way of animal manures for them. Therefore, experienced organic farmers could decrease their expenditure on inputs, and bring higher profit. Second, experienced organic farmers could get higher income by establishing markets for their crop products' selling. It could be quite difficult for new organic farmers to get premium price at market places. Experienced organic farmers are more likely to get a chance to sell their crop products as organic products. However, years of practicing organic farming is one of the elements of organic farming. Except for elements of organic farming, there would be no significant factors affecting profit of the farmers. Therefore, this result after all came to support the significant difference of profit between organic farmers and conventional/traditional farmers.

4.5.3 Food security

Factors affecting food security were analysed from aspects of food consumption score, dietary energy consumed and percentage of a household's total expenditure on food. Multiple linear regression of food consumption score showed it was attributed to whether they owned livestock, age of a household head and whether they had organic supporters (See Table 31). Since B coefficient of whether they owned livestock was negative (0 = Yes, 1 = No), it implies that households with livestock had higher food consumption score. About age, elder person-headed households had higher food consumption score. The variable of whether they owned livestock could be related to income from livestock. Since about half of livestock keepers had incomes in 2013 from selling their livestock or their products such as eggs and milk (average income from livestock was 205421.3), these additional earnings to income from crop production may have economically caused better food security. In a related study, Bashir *et al.* (2012) found that smallholder farmers with livestock of cows, buffalos, goats and sheep had significantly higher food security in Pakistan. Age of household head may have positive effect on food security because of their richer experiences as supported by Obamiro *et al* (2003).

About dietary energy consumed, multiple linear regression showed that there was no significantly effective factors to dietary energy consumed. Multiple linear regression of percentage of a household's total expenditure on food showed that it was due to whether they had enough water in their farm (See Table 24). Since the coding of the variable of whether they had enough water in their farm was 2 = Available, 1 = Depends on a farm and 0 = Depends on rain, this inverse relationship implies that households having available water source had higher vulnerability to food insecurity. Water cost would be one of the reasons of the situation that households with available water source were more vulnerable to food insecurity. Since other households not having available water source had occasional

expenditure on water, this additional cost pulled down the percentage of food cost against total household's expenditure.

Table 24: Impact of some of the independent variables to productivity, profit and food security

Dependent variable	Independent variable	n	Unstandardized Coefficients (B)	Beta	T	Sig.
	Sex of a household head*	324	-0.337	-0.296	-3.105	0.002**
Productivity of maize	Number of people in a household	324	0.061	0.248	2.599	0.011*
	Whether they had a constant market	324	-0.203	-0.216	-2.287	0.024*
Productivity of pumpkins	Whether they owned livestock	324	-0.937	-0.380	-3.384	0.001***
Profit	Years of practicing organic farming	324	337206.131	0.375	3.839	0.000***
Food consumption score	Whether they owned livestock	324	-6.377	-0.244	-2.831	0.005**
	Age of a household head	324	0.169	0.226	2.622	0.010**
Percentage of a household's total expenditure on food	Whether they had enough water in their farm	324	-20.099	-0.236	-2.695	0.015*

*** Multiple linear regression was run with 13 independent variables for each of the dependent variables, but this table only shows the independent variables which showed significant impacts on the dependent variable**

****significant at 0.01 level; *significant at 0.05 level; ***significant at 0.001 level**

4.6 Challenges of Organic Farmers

This section presents the findings for the fifth objective. Challenges of organic farmers were determined using content analysis of FGDs.

4.6.1 Profiles of villages

Focus group discussions were conducted in three villages namely Kireka, Ruvuma and Kauzeni. In Kireka, which is located at the bottom of Uluguru Mountains with several rivers in Morogoro Municipality, 25 households were conducting organic farming. In 2013, Kireka village got a chance to get a free organic farming training from an Italian NGO, *Comunità Volontari per il Mondo* (CVM) which is targeting youth development in agriculture. Kireka village made a youth group for the training, and they had an one year-training which was offered once per week in a group farm. They were taught how to make fertilizers and pesticides organically, how to make good farming environment by terracing, crop rotation and mulching. Members were given important agricultural equipment, seeds, and certificates after completion of the training. According to the group members, CVM teaches that organic farming works better for garden farming, so some of the members divide their farm into an organic farm which is mainly for vegetables and a conventional farm which is for other crops such as maize.

In Ruvuma village, which is located in upper Uruguru Mountains with plenty water in Morogoro Municipality, about 20 households were conducting organic farming. In 2010, the village got an announcement of free organic farming training from a Tanzanian organization named Sustainable Agriculture Tanzania (SAT). People made a group and started taking the once per week-training for a year in a group farm. They were taught how to prepare farm land by terracing, how to make organic fertilizers and pesticides and arrangement of planting. SAT gave the group necessary farm equipment. They are the main producers for an organic shop established by SAT in Morogoro town. They bring their crop products to the organic shop every week according to the order from the shop. From 2013, they started training other two farmers' groups which are near to Ruvuma village. Their organic products are certified by a Participatory Guarantee System (PGS) under the East

African Product Standards (EAOPS) (SAT, 2013).

In Kauzeni village, which is located about 8 km away from the centre of Morogoro Municipality, about 10 households were conducting organic farming. In 2012, the village got an announcement of free organic farming training from SAT, and farmers started taking the training for a year in a group farm. They learnt how to make organic fertilizers and pesticides and ecosystem which should be conserved. SAT gave the group necessary farm equipment.

4.6.2 Reasons to start organic farming

There are several reasons for farmers to start organic farming (See Box 1). There are expectations for less expenditure on agrochemicals, health issues and expectation of premium price.

Box 1: Reasons for farmers to start organic farming

The reasons for the surveyed farmers to start organic farming could be generally grouped into three major categories as shown below:

Less expenditure on agrochemicals

"We used to buy fertilizers, but it was expensive. Now this expenditure has been decreased." (Old woman in Ruvuma)

Health issues

"Our expectation of organic farming is good harvest of good and safe crops." (Old woman in Ruvuma)

"We used to use chemical pesticides. It works well, but there are health problems these days because of chemicals"

Premium price

"We expected that organic products are different from normal ones, and price would be increased." (Old man in Ruvuma)

4.6.3 Strengths of organic farming

The farmers mentioned several strengths of organic farming (See Box 2). There are higher understanding of ecosystem, homemade fertilizers and pesticides and stronger crops. Higher understanding of ecosystem was taught by organic farming organizations through training, and they helped them to create better farming environment. Since farmers of all the three areas learnt how to make organic fertilizers and pesticides from available materials, it decreased farm expenditure, and made farmers to make use of local materials. There were also some farmers who mentioned that crops grew better compared to the time they were using agro-chemicals by giving examples of crop troubles they used to have.

Some farmers mentioned that they were satisfied with organic farming, because they got to know general agricultural knowledge such as how to keep seeds, and how to arrange crops in a farm. Therefore, it seems that organic farmers take advantages even from the general

agricultural lessons provided during organic farming training.

Box 2: Strengths of organic farming

Below are some of the quotations from the farmers about strengths of organic farming. Their opinions were categorized into three groups.

Higher understanding of ecosystem

“We used to fire farms. Now we know that there are good microorganisms (and we stopped putting a fire).” (Middle aged woman in Kauzeni)

Homemade fertilizers and pesticides

“We do not need to struggle in farming shops.” (Old woman in Kauzeni)

"We used to see weeds as functionless and throw them away. Surprising enough they have their role (for fertilizers)." (Old woman in Ruvuma)

Stronger crops

“When I harvested carrots which were grown with chemical pesticides, the carrots used to become rotten. But they do not now.” (Old woman in Ruvuma)

“When we used agro-chemicals, plants used to become bad in summer season. They turn to yellow colour. But after starting organic farming with fertilizer of animal manure, plants are okay even under strong sun. They grow well. Moreover, vegetables do not get so many diseases as many as they used to have when we used agro-chemicals.”(Old woman in Ruvuma)

“When we used agro-chemicals, if you planted maize, some of them grew well but some did not grow well. It made us to buy fertilizer to make them grow again. But organic maize grows well without that process. It gives us a lot of profit.”(Old woman in Ruvuma)

4.6.4 Difficulties of conducting organic farming

Despite the strengths of organic farming mentioned above, they had difficulties of conducting organic farming, as shown in Box 3. It was revealed that there were challenges of land preparation, market, premium price, contamination, and water availability.

Box 3: Difficulties of conducting organic farming

Below are some of the quotations from the farmers with regard to difficulties of conducting organic farming. They could be grouped into five categories as shown below:

Preparation of a farm land

"Making terraces by yourself is not easy. To get money for hiring people to help with this work is difficult" (Old man in Ruvuma)

"If you have a farm of 1.5ha, you cannot make terraces by yourself. Hiring a temporary worker for making one terrace costs TZS 5000. It is expensive." (Old woman in Ruvuma)

No market

"There is no selling place. Sometimes amaranths stay at farm until they get rotten." (Young girl in Kireka)

"We harvest many times, but we take rest during the long rainy season because vegetables will be too much."(Young girl in Kireka)

No premium price

"People have interest in organic products. But if we sell in this area, price should be the same as that of neighbours."(Middle aged woman in Kauzeni)

"People know organic farming. But they do not know values of health. You can tell a customer that your one bunch of carrots is for TZS 1500. She/he goes for carrots of TZS 600 which are grown with agrochemicals." (Old man in Ruvuma)

Contamination of soil with conventional farmers

"We are using organic fertilizers and pesticides. But some neighbours are using chemicals. Our crops get contaminated on farm." (Middle aged woman in Kauzeni)

Necessity of water

"When you grow vegetables, it is necessary to have water." (Old woman in Ruvuma)

Cost for preparation of a farm land rises is often raised as one of the constraints of organic farming. Many studies have found that organic farming requires greater labour input (FAO, 1999). Even though the surveyed farmers in this study were smallholder farmers who did not need as many labourers as large scale organic farmers need, it was revealed that land preparation was a big burden on organic farmers.

The situation of no market is a big problem, and even the long rainy season, which is usually a suitable time for farming, became a time to take a rest because of too much crops without markets in some areas. According to UN (2006), poor organic market development is raised as one of the constraints of organic farming. During the FGDs, it was found that even normal market development was very poor, and it became a challenge for organic farmers. It was also revealed that there were organic farming groups which could access the organic shop for selling and which could not. One middle aged woman in Kauzeni mentioned that "we were told that there is an organic shop in town, but we did not have transportation". The organic shop in town, owned by SAT, buys crop products from only a few villages which are near to the shop. Therefore, even organic farmers trained by SAT do not have an easy access to sell there. In another case, farmers in Kireka, the group trained by CVM, did not have a selling place. In addition to this accessibility issue, there were also challenges of selling crop products in the organic shop. One of the farmers mentioned that "If you order only five (crop products), others get rotten in a big farm", meagre scale of the organic shop is another issue which constrains organic farming.

With regard to the selling price, most farmers had difficulties to get premium price. The FGDs revealed that people have interests in organic products, but it rarely leads to premium price. Farmers in Kireka explained that people know they conduct organic farming and many of them like their organic products because they do not have chemicals. Another farmer in Kauzeni also mentioned that people get interest in organic products when they tell them about organic products. However, those customers' positive reactions do not seem to be big enough to create premium price in many cases as one farmer in Kauzeni said that "price (of our organic products) should be the same as that of neighbours". There are chances for organic farmers to get higher price as a young girl in Kireka said that "sometimes we see others selling their crop products for TZS 200 and our price is TZS

300".Another man in Ruvuma also mentioned that there are some people who buy even for higher price because they know what health is. However, as he continued that those people are very few, those who have understanding of organic products with willingness to purchase are very few. This premium price issue is also important when considering promoting organic farming. One farmer in Ruvuma explained that when they promote organic farming to neighbours, some farmers do not get attracted because of the same selling price.

Contamination of soil with conventional farmers is a difficult issue. Even though there are not so many conventional farmers using agro-chemicals for this time yet, according to the country's trend, the number of users of agro-chemicals would increase in the future. Especially mountainous areas where no efficient coping strategies against soil erosion are used would get serious damage.

The necessity of water was not a problem for the people who mentioned it, but it reminds us that it is difficult to conduct organic farming in areas where there is poor water availability. The availability of water should be considered well when starting organic farming. As organic farming organizations provided hose pipes or sprinklers when starting training, presence of water is considered as very important. One traditional farmer in Lukobe pointed out one of the challenges of organic farming by explaining their situation that they need to buy buckets of water. She mentioned "If I buy buckets of water which for TZS 200 each for growing vegetables and sell one bunch of them for TZS 200, can we really get profit?". This water issue would be essential when considering possibilities of conventional/traditional farmers to start organic farming.

4.7 Communities' Attitude towards Organic Products

The sixth objective of this research was to determine communities' attitude towards organic products. In order to meet this objective, this section analyses the data of knowledge of market customers and their attitude towards organic products.

4.7.1 Knowledge of organic products

Knowledge of market customers about organic products is summarized in Table25. About the question whether they knew what organic products are, 100% of customers of the organic shop answered either "I know them well" or "I know a little bit". On the other hand, 25% of customers of the normal market place answered "I know them well" or "I know a little bit", and 65.6% of them chose the answer of "I have never heard of them". Among the people who answered "I know them well" or "I know a little bit", only 30.8% of the customers of the normal market place chose the right answer of explanation of organic farming (Farming which is not using agro-chemicals), while 76.5% of customers of the organic shop selected the right answers (Farming which is not using agro-chemicals and farming considering ecosystem).There were two merits of organic products chosen most; they are more nutritious; you can avoid taking chemicals; and they are environmentally friendly. For the answer of "You can avoid taking chemicals", there was only one person who chose this, while 41.2% of customers of the organic shop chose this answer. The reasons to get to know organic products varied among people from media, family, relatives, friends and neighbours, studies to coming across an organic shop.

Table 25: Knowledge about organic products

Knowledge about organic products	Normal market place	Organic shop
Do you know what organic products are?	**n = 32**	**n = 17**
I know them well	6 (18.8)*	12 (70.6%)*
I know a little bit	2 (6.2)	5 (29.4%)
I have heard of them, but I am not sure what they are	3 (9.4)	0 (0%)
I have never heard of them	21 (65.6)	0 (0%)
Select all explanations of organic farming**	**n = 13**	**n = 17**
Farming using special seeds	6 (46.2)	2 (11.8)
Mechanized farming	0 (0)	0 (0)
Farming which is not using agro-chemicals	4 (30.8)	13 (76.5)
Western style of farming	0 (0)	2 (11.8)
Farming considering ecosystem	0 (0)	3 (17.6)
I am not sure	1 (7.7)	1 (5.9)
What are the merits of organic products for you?**	**n = 11**	**n = 17**
They are more nutritious	6 (54.5)	10 (58.8)
You can avoid taking chemicals	1 (9.1)	7 (41.2)
They are environmentally friendly	6 (54.5)	9 (52.9)
They are more delicious	0 (0)	3 (17.6)
I am not sure	0 (0)	0 (0)
How did you know about organic products?**	**n = 11**	**n = 17**
From media	3 (27.3)	1 (5.9)
From family, relatives, friends and neighbours	4 (36.4)	6 (35.3)
Studied about organic farming	5 (45.5)	5 (29.4)
Came across an organic shop	0 (0)	8 (47.1)

*** The numbers in brackets for percentages**

****Respondents were allowed to tick more than one answer. Therefore total percentage can exceed 100%.**

4.7.2 Attitudes of market customers towards organic products

The overall attitude of customers was grouped into favourable, neutral and unfavourable among 17 customers of the organic shop and 10 customers of the normal market place. The number became smaller due to some of the likert scale items, which were not answered by all the respondents. Table 26 shows that 80% of customers who went to the normal market place had favourable attitudes, and 64.7% of customers of the organic shop had favourable attitude.

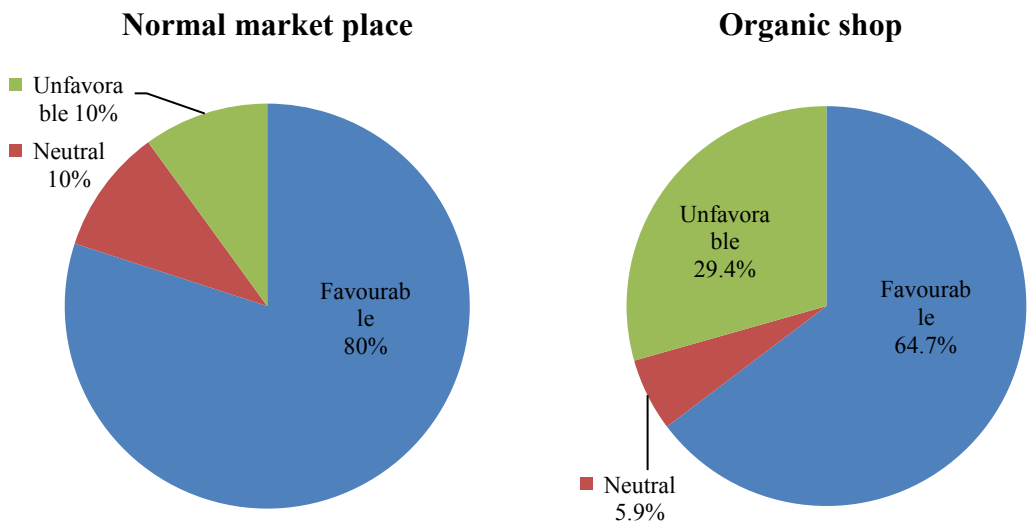

Figure 5: Overall attitude towards organic products

Minimum, maximum and mean scores of overall customers' attitude towards organic products are shown in Table 26. The mean score of all farmers was 39.00. The mean scores of customers of the organic shop and the normal market place were similar (39.18 and 38.70 respectively), and there was no significant difference between them ($p > 0.05$). The result of no significant difference in scores of overall customers' attitude towards organic products between customers of the organic shop and customers of the normal market place tells us that customers of the normal market have almost similar attitude to the attitude of customers of the organic shop. It implies that the only difference between them is whether they are empowered about organic products or not. Therefore, if people got appropriate knowledge of organic products, organic products would be more familiar and produced.

Table 26: Score of overall customers' attitude towards organic products

Customer group	n	Min	Max	Mean	F	Sig.
All customers	27	32	46	39.00		
Customers of an organic shop	17	34	46	39.18		
Customers of a normal market place	10	32	44	38.70	1.126	0.299

Details of customers' attitude towards organic products are summarized in Table 27. The responses of not at all and not really were grouped as "disagree", while "undecided" was left alone, and the responses of somewhat and very much were grouped as "agree". Regarding the statement of "when buying food products, considering the process how the products were grown", 71.9% of customers of the normal market place answered "disagree", while customers of the organic shop who chose this answer were only 35.3%. There were many similar comments for this statement from only customers of the normal markets. They stated that "it is impossible to know" and "even sellers do not know". It tells us that a market for them is a place where they cannot know everything they want, and they do not know about the place such as an organic shop where they can be sure about the process of how products are grown.

From economic point of view, a large percentage of customers had positive attitude towards organic products. For the statement of "prices of organic products are not reasonable", more than 50% of customers of both markets disagreed. In line with this, more than 80% disagreed with the statement of "prices of organic products are not affordable". However, 87.5% of customers of the normal market place agreed with the statement of "when buying food products, price is the most important thing to consider". It tells us that price of crop products is still the most important thing, and price is the biggest factor which influences customers' buying intention. It seems that people do not have negative economic impression for organic products. Even though a large amount of people stated that price is the most important thing to consider when they buy crop products, they did not think prices of organic products were not reasonable. Therefore, it could be said that financial situation of customers would not trouble much for the promotion of organic products.

Table 27: Customers' attitude

Statements about customers' attitude	Disagree		Undecided		Very much	
	O*	N**	O	N	O	N
There are organic farmers in your area (O: n = 17, N: n = 10)	4 (23.5)***	2 (20.0)	4 (23.5)	0 (0)	9 (53.0)	8 (80.0)
When buying food products, considering the process how the products were grown (O: n = 17, N: n = 32)	6 (35.3)	23 (71.9)	2 (11.8)	2 (6.2)	9 (53.0)	7 (21.9)
You want to eat (or want your family eat) healthy food (O: n = 17, N: n = 32)	0 (0)	0 (0)	0 (0)	1 (3.1)	17 (100)	31 (96.9)
Preferring organic products to normal products (O: n = 17, N: n = 10)	0 (0)	1 (10.0)	0 (0)	0 (0)	17 (100)	9 (90.0)
Prices of organic products are not reasonable (O: n = 17, N: n = 10)	10 (58.8)	7 (70.0)	0 (0)	1 (10.0)	7 (41.2)	2 (20.0)
Prices of organic products are not affordable(O: n = 17, N: n = 10)	15 (88.3)	9 (90.0)	0 (0)	0 (0)	2 (11.8)	2 (20.0)
Organic products are worth of buying regardless its price (O: n = 17, N: n = 10)	10 (58.8)	7 (70.0)	0 (0)	0 (0)	7 (41.2)	3 (30.0)
When getting extra money for food, you want to change crop products to organic(O: n = 17, N: n = 10)	1 (5.9)	0 (0)	0 (0)	0 (0)	16 (94.1)	10 (100)
When getting extra money for food, you want to buy something which is not crop products (such as meat and fish)(O: n = 32, N: n = 10)	4 (23.5)	9 (28.1)	1 (5.9)	1 (3.1)	12 (70.6)	22 (68.8)
When getting extra money, budget of food is not the first to increase (O: n = 32, N: n = 10)	14 (82.4)	22 (68.7)	1 (5.9)	2 (6.2)	2 (11.8)	8 (25.0)
When buying food products, price is the most important thing to consider (O: n = 32, N: n = 10)	7 (41.2)	4 (12.5)	0 (0)	0 (0)	10 (58.8)	28 (87.5)
Quantity of food is more important than quality of food (O: n = 32, N: n = 10)	13 (76.5)	28 (87.5)	0 (0)	3 (9.4)	4 (23.5)	1 (3.1)

***O stands for customers of the organic shop; **N stands for customers of the normal market place**

*** **The numbers in brackets are for percentages**

CHAPTER FIVE

5.0 CONCLUSIONS AND RCOMMENDATIONS

5.1 Conclusion

The study examined several differences of agricultural environment and practices between organic farmers and conventional/traditional farmers. Organic farmers grew more diversified crops and had more availability of water for irrigation. With regard to farming practices, even though a large proportion of conventional/traditional farmers did not use synthetic fertilizers and pesticides as organic farmers, most of other organic farming practices such as organic fertilizers, organic pesticides, crop rotation, terracing and mulching were mostly used by organic farmers. Therefore, organic farmers take advantages of organic farming practices including crop varieties and water availability.

It was found that organic farmers had a better selling situation of their crop products. The percentage of organic farmers having a constant market and regular customers was much higher than that of conventional/traditional farmers. However, it was revealed that there were still difficulties for organic farmers to sell their crop products as organic, and to get premium price because of low awareness of organic products' value. Therefore, more awareness of organic brand is a key to practise organic farming, which definitely brings organic farmers a better selling situation.

The productivity of the three crops grown most by each farming groups; maize, cow pea and pumpkins; did not show significant difference between organic farmers and conventional/traditional farmers even though the averages among organic farmers were slightly higher than those among conventional/traditional farmers. However, some crops grown by many organic farmers such as tomato, cabbage and amaranths showed

significantly higher productivity. Profit among organic farmers was revealed to be more than ten times of profit among conventional/traditional farmers, with less expenditure for farm activity and higher income from their crops. Organic farming could be one of the ways to get higher profit by balancing expenditure and income, since organic farming can lower farm expenditure by taking advantages of hand-made organic fertilizers and pesticides, and can bring higher income by making farmers connected to markets with more crop varieties. Even from the food security perspective, organic farmers brought significantly better results with two food security indicators of consumption score and dietary energy consumed. Hence, organic farming would be one of the development approaches to improve well-being of smallholder farmers in terms of profit and food security.

Several determinants of crop productivity, profit and food security were analysed. With regard to productivity, sex of a household head, number of people in a household, whether they had a constant market and livestock keeping were found to significantly influence productivity of maize and pumpkins. As raised as one of the challenges of organic farming in FGDs, construction of more market places would help smallholder farmers get higher crop productivity. About profit, years of practicing organic farming showed significant association, and it supports the contribution of organic farming to profit. Food security which was analysed by food consumption score showed that livestock keeping and age of a household head were significant determinants. Hence livestock keeping is one of important factors to be taught in training on farming for improvement in social economic well-being.

From the FGDs of organic farmers, several challenges were revealed in organic farming. There was hardness of land preparation, lack of markets, and difficulty of getting premium price and a problem of contamination with other farms. In order for smallholder farmers to conduct organic farming smoothly and for new farmers to get interested in starting organic

farming, these challenges should be overcome, especially difficulties of land preparation in mountainous areas that need terraces. Moreover, further support is needed against the soil contamination problem.

Overall customers' attitude towards organic products between customers of the organic shop and customers of the normal market place revealed that customers of the normal market place had similar attitude towards the customers of the organic shop. It implies that the only difference between them was whether they were empowered about organic products or not. Therefore, it appears that customers have high possibilities to be familiar with organic products.

Based on the above conclusions, this study has shown that organic farming can be an alternative to improve well-being of smallholder farmers with respect to profit and food security. It could be said that organic farming, which is enhanced by accessible local resources, can replace former development efforts as a sustainable rural development approach.

5.2 Recommendations

(i) In order to improve the agricultural situation of conventional/traditional farmers, organic farming practices and crop diversity should be introduced by agricultural organizations making use of media and agricultural officers that farmers are familiar with. Water availability should be considered as an important factor to succeed in organic farming and to bring the diversification of crops. The government is urged to improve water systems especially in flatland areas where people have limited water for irrigation.

(ii) More conducive environment for organic farmers to be able to sell their crop products as organic should be made by organic farming organizations and development institutions in order for customers to be more familiar with the organic brand, and for organic farmers to get better selling situations.

(iii) Organic farming should be highly recommended as one of the development ways to improve well-being of smallholder farmers from aspects of profit and food security. Since those two are often discussed as core problems of poverty, the government, development institutions and agricultural organizations should take organic farming as one of effective ways to eliminate poverty.

(iv) Construction of new market places, more convenient transportation and more reasonable transaction costs at market places should be promoted by the government, development institutions and agricultural organizations in order for smallholder farmers to get high productivity. Moreover, training on farming should include livestock keeping as one of the important factors which cause high profit.

(v) Further support for organic farming is required in order to solve the difficulties of preparing organic farms, especially in mountainous areas that need terraces. Mechanisms to solve the soil contamination problem are required as well.

(vi) Organic products should be promoted by organic farming organizations and development institutions in order to make more customers to know organic products with efficient ways such as media. Those organizations need to get connected with media organizations for promotion. Moreover, organic shops in which customers can be familiar with the organic brand should be increased.

5.3 Suggestions for Further Research

(i) This study concluded that water availability is an important factor to succeed in organic farming, but how to do away with rain fed agriculture should be researched on.

(ii) Using longitudinal research questions whether the selling situation changed after starting organic farming would bring deeper explanation. If the longitudinal research questions show that organic farmers got new market places and customers after starting organic farming, this would prove the contribution of organic farming to well-being.

(iii) Further research on productivity of vegetables should be conducted in order to show advantages of organic farming on vegetables, since this study showed significantly higher productivity of some vegetables, but the number of farmers growing those vegetable was much smaller than that of organic farmers. A more concerted study on this topic would bring more appropriate results with statistical significance.

(iv) Information on productivity considering intercropping and applied organic farming practices is required to examine the surrounding environment of organic farmers' productivity, since this study could not take into account the intercropping issue in the calculation of productivity, and could not relate the productivity to the applied organic farming practices.

(v) Since this study showed that female-headed households have higher productivity of maize, further research on gender roles in agricultural practices in relation to productivity is needed in order to bring deeper explanation. For instance, when women participate in cultivation of farm, which crops women tend to take charge of could explain better relationships between gender roles and maize productivity.

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APPENDICES

Appendix 1: Organic farming organizations of Tanzania

	Name of organization	Region	Products
1	ADP Isangi	Isangi, Mbeya	Dried turmeric
2	Bagamoyo Fruits Company Ltd.	Bagamoyo, Dar es Salaam	Fresh Pineapple
3	Biolands International Ltd.	Kyela, Mbeya	Cocoa
4	BioPe Tanzania Ltd.	Meatu, Shinyanga	Cotton
5	BioSustain	Singida	Cotton, sesame
6	Bonde la chem chem	Siha, Kilimanjaro	Hibiscus
7	Claphjo Enterprises	Kibaha, Dar es Salaam	Dried pineapple, mangoes, bananas, tomatoes
8	Clipper		Chamomile
9	Clove Stem Oil Distillery (CSOD)	Pemba	Essential oils
10	Dabaga Vegetable & Fruit Canning Company	Iringa	Canned pineapples
11	ECOL Cotton Project	Handeni, Tanga	Cocoa
12	Envirocare	Kilimanjaro	Safflower
13	Fairshare Ltd. Sumbawanga peanut projects	Rukwa	Peanuts
14	Fidahussein Co.	Rufiji delta	Honey
15	Frank Msigwa	Njonbe, Iringa	Avocados, apples, mangos, passion
16	Gando Farmers Association (GAFA)	Pemba, Zanzibar	Assorted spices
17	Golden Fruits Products Ltd.	Arusha	Black pepper, cardamom and ginger
18	HAI Tanzania Ltd.	Mbeya	Cocoa
19	Kagera Cooperative union (KCU)	Bukoba	Rubsta coffee
20	KIHAMA		Cotton
21	Kilimanjaro Native Cooperative Union (KNCU)	Moshi, Kilimanjaro	Arabica coffee
22	Kimango Farm Enterprises Ltd.	Morogoro	Paprika, chili, lemongrass, hibiscus, lemongrass, peppermint
23	Masasi High Quality Farmers' Products (MHQFP)	Masasi, Mtwara	Cashew nuts
24	Matunda Mema	Karagwe, Lindi	Dried fruits

25	MAYAWA	Bukoba, Kagera	Vanilla
26	Mbingu Farmers Association (MOCOA)	Mbingu, Morogoro	Cocoa beans
27	MELTD	Kyela	Cocoa beans
28	Mikese Organic Farm	Kyela, Morogoro	Mangos, oranges, tangarines, young coconuts, limes
29	Mkuranga Women Vegetable Growers	Mkuranga, Coast	Amaranths, cassava, tomatoes
30	Mufindi Tea Estates Ltd. (MTC)	Njombe, Iringa	Black tea
31	Premier Cashew Industries Ltd. (PCI)	Kerekese, Mkuranga	Cashew nuts
32	Rufiji	Pwani	Honey
33	Saienergy and Logistic Service	Iringa	Fertilizer, Charcoal
34	Sea Products Ltd.	Tanga	Tuna fish and line caught
35	Tanganyika Instant Coffee Company (TANICA)	Bukoba, Kagera	Instant coffee
36	TANPRO	Sumbawanga, Rukwa	Groundnuts
37	Tanzania Organic Products Ltd. (TAZOP)	Zanzibar, Morogoro	Ginger, turmeric, pepper, cinnamon, cloves
38	UMA		Arabica coffee
39	West Lake Agro Products Ltd.	Bukoba	Vanilla
40	ZAFFIDE	Zanzibar	Spices
41	Zanzgerm Enterprises Ltd.	Zanzibar, Tanga, Kigoma	Ginger, turmeric, pepper, chili, lemongrass
42	Zanzibar Organic Spices and Herbs	Zanzibar	Hibiscus
43	Zanzibar State Trading Company (ZSTC)	Zanzibar	Essential oils

Source: Compiled from the literature including EPOPA (2014), TanCert (2014), and Bakewell-Stone (2006)

Appendix 2: A questionnaire for farmers

SOKOINE UNIVERSITY OF AGRICULTURE (SUA)
DEVELOPMENT STUDIES INSTITUTE (DSI)

Chie Miyashita (Master of Rural Development)
Research Title "Can organic farming be an alternative to improve well-being of smallholder farmers in disadvantaged areas?
A case study of Morogoro region, Tanzania"
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A. Characteristics of a household

1. Village…….
2. Household members' information (family member living together and sharing food only)

S/N	1. Head	2	3	4	5
Sex (1 = F, 2 = M)					
Age					
Occupation (1 = farmer, 2 = non-farm employee, 3 = no job)					
Side business					
Final education (1 = no formal education, 2 = not completed primary, 3 = primary, 4 = secondary, 5 = higher than above)					

S/N	6	7	8	9	10
Sex (1 = F, 2 = M)					
Age					
Occupation (1 = farmer, 2 = non-farm employee, 3 = no job)					

Side business					

B. Agricultural Environment

3. Which type of farming do you conduct?

   1 = Organic farming

   2 = Conventional farming

4. What is your farm size you cultivate? …… acres (…….. ha)

5. Number of livestock owned by the household

Type	Number
Cattle	
Goat	
Sheep	
Chicken	
Duck	

6. Do you have enough water for your farm?

   1 = Yes (type of source ……

   2 = No (why ……..……

7. How long does it take to your water source from your farm? …….. minutes

8. Years of practicing organic farming …… years

9. Existence of paid labourers (last year Jan – Dec)

Types of labourers	Hiring period	Number	Total wage
Seasonal labourers 1			
Seasonal labourers 2			
Seasonal labourers 3			
Permanent labourers			

10. Total wage of labourers …… TZS

11. Cultivation equipment (circle everything you use)

    1 = Hand hoe

    2 = Plough

    3 = Oxen

    4 = Tractor

    5 = Manual sprinkler

    6 = Plastic container

    7 = Automatic/Power sprinkler

    8 = Machete

    9 = Rake

    10 = Hose pipe

    11 = Others (mention ……)

C. Organic farming

12. Which crops do you grow at your farm?

1		8	
2		9	
3		10	
4		11	
5		12	
6		13	
7		14	

13. Which farming practices have you conducted?

Practices	Adopted (1)	Not adopted (2)	If adopted, for which crops? Mention names of seeds, fertilizer, pesticides and herbicides.
Improved seeds			
Chemical fertilizers			
Chemical pesticides			
Chemical herbicides			
Organic fertilizers			
Organic pesticides			
Organic herbicides			
Crop rotation			
Intercropping			
Terrace			
Mulching			
Cover crops			

D. Organic farming support

14. Do you have organic farming supporters?

1 = Organic farming organization (mention …….)

2 = Private company (mention …….)

3 = Government

4 = Individual farming trainer (mention ……..)

5 =Others (mention……)

6 = I don't have any

15. Do you have occasional training from your supporters?

1 = Yes (how often ……) 2 = No

C. Market Condition

16. Do you have a constant market where you sell your crop products?
    1 = Yes (how often ……) 2 = No
17. Do you have a contract with a certain trader/buyer?
    1 = Yes (mention … …….……) 2 = No
18. Do you have occasional customers whom you take your crops to or who come to buy your crops?
    1 = Yes (how often ……) 2 = No
19. Are your crop products sold as Organic?
    1 = Yes 2 = No
20. Do you get premium price due to organic crops?
    1 = Yes 2 = No

D. Farmers' Well-being

21. Write the productivity and income of each crop and animal you grew last year (Jan – Dec).

Name of a crop	Farm size (acre)	Weight of a harvested crop (kg)	Intercropped with	Weight of a crop sold (kg)	Sold price (TZS)	Sold as Organic / Normal

Name of a livestock	Land size for the livestock (acre)	Number of livestock sold	Sold price (TZS)

22. Cost items about the farm (last year Jan - Dec)

Ways	Costs (TZS)
Land clearance	
Seeds	

Farm equipment	
Manure application	
Fertilizer and pesticides application	
Transportation for selling	

23. Describe the foods that your family members ate or drank in the past 7 days. Mention status whether the food were purchased or taken from farm .

	Morning			Lunch time			Dinner time		
	Food	Kg	Status	Food	Kg	Status	Food	Kg	Status
Day1									
Day2									
Day3									
Day4									
Day5									
Day6									
Day7									

24. Write down your household's expenditure of last month.

Type of cost	Expenditure (TZS)
Food (including sugar, salt, cooking oil, etc)	
Medical care	
Education	
Electricity and water	
Fuel (oil, charcoal, fire wood, etc)	
Taxes	
Housing	

Thank you very much for your cooperation. This information is only used for my research at SUA.

Appendix 3: A questionnaire for market customers

SOKOINE UNIVERSITY OF AGRICULTURE (SUA)
DEVELOPMENT STUDIES INSTITUTE (DSI)

Chie Miyashita (Master of Rural Development)
Research Title "Can organic farming be an alternative to improve well-being of smallholder farmers in disadvantaged areas?
A case study of Morogoro region, Tanzania"
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A. Personal Information

1. Market
   1 = Normal market (Where …….)
   2 = Organic shop (How often do you come per month ……....)
2. Age ……
3. Sex
   1 = Female2 = Male
4. Marital status
   1 = Married 2 = Single 3 = Divorced
5. Do you have children?
   1 = Yes (how many ……) 2 = No
6. Do you have a farm?
   1 = Yes 2 = No
7. Occupation ……

B. Knowledge about organic products

8. Do you know what organic products are?
   1. I know them well
   2. I know a little bit
   3. I have heard of them, but I am not sure what they are
   4. I have never heard of them
9. If you answer 1, 2 and 3 for Q.9, select all explanations of organic farming.
   1. Farming using special seeds
   2. Mechanized farming

3. Farming which is not using agro-chemicals
4. Western style of farming
5. Farming considering ecosystem
6. I am not sure

10. If you answer 1, 2 and 3 for Q.9, what are the merits of organic products for you?
1. They are more nutritious
2. You can avoid taking chemicals
3. They are environmentally friendly
4. They are more delicious
5. I am not sure
6. Others (mention ……)

11. If you answer 1, 2 and 3 for Q.9, how did you know about organic products?
1. From media
2. From family, relatives, friends and neighbours
3.Studied about organic farming
4.Came across an organic shop
5. Others (mention ……..……)

If you answer 1, 2 and 3 for Q.8, continue for next following questions.

C. Attitude towards organic products from socio-cultural aspects

Statements regarding attitude to organic products	Not at all	Not Really	Undecided	Somewhat	Very much
12. There are organic farmers in your area					
13. When buying food products, considering the process how the products were grown.					
14. You want to eat (or want your family eat) healthy food.					
15. Preferring organic products to normal products.					

D. Attitude towards organic products from economic aspects

Statements regarding attitude to organic products	Not at all	Not Really	Undecided	Somewhat	Very much
16. Prices of organic products are not reasonable.					

17. Prices of organic products are not affordable.					
18. Organic products are worth of buying regardless its price.					
19. When getting extra money for food, you want to change crop products to organic.					
20. When getting extra money for food, you want to buy something which is not crop products (such as meat and fish).					
21. When getting extra money, budget of food is not the first to increase.					
22. When buying food products, price is the most important thing to consider.					
23. Quantity of food is more important than quality of food.					

Thank you very much for your cooperation. This information is only used for my research at SUA.

Appendix 4: A check list for the focus group discussion

SOKOINE UNIVERSITY OF AGRICULTURE (SUA)
DEVELOPMENT STUDIES INSTITUTE (DSI)

Chie Miyashita (Master of Rural Development)
Research Title "Can organic farming be an alternative to improve well-being of smallholder farmers in disadvantaged areas?
A case study of Morogoro region, Tanzania"
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- Reasons to start organic farming
- Expectation before starting organic farming
- Unsuitable organic farming practices in the area
- Strengths of organic farming (e.g.growth of crops / selling price / against unfavourable farming situation / selling prices)
- Difficulties of conducting organic farming (e.g.cultivation practices / converting period / trainers / accessibility of materials / suitable selling place / certification)
- Reactions of people at markets towards organic products