Assessing the impacts of organic farming on domestic and exporting smallholder farming households in Tanzania: A comparative analysis.

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ABSTRACT

Organic farming has been professed as a way out of food insecurity and poverty in Africa. However, the holistic assessment of the contribution of the organic farming system to smallholder farmers' livelihoods is lacking. Little has been done to directly assess food security impacts of the system or its contribution to the domestic selling organic farmers' incomes and general livelihoods. No attempts have been made to ascertain the contribution of organic farming to farmer's health. This study was conducted to assess the impact of organic farming on exporting and domestic selling smallholder farming households in Tanzania as well as establishing the future prospects of organic markets for tropical fruits. The study aimed i) assess the factors influencing the adoption of organic farming among smallholder farmers ii) assess the impacts of organic farming on smallholder farmers' revenues under different forms of farmer organization and market linkages iii) assess the impact of organic farming on household food security iv) assess the impacts of organic farming and export trade on farmer health, and lastly, v) assess the future prospects of European organic markets for tropical organic fruits. The study areas involved in Tanzania were Bagamoyo in the Pwani region, Karagwe in the Kagera region and Njombe in the Iringa region. Over 320 UK respondents participated in the consumer study and a total of 488 smallholder pineapple farmers were recruited for farmers' survey in Tanzania. Roughly half of the smallholder farmers involved were organic and half conventional from both domestic selling and exporting sectors. Older farmers with smaller farms and located further from urban markets were more likely to adopt organic farming. Economic and monetary reasons were the overriding motivations for adoption of organic farming. Only exporting organic farmers involved in the export schemes had significantly higher incomes than their conventional counterparts. The domestic selling and partly exporting farmers had similar or worse revenues compared to conventional farmers. Likewise, organic farming was found to improve household food security only for contractually linked, exporting organic farmers. Again only contractually linked exporting organic farmers had consistently better health scores compared to conventional farmers. The conjoint analysis in the UK revealed two consumer segments with the price-sensitive category comprising about 60% of the consumers. Distance travelled and means of transport of the fruits had little importance on the buying decisions with no local alternative available. Fair-trade fruits were preferred to organic and conventional in that order. While the future of tropical organic exports at the European markets remains promising, the holistic contribution of organic farming on smallholder farmers' livelihoods in SSA shows the benefits are limited to a few lucky farmers with contractual linkages to export markets. Governments, NGOs and other organic farming stakeholders may wish to invest in securing and maintaining more export markets if the benefits of organic farming are to be realized. Developing domestic organic markets concurrent with the supporting domestic market infrastructure might be a long term alternative.

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless as agreed by the University for approved dual awards.

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Statement 1

This thesis is the result of my own investigations, except where otherwise stated. Where correction services have been used, the extent and nature of the correction is clearly marked in a footnote(s).

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DEDICATION

- To my mum Grace, for her love, support and being there for me in every step of my life to assure me I could do anything I set out to do.

- To my late father Waized Mamuya, whom I never got to know – but a source of my inspiration as I always believed I would grow up to be as good as him.

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ABBREVIATIONS AND ACRONYMNS

BP	Bodily Pain scale of the SF-36
DEFRA	Department of Rural Affairs
DALDO	District Agricultural and Livestock Office
EPOPA	Export Promotion of Organic Products from Africa
EQ5-D	The five itemed EuroQol health questionnaire instrument
EU	European Union
EUREP-GAP	European Retailers Protocol for Good Agricultural Practice
FAO	Food and Agricultural Organization of the United nation
GDP	Gross Domestic Product
GH	General Health scale of the SF-36
GHG	Green House Gas
IFOAM	International Federation of Organic Agriculture Movements
LDCs	Least Developing Countries
MCS	Mental Component Summary scale of the SF-36
MH	Mental Health scale of the SF-36
PCS	Physical Component Summary scale of the SF-36
PF	Physical Functioning scale of the SF-36
RE	Role Emotional scale of the SF-36
RELU	Rural Economy and Land Use
RP	Role Physical scale of the SF-36
SF	Social Functioning scale of the SF-36
SF-36	The thirty-six itemed version of the Short Form health questionnaire instrument
SSA	Sub Saharan Africa
VAS	Visual Analogue Scale
VT	Vitality scale of the SF-36
TanCERT	Tanzania Organic Certification Association
TOAM	Tanzania Organic Agriculture Movement
TRA	Tanzania Revenue Authority
UNEP-UNCTAD	United Nations Environment Programme - United Nations Conference on Trade and Development
WDR	World Development Report

CHAPTER ONE: INTRODUCTION

1.1 Background

1.1.1 Sub-Saharan Africa agriculture

More than two-thirds of the sub-Saharan Africa (SSA) population is employed in or depends on agriculture for their livelihoods (World Bank, 2003; Zhang *et al*., 2007; Scialabba, 2007; World Bank, 2007; Chen and Ravallion, 2007). Agriculture is also the main economic activity in Eastern and Southern Africa (ESA)[1] accounting for an estimated 41% of the Gross Domestic Product (GDP) in the 1990's. Approximately 82% of the population in the region resides in rural areas depending on agriculture for their livelihood (World Bank, 2003; Temu and Temu, 2005). Although the agriculture sector employs the majority of the people and contributes substantially to GDP, typically farmers in the SSA region manage very small plots of land (0.25 to 3ha), and production is mainly reliant on rain fed irrigation (Diao *et al.,* 2003; Temu and Temu, 2005; Zhang *et al*., 2007). Consequently, farming is considered risky due to its dependency on rain activity given the recurring droughts. Agriculture and vulnerability have thus become inseparable terms in SSA (Zhang *et al*., 2007; Ellis, 2006).

The poor economic performance of African agriculture and its relationship to poverty and food insecurity has generated considerable concern for academicians and development stakeholders over a number of years (e.g. FAO-AHP, 2002; FAO, 2006; wsws.org, 2006; Havnevik *et al*., 2007; Boon, 2007; WDR, 2008; FAO, 2008; UK Food Group, 2008; FAO, 2009; Boon and Semakula, 2010). The green revolution that improved agricultural productivity for developing countries in Asia and Latin America 'by- passed' the SSA region (Holt-Giménez, 2008). Due to the inter-linkages between agriculture, development and vulnerability in SSA, the sector's poor performance has continually threatened the survival and livelihoods of the majority of SSA's inhabitants (Diao *et al*., 2006; Zhang *et al*., 2007; Ellis, 2006). The persistent poverty and food insecurity in SSA is thought to be caused primarily by poor performance of the agriculture sector. Agricultural growth is seen as

[1] Tanzania, Kenya, Uganda, Ethiopia, Malawi and Mozambique

therefore the starting point for improving economic development in the region (Zhang *et al*., 2007; Ellis, 2006; FAO, 2006).

Traditional export of cash crops from SSA has seen declining profit margins due to falls in the world market price for produce caused by intense competition from capital intensive developing countries in Latin America and Asia (FAO, 2003; UNCTAD, 2003; UNCTAD, 2004 and URT, 2008). This has left a revenue gap that needs to be filled either though innovations in agriculture to develop specialized products that can exploit niche markets, or increased investment in the sector to generate capital intensive sectoral economy in order to improve competitiveness in international markets (USAID, 2007). Production of fruits and vegetables (F&V) for export has therefore gained importance in as an alternative source of income (Temu and Marwa, 2007; USAID, 2007). Ascribing to the rising demand and higher prices of these products compared to traditional primary commodities, the production of F&V for trade has been consciously encouraged in many developing countries for alleviating heavy dependence on few, and often non-remunerative, primary commodities (Diop and Jaffee, 2005).

1.1.2 Export horticulture, organic farming and poverty alleviation

Export horticulture from SSA has grown rapidly in recent decades and countries such as Kenya, Ivory Coast and Zimbabwe have enjoyed the benefits of the growing trade (MCulloh and Ota, 2002; Minot and Ngingi, 2004). Compared to the neighbouring Kenya and Uganda, the production and export of fruit and vegetables in Tanzania is lagging behind (USAID, 2007). The government of Tanzania has identified horticulture as one of the potential growth area and has prioritized the development of export diversification in order to reduce the risk of dependency on traditional exports (URT, 2008). The benefits generated by the horticultural sub-sector, particularly the export component, include employment generation, marketing efficiency, institutional development, development in domestic supply chains, and the multiplier effect from export income flow into the rural economy (e.g. Temu and Temu 2005; Temu and Marwa, 2007; and SME Competitive Facility, 2008; Lazaro *et al*., 2010). However, the need to overcome several barriers preventing small-farmers from being integrated into the sub-sector and benefit from the emerging markets has been emphasized (Amani, 2005; UD-MLPG, 2009; Gibbon *et al*., 2010).

While smallholders are estimated to produce 60% of the exported vegetables and fruits in Kenya for example (Diao *et al.*, 2003); globalization of the fruit and vegetable chains and growth of supermarkets have caused concern regarding smallholders being excluded from the supply chain due to the dis-economies of scale and inefficiency disadvantages (Temu and Marwa, 2007). Costs of compliance and adjusting to different standards and product quality requirements for export produce have also presented an important obstacle for smallholder integration into the global supply chains (COLEACP, 2010; Akyoo and Lazaro, 2008; Kadigi *et al*., 2007; Lazaro *et al*., 2010; Gibbon *et al*., 2010). Import markets define different standards and quality requirements for the imported produce, compliance with which can be mandatory or voluntary. These standards include the Codex Alimentarius, Minimum Residue Levels (MRLs), GlobalGAP, British Retail Consortium (BRC), ISO 14001, ISO 2200, Fair trade, Organic Agriculture, etc. (FAO, 2008). In practice, the compliance to the standards becomes a requirement if a producer or exporter wants to guarantee selling opportunity in a particular market where the standards are of particular importance to consumer preferences. In a competitive market environment, the ability to meet or exceed the standards gives an exporter a significant competitive advantage (USAID, 2007).

Organic farming has often been promoted by governments, development agencies and NGOs as a means to improve farmers' livelihoods through food security improvements, income generation and health improvement while simultaneously conserving the general ecosystem (UNEP-UNCTAD, 2008; 2010; Sciallaba, 2007; Bakewell-Stone, 2006; Bakewell-Stone *et al*., 2008). Some studies have identified the potential for organic farming to reduce poverty through income and food security improvements and help achieve the SSA Millennium Development Goals (MDGs) targets (Setboonsarng, 2006; UNEP-UNCTAD, 2008). Currently there are few studies on organic farming in Tanzania, and most have paid more attention to the prospects of the market and potentials for wider participation in the export organic farming market for F&V (e.g. USAID, 2007, SME Competitive Facility, 2008; UNEP/UNCTAD, 2007a). Lack of organic farming studies with comprehensive farm budget surveys in tropical Africa has been pointed out as a gap in the existing literature (Bolwig *et al*., 2009).

Export orientated organic farming in Tanzania for F&V has been advocated in the poverty reduction strategies for meeting the 2015 MDGs (URT, 2008). Several campaigns and programs including Export Promotion of Organic Products from Africa (EPOPA) and UNEP-UNCTAD Capacity Building Task Force (UNEP-UNCTAD CBTF) projects have been launched to raise awareness and/or support the development of organic farming for export of cash crops and horticultural produce from the region. Tanzania is among the few countries in Africa where large numbers of farmers are employed in certified organic agriculture with over 100,000 certified farmers in 2006 and many more involved in non-certified organic farming (Helga and Yussefi, 2006). Other countries in the region include Uganda with the largest number of certified organic farmers in the world (over 200,000) and Ethiopia (over 150,000) (Helga and Yussefi, 2006). It is estimated that, more than 2,000 million tonnes of organic products are exported from Tanzania annually (UNEP-UNCTAP CBTF, 2007). Tanzania is also the fourth country in Africa in terms of organic agricultural land area (62,180 ha), after Uganda, Ethiopia and Tunisia (Bouganimbeck, 2009). This shows the sector has a potential to positively influence many farmers livelihoods if the proper infrastructure is implemented.

Adoption of organic practices in SSA has met with varying levels of acceptance (Goldberg, 2008). Its adoption in the region is believed to be driven by the perceived improved income generation associated with improved access to high value export markets (e.g. Johannsen *et al*., 2005; Bakewell-Stone *et al*., 2008; APO, 2010). As organic farming is a relatively new concept in SSA (Bolwig *et al*., 2009), little has been done about adoption of organic practices in different areas under different institutional settings. Studies in developed countries have reported environmental and health concerns to be the main drivers for the adoption of organic farming (Young, 1998; Burton *et al*., 2003; Best, 2008). Elsewhere in the developing world, an International Fund for Agricultural Development (IFAD) study (2003) involving 68 case studies in Latin America and the Caribbean found higher financial returns to be the main driving force that led small farmers to adopt organic agriculture. Different institutional settings for agriculture support and the differences in farmers' motivations for the adoption of organic farming between the north and south (Johannsen *et al*., 2005), has meant that generalizations cannot be made about factors affecting adoption of organic farming.

While the potentials for organic farming have caught the attention of development practitioners and academics, there is very limited peer reviewed literature on the impact of producing certified organic tropical fruit exports in SSA (Bolwig *et al*., 2009, Akyoo and Lazaro, 2007). Studies from developed countries where farmers use more intensive farming techniques tend to show that, organic farming is associated with decreased productivity (e.g. Nicolai and Ada, 2005; Henning *et al*., 1991; Lampkin 1994, Padel & Lampkin 1994). In SSA the question of improved productivity and/or profitability of organic farming is still debatable; where farming is characterised by use of very low off-farm inputs, only a couple of studies has shown improvement in incomes with organic export schemes (Gibbon and Bolwig, 2007a; UNEP-UNCTAD CBTF, 2008). Furthermore, the impact of organic farming on domestic selling farmers has received very little attention. To date no peer reviewed studies in SSA have reported comprehensive farm budget related survey data on this sector.

Among the IFOAM's (2006) principles of organic farming is the principle of health which states that*, "Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible".* There is a lack of consensus regarding the contribution of organic farming to food security, and its ability to feed the world as well as its health benefits (Connor, 2008; Kirchmann *et al*., 2008; Williams, 2002; Heaton, 2001). There is however, a common understanding that organic farming limits the use of external inputs such as pesticides and fertilizers that can pose health risks to humans, livestock and the general ecosystem (Heaton, 2001; Hole *et al*., 2005). Since SSA agriculture uses very few external inputs in their production, the health benefits of organic farming can only be realized through improvements in incomes, food production and food availability. No studies to date have comprehensively measured the health benefits of organic farming in SSA.

Campaigns to consume local foods in developed countries and concerns relating to food miles and the air-freighted organic produce raise the concerns for the future of organic export markets from SSA producers (e.g. Pretty, 2001; Pretty *et al*., 2000; Pretty *at al*., 2001; Chang and Lusk, 2009; Sim *et al*., 2007; Gibbon and Bolwig, 2007b; Edwards-Jones *et al*., 2008; 2009; Lusk and Briggeman 2009; Soil

Association, 2011; 2008; 2007; Hayes, 2008). Although studies have suggested it is unlikely that consumer responses to carbon labels would have a major impact on the horticultural sector in the short-term (Edwards-Jones *et al*., 2009), the ongoing developments in carbon foot-printing cause concern for the future of SSA organic exports. Understanding of consumer purchase decisions for imported produce in the absence of local alternatives may be important for the future of SSA organic exports.

The small scale of the organic export firms mean not all organic produce from smallholders is exported; substantial part of the produce is sold in the domestic markets (Boon and Semakula, 2010; Mbote, 2010; Mhana, 2010; Kazimoto, 2010). Domestic markets that pay premium prices for organic produce in SSA are currently non-existent (Akyoo and Lazaro, 2007; Rundgren and Lustig, 2007; Boon and Semakula, 2010). This questions the perception that organic produce improve incomes through access to export markets that pay premium prices. There are unresolved issues around food miles, air-freighting of organic produce and the ability of organic systems to feed Africa. The load of costs for compliance to standards and safety requirements in agri-food industry on smallholders can also be overwhelming (COLEACP, 2010; Akyoo and Lazaro, 2008; Kadigi *et al*., 2007; Lazaro *et al*., 2010; Gibbon *et al*., 2010). It is therefore difficult to tell whether or not and to what extent does attaining a formal organic status have any significance in enhancing market access and consequently improve smallholders' incomes and livelihoods. In depth understanding of production, marketing, financial and the social settings functioning around small scale F&V producers and how they interact to affect agribusiness in the context of local and global value chains is crucial for effective policies proposals that can foster development of SSA agriculture.

1.2 Objectives of the Study

This study assessed the impact of organic fruit production on exporting and domestic selling smallholder farmers' livelihoods in Tanzania. Pineapple farmers were selected for this study because they exist in large numbers both in organic and conventional systems, and the domestic and export sectors suiting the comparative investigation. Specifically, the study aimed to:-

i. Assess the factors influencing the adoption of organic farming among smallholder farmers.
ii. Assess the impacts of organic farming on smallholder farmers' revenues under different forms of farmer organization and market linkages.
iii. Assess the impact of organic farming on food security using a comparative analysis between the organic and conventional farming households in the domestic and export sectors.
iv. Assess the impacts of organic farming and export trade on farmer health using comparative assessment of self-reported health between organic and conventional farmers, and between the farming sectors.
v. Assess the future prospects of European organic markets for SSA organic fruit supply using a conjoint analysis model of the factors influencing UK consumer's purchase decisions of fruits in absence of local alternative.

The study was further guided by the following research questions:-

i. What are factors influence the adoption of organic farming practices among smallholder farmers?
ii. In SSA where farming is organic by default, are organic farmers using different farming practices than their conventional counter parts?
iii. Is it more profitable to produce and sell fruits organically in a Tanzanian context compared to conventional production?
iv. Is it cheaper to produce and sell F&V organically in a Tanzanian context compared to conventional production?
v. Does organic farming improve household food security?
vi. Does organic farming and export impact farmer health?
vii. What are the future prospects of entering European organic markets for organic fruits from SSA?
viii. What influences the final consumer choice of the organic fruit in the absence of local alternative?
ix. Should the governments in SSA continue to promote organic farming as a means for poverty alleviation and improvement of farmer's livelihoods?

1.3 Thesis structure

This thesis is organized in nine chapters starting with general introduction in ***Chapter One***, followed by literature review in ***Chapter Two.*** The main result chapters are presented in form of publishable papers and methodology parts are detailed in their respective chapters. The results presented in chapters IV through VII were however collected using the same instrument (questionnaire) from the same respondents. For this reason and to avoid repetition in each chapter, ***Chapter Three*** will cover general methods and detailed study area description for the proceeding four chapters. ***Chapter Four*** the factors influencing adoption of organic methods while ***Chapter Five*** explores revenue implications of organic farming in different sectors and market organization. Food security impacts of organic farming on household level are reported in ***Chapter Six.*** The impact of organic farming and export trade on farmer health are reported in ***Chapter Seven***. At the end of the supply chain, factors influencing UK consumers buying decision in the absence of local alternative is examined in ***Chapter Eight***. The general discussion, conclusion and recommendations from this study conclude the thesis in ***Chapter Nine***.

CHAPTER TWO: LITERATURE REVIEW

2.1 Sub Saharan Africa (SSA) Agriculture

Agriculture is among the most important economic activities in Africa employing a large proportion of the population. Approximately 70% of the workforce in Africa is at least partially engaged in agriculture (Maxwell, 2001, World Bank, 2003; Chen and Ravallion, 2007; Scialabba, 2007; World Bank, 2007; Zhang *et al*., 2007). There has been a remarkable growth in Agricultural production around the world in the past four decades with per capita world food production growing by 17% and aggregate world food production growing by 145%; over the same period the world population doubled from three to six billion (DFID, 2004; FAO, 2005). While world agricultural production per capita overtook population growth, with each person having 25% more food than they did in 1960s, it has not been the case for Africa where food production per person is 10% less than it was in 1960s (DFID, 2004; FAO 2005; Zhang *et al*., 2007).

Agricultural production in SSA is mainly characterised by small scale/subsistence farming typically 0.25 to 3ha of land, and production is mainly rain fed (Temu and Temu, 2005). As noted recently by Bowling *et al.* (2009), the conventional agriculture in tropical Africa is semi or non-industrial, characterised by very low use of off-farm inputs like chemical fertilizers. Infertile soils, use of poor technologies and low use of off-farm inputs including agrochemicals among other factors makes the productivity of most crops in SSA lower than elsewhere in the world (Temu and Temu, 2005). For these reasons, food production in SSA, the poorest region in the world, has continued to lag behind its population growth. Unless the current trends are reversed, in the next few decades the region will face the world's largest food (cereal) deficit both in absolute and relative terms (Mwagi, 1995 in Heisey and Mwangi, 1996). The livelihoods and survival of the majority of SSA inhabitants are reportedly threatened due to the strong inter-linkages between agriculture, development and vulnerability in the region culminating into the poor performance of the agricultural sector over the years (Diao *et al*., 2006; Zhang *et al*., 2007; Ellis, 2006).

Export horticulture is a fairly new industry in most SSA countries and in the past few decades the sector has seen rapid growth and consequently noticeable contributions to GDP and improvement of farmers' livelihoods (Danielou and Ravry, 2005; Larcher, 2005; Subramanian and Matthijs, 2007). Countries like Kenya, Uganda, Malawi and South Africa have seen tremendous revenues from cut-flower and fruits and vegetable(F&V) exports, similar trends have been reported in Ghana and Ivory coast where reasonable benefits from F&V exports notably pineapple are evident (MCulloh and Ota, 2002; Minot and Ngingi, 2004; Danielou and Ravry, 2005). Organic and fair trade products have also been fairly recently introduced to many SSA countries and have seen casual growth and promising future prospects (EPOPA, 2008). According to African Press Association (2010), "The market for organic and fair-trade products in the developed countries is expected to grow by five to ten percent over the next three years offering new opportunities for smallholder farmer in poor countries". The poor farmers in SSA however struggle to comply with high level of food standards demanded by developed countries and the need to meet certification requirements mainly due to poor strategic infrastructure for food storage and transport, and inadequate knowledge and information in production and marketing (Kimenye, 1995; Akyoo and Lazaro, 2007; COLEACP, 2007; UD-MLPG, 2009; APO, 2010).

2.2 Poverty, food security and vulnerability in SSA region

In the literature, poverty is implicitly taken to indicate food insecurity and vice-versa; although food insecurity is the main component of poverty, the two do not completely overlap and neither do their solutions (FAO, 2006). The indicators of poverty and food insecurity suggest that their levels in SSA are among the highest in the world - Table 2.1 (FAO, 2006). There is widespread undernourishment in the region and the trend has shown an increase in absolute numbers of undernourished by about 20% between 1990-1992 and 2000-2002 (FAO, SOFI 2004).

Agriculture, which employs the majority of SSA inhabitants, is considered a financially risky activity, and more so in Africa where subsidies, price support and other forms of support to farmers are very little or non-existent (Diao *et al*., 2006; Zhang *et al*., 2007; Ellis, 2006). Other common agricultural risks in African context include, but are not limited to, the outbreak of pests and diseases, droughts, floods,

price fluctuation, political instability, and crop loss due to damage during storage and transportation (Temu and Temu, 2005). It is argued that, "vulnerability and agriculture are intimately linked in SSA due to the location of the poor, their dependence on agriculture and the inherent risks of an agricultural livelihood"(Zhang *et al*., 2007). With a caution that "agriculture is not homogeneous, and the inherent risks vary across countries and regions", its growth has been argued to be the most effective means for improving permanent incomes and reducing this vulnerability (Zhang *et al*., 2007).

Table 2.1 Change in poverty levels in developing countries, 1981-2001

	Percentage of people living under US$1/day (*1993 PPP**)		
	1981	***1990***	***2001***
East Asia and Pacific (excluding China)	57.7	29.6	14.9
Europe and Central Asia	0.7	0.5	3.7
Latin America and Caribbean	9.7	11.3	9.5
Middle East and North Africa	5.1	2.3	2.4
South Asia (excluding India)	51.5	41.3	31.3
Sub-Saharan Africa	41.6	44.6	46.9

* PPP: Purchasing Power Parity. **Source**: DFID and Thompson 2004, in FAO 2006

The state of the food security, political instability, diseases and poverty in the region raise concerns among the international community; consequently the ambitious goal of halving the world poverty by 2015 has been set in an effort to change the situation (Zhang *et al*., 2007). A number of policy reforms including agricultural policy reforms have been implemented across the region. However, only in a few countries in which the reforms have been implemented consistently there has been some modest revival of agricultural growth averaging between 3.5-5% for several years (Cleaver and Donovan, 1995). According to the UN's Millennium development Goals Report (2006), the poverty rates have declined marginally in SSA, but the number of people living in extreme poverty increased by 140 million. Diversification into off-farm income generating activities and increasing the variety of crops produced/sold to reduce the over reliance on a single crop has also been suggested as

the best way of reducing the vulnerability (USAID, 2004; FAO, 2006; Jones *et al*., 2008). Export horticulture has been suggested as one way to diversify export base and help reduce the risk of dwindling markets for traditional exports (MCulloh and Ota, 2002; Minot and Ngingi, 2004; UNEP-UNCTAD, 2008).

2.3 Overview of the Tanzanian agricultural sector

Agriculture in Tanzania provides employment for over 70% of the population, contributes about 45% to GDP, brings approximately 66% of foreign exchange and provides the bulk of raw materials for local industries (URT, 2008a). It is the main activity for the rural dwellers that comprise the majority of the population and is thus considered the most important sector to target in fighting poverty and food insecurity (URT 2008a). To fulfil its role of feeding the nation and achieving food security, the Ministry of Agriculture and Food Security (MAFS) estimates that, the agriculture sector must grow by 10 percent annually (MAFS, 2005). In 2004 the sector grew by 6% from 3.4% four years earlier (URT, 2008a); however in the years 2005, 2006 and 2007 the growth rates of the sector has been 4.3%, 3.8% and 4.0% respectively (URT, 2008c) showing even stronger doubt as to whether the 10% rate of growth will be achieved in the near future. According to the Tanzania 2007 Economic Survey, monetary agriculture grew to 4.1% in 2007 from 3.5% in 2006 while non-monetary (subsistence) agriculture decreased to 3.9% in 2007 from 4.6% in 2006 reflecting an increase in monetary agriculture activities vis-à-vis subsistence agriculture (URT, 2008c). According to the same survey, the general decline in the contribution of agriculture activities to GDP in 2007 compared to 2006 does not mean a decrease in agriculture production, but rather reflects an increase in other economic activities.

Like many SSA countries, since 1960s Tanzanian economy relied on export of cash crops such as cotton, sisal, tobacco, and coffee for substantial part of its GDP (URT, 2008a;b). However the increasingly stiff competition from other emerging economies from Latin America and Asia, and also low investment in agriculture and its supporting sectors have resulted in the decline in traditional agricultural share of export trade over the years (FAO, 2003, UNCTAD, 2004; URT, 2008a). The government of Tanzania and its development partners have been working towards an alternative to the income gap left on farmers and the country's GDP (URT, 2008a).

The agricultural sector has been progressively liberalized since the 1980s, with food crop marketing liberalization starting in 1985 and export crop marketing liberalization in 1993. Since then, several reforms have taken place in the sector. Strategies for implementing the reforms were comprehensively articulated in the Agricultural Sector Development Strategy (ASDS) which was prepared in 2001 (URT, 2008a;c). Its implementation programme (the Agricultural Sector Development Program (ASDP)) was subsequently formulated and adopted in 2006, and have since been used as a basis for the government's budgetary allocations and negotiations with international development partners(URT, 2008a). The vision of the ASDS is to have in place by 2025, an agricultural sector that is modernized, commercial, highly productive and one which utilizes natural resources in a sustainable manner (URT, 2008a).

Some of the targeted institutional reforms include redefinition of roles for relevant government institutions to focus on policy formulation, implementation procedures and enforcement (URT, 2008a). Disengaging the state trading enterprises (e.g. the agricultural commodity marketing boards) and confining their role to regulatory and promotional responsibilities was one such intervention (Putterman, 1995). Currently, the sector is characterized by mainly small subsistence farms and a few medium to large scale commercial ones (Temu and Temu, 2005). The main food crops include maize, beans, cassava, sorghum, rice and banana while the major cash crops are cotton, coffee, tobacco, cashew nuts, tea, pyrethrum and sisal (URT, 2008a). Horticultural exports are among the fastest growing sectors in the country with cut roses and vegetables taking the lead (TAHA, 2009). With the economic reforms taking root, there are strong signs of good growth, with export basket changing in favour of the non-traditional exports (URT, 2008a).

2.3.1 Traditional Exports

The export basket from Tanzania include seven major crops namely cotton, coffee, tobacco, cashew nuts, tea, pyrethrum and sisal. The initial impact of market liberalization, together with rising international prices initially resulted in increases in exports of the some of the key commodities (cashew nuts, coffee, tea, sisal and cotton) during the first half of the 1990s (Mlula, 2003). However, since then, such exports have been falling, in part due to the decline in international commodity

prices, but also due to other problems related to weak incentives, competition from low cost producers, inadequate investments and poor research and extension services (URT, 2008a). This caused a substantial drop in the contribution of export earnings by the agricultural sector from 50 percent in the mid 1990 to 23 percent in year 2002 (Mlula, 2003). Although the trend is not similar for all traditional exports, there have been efforts to encourage the farmers to expand their export baskets into other crops with relatively better markets and stable prices (Akyoo and Lazaro, 2007).

Table 2.2 Value of traditional exports 2002-2006

Year	Total exp. value(TEV) (mil. US$)	Value of Traditional Exports (mil. US$)								
		Coffee	Cotton	Sisal	Tea	Tobacco	Coconuts	Cloves	Total	% of TEV
2002	902.50	35.2	28.6	6.6	29.6	55.5	46.6	4.0	206.1	22.8
2003	1,142.40	50.0	46.6	6.6	24.8	42.2	42.2	10.3	222.7	19.5
2004	1,334.90	49.8	74.6	7.2	24.7	57.6	68.1	10.3	292.3	21.9
2005	1,675.80	74.3	111.5	7.3	25.6	80.8	46.6	8.5	354.6	21.2
2006	1,723.00	61.4	55.8	6.1	31.0	65.2	39.4	8.2	267.1	15.5
Ave.	1,355.72	54.1	63.4	6.8	27.1	60.3	48.6	8.3	268.6	19.8

Source: URT, 2008a)

2.3.2 Non Traditional exports

Like most African countries, the falling exports from traditional exports are being supplemented with the fast growing non-traditional export sector (Akyoo and Lazaro, 2007). Several non-traditional crops that have acquired recent prominence include fruit and vegetables, cut flowers, spices and herbs, oilseeds and fish products (URT, 2008a). In the period, 2002-2006 the value of traditional exports accounted for an average of 19.8% of the total export value where as the export value of horticultural products alone (excluding fruits), accounted for about 1.1% of the total exports value and an average of 1.4% of all non-traditional exports (Tables 2.2 and 2.3). However

the export of non-traditional agricultural products looks insignificant mainly because much of it is carried out as an informal cross-border trade (URT, 2008a) thus not shown in records.

Table 2.3 Value of Non-traditional Exports

Year	Total exports value (mil.US$)	Value of non-traditional exports (mill. US$)						
		Minerals	Manu. products	Fish & fish products	Horti. products	Other exports (incl. fruits & grains)	Total	% ttl. export value
2002	902.50	383.8	65.9	116.8	10.9	119.2	696.6	77.2
2003	1,142.40	548.3	99.9	136.2	13.7	121.6	919.7	80.5
2004	1,334.90	686.5	110.6	124.2	14.3	106.9	1,042.5	78.1
2005	1,675.80	711.3	156.1	147.5	18.3	161.5	1,194.7	71.3
2006	1,723.00	823.9	195.8	138.6	15.4	154.0	1327.7	77.1
Ave.	1,355.72	630.8	125.7	132.7	14.5	132.6	1,036.2	76.4

Source: URT, 2008a

2.4 Fruits and vegetables industry in Tanzania

The variation in topography and altitudes in Tanzania give the country a potential to produce tropical, subtropical and temperate fruits, flowers, vegetables and herbs for domestic and export market which is not fully exploited (USAID, 2007; URT, 2008a; Temu and Marwa, 2008). Potential areas for horticultural crops production include Kilimanjaro and Arusha regions in the northern highlands, southern highland areas in Mbeya and Iringa regions, coastal belt in Tanga, Morogoro, Coast region and Dar-es-Salaam, and lake zone areas in Mwanza, Mara, Kagera (Figure 2.1) (URT, 2008a; Temu and Marwa, 2008; SME-CF, 2008). Fruits are mainly produced by smallholder farmers mainly for local consumption and sale with very little export. The main fruits include oranges, mangoes, pineapples, bananas, avocados, grapes, papaws, guavas, lemons, tangerines, soursops, peaches, plums, pears, apples, jackfruits etc (Nyange et al., 1994). Information from Tanzania Horticulture

Association(TAHA) show that private companies export mangoes, pineapples, grapes, plums, avocados, lemons, raspberries and strawberries (URT 2008a).

Like fruits, the production of vegetables is mostly practiced by small scale farmers mainly for domestic markets, except for a few vegetables that are produced for export by out-grower farmers organized in schemes by large commercial exporters (USAID, 2007; Temu and Marwa, 2007; SME CF, 2008). Potential areas for vegetable production are found in the highlands and coastal belt of the country; including Kilimanjaro, Arusha, Tanga, Mbeya, Morogoro, and Iringa regions (Figure 2.1) (USAID, 2007). The vegetables produced include exotic vegetables such as tomato onion, leeks, shallots, chives, sweet pepper, cabbages, Chinese cabbages, lettuce, cauliflower, peas, carrots, cucumber, water melon, string-less beans, peas, mushrooms etc. Indigenous/tropical vegetables such as cherry tomato, eggplants, African eggplants, okra, collards/mustards, green leafy vegetables such as amaranths, nightshades, pumpkin leaves, sweet potato leaves, cassava leaves, and other wild varieties such as wild mushrooms (URT, 2008a).

The commercial vegetable production and export sector is dominated by private companies like WIMBO Exports, Serengeti fresh and former Gomba estates that own large farms for production but also buy vegetables from their contracted smallholder farmers (out-growers). They mainly produce and export green beans, peas**,** courgettes, chillies, baby corn, baby carrots and baby leeks (Mnenwa *et al*, 2007). In 2005/06 and 2006/2007 seasons, the Gomba Estates Ltd (the former vegetable exporter) exported 1,666 tons and 1,500 tons of fresh vegetables respectively (URT, 2008a). The exporter – smallholder relationship in the out-grower schemes has provided critical knowledge on standards requirements and market linkages leading to the development of a local industry that is internationally competitive, subscribing to private standards such as EUREPGAP (Mnenwa *et al.,* 2007; URT, 2008a). This has lead to a considerable trade in food products such as grains and fresh produce (including fruits, spices and vegetables) within the East African region, although a large proportion of it goes through unofficial channels and data are scarce (URT 2008a).

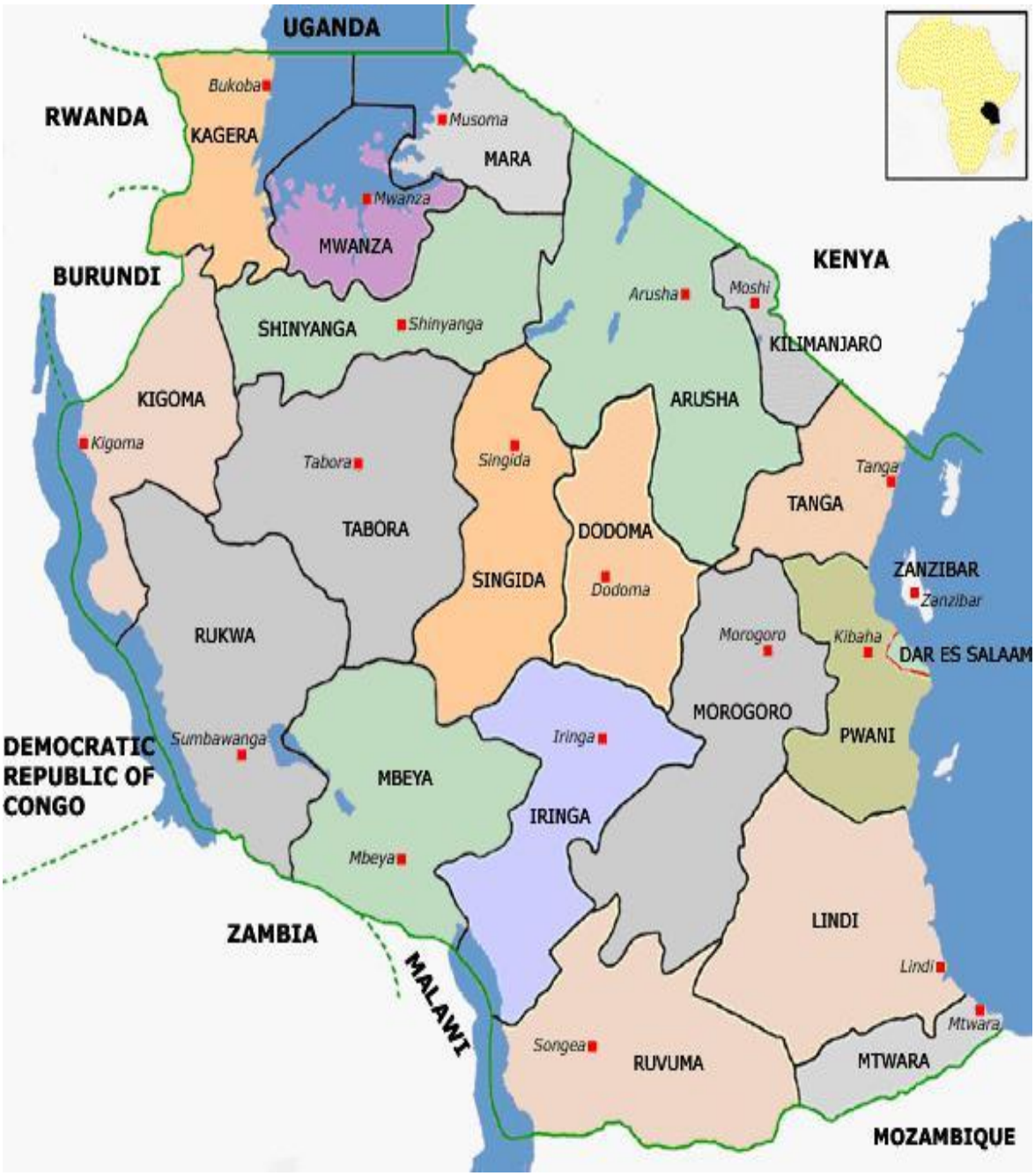


Figure 2.1 Map of Tanzania showing the regions

Fruit and vegetable value chains in Tanzania are largely uncoordinated with the exception of few export chains (Temu and Temu, 2005; Temu and Marwa, 2007). They vary from farm to consumption; farm to local market; farm - local market - middlemen - urban markets; and only a few farmers can afford to take their produce from farm to urban markets (Temu and Marwa, 2007). The export of fruits and vegetables is mainly organized and coordinated by private export firms that owns

farms and/or processing plants and buy produce from out-grower farmers. Major players in vegetable export[2] value chains are the out-growers (large scale; medium and smallholder farmers), exporters (Serengeti fresh and Gomba estate/Wimbo exports) and retailers/distributors (Sainsbury, Tesco, Flamingo and Boom Foods in the UK and Exofi in the Belgium) (Mnenwa *et al*., 2007). The export market is controlled by supermarkets in Europe and most of the UK buyers require the export companies in Tanzania to meet food safety, plant health, environment and social standards as set by EurepGAP, Natures Choice and British Retailers Consortium (BRC)(Mnenwa *et al*., 2007; Mnenwa, 2010). The relationship between the exporter and out-grower involves the exporters providing technical back-up to their suppliers (out-growers) including supply of planting materials, training on GAP and transport of produce, where as farmers supply labour for all farm operations including management of farm activities, and land for production (Mnenwa *et al*., 2007). In turn product prices are set by the estate (exporter) based on the overhead costs, cost of processing, transportation and selling prices in the foreign (export) market (Mnenwa *et al.*, 2007). Table 2.4 shows Tanzania vegetable export by destination in 2006, however the statistics are largely underestimated as most F&V exports are conducted through unofficial cross-border trade that goes unrecorded (URT, 2008a).

[2] Only EUREPGAP(now GlobalGAP) certified chains

Table 2.4 Tanzania vegetable exports by destination in year 2006

	Type of Vegetable	Destination	FOB value (Tshs)	Net weight (Tons)
-	Other potatoes, fresh or chilled	Kenya, Mozambique, South Africa.	356,702,653	3038.10
-	Tomatoes fresh or chilled	Kenya, Comoro, DRC, China.	14,157,814	124.00
-	Onions and shallots, fresh or chilled	Burundi, Kenya, Comoro, Mozambique, Egypt, DRC.	381,221,510	3316.80
-	Leeks and other alliaceous vegetables	Switzerland.	846,805	0.70
-	Cauliflowers and headed broccoli, fresh or chilled	UK, Italy.	37,211,782	8.83
-	White and red cabbages, kohlrabi, kale, fresh or chilled	UK, Kenya, Netherlands, South Africa.	270,569,772	1164.58
-	Cabbage lettuce, fresh or chilled	Hong Kong, Netherlands.	88,459,157	125.44
-	Cucumbers and gherkins, fresh or chilled	China, Singapore, Vietnam.	83,151,894	160.77
-	Peas, fresh or chilled	UAE, UK, Nethrlands, Belgium, Kenya.	1,635,431,692	677.53
-	Beans, fresh or chilled	UK, Netherlands, Kenya, DRC.	632,027,435	137.60
-	Leguminous vegetables, fresh or chilled	UK, Netherlands.	52,627,794	11.52
-	Potatoes, frozen	Kenya.	600,000	0.25
-	Leguminous vegetables, shelled or unshelled, frozen	Saudi Arabia.	7,384,375	21.00
-	Other vegetables and	Kenya.	12,897,253	151.61
-	mixture of vegetables			
-	provisionally reserved			
-	Vegetable products used primarily for human consumption, fresh/dried	UAE.	761,830,240	1012.00
-	Cucumbers and gherkins, preserved by vinegar/acetic acid	Comoro.	1,749,100	0.69
	Total		4,336,869,276	9,951.41

Source: URT, (2008a)

2.5 Organic farming development

Organic farming can be argued to be the oldest form of agriculture; this is because it wasn't until after World War II did the use of petroleum based chemicals in farming began (Pollan, 2006a). In most European countries, the acceptance and support of organic agriculture has not been smooth; according to Tate (1994), earlier governments were concerned about maximizing agricultural production for economic, socio and political reasons, and environmental concerns were negligible. It wasn't until the belated realization of fragility of the planet and recognition of persistent agricultural over-production that organic farming started to be viewed in a better light (Tate, 1994).

Organic farming has been defined in a number of ways and with time the definition has grown to include broader socio aspects such as social welfare (Cross, 2008). Tworag (2006) describes organic agriculture in developing countries as a form of sustainable having many characteristics of traditional agriculture, and it can be certified or uncertified - Figure 2.2. According to the US Department of Agriculture (USDA) (2000), organic food is defined by how it cannot be made instead of how it can be made. The many definitions of organic farming agree on a set of common elements, a farming system that avoids the use of Genetically Modified Organisms (GMO), synthetic chemicals and fertilizers, antibiotics and growth hormones, and follows the principles of sustainable agriculture (e.g. IFOAM, 2003; USDA, 2000, Soil Association, 2005).

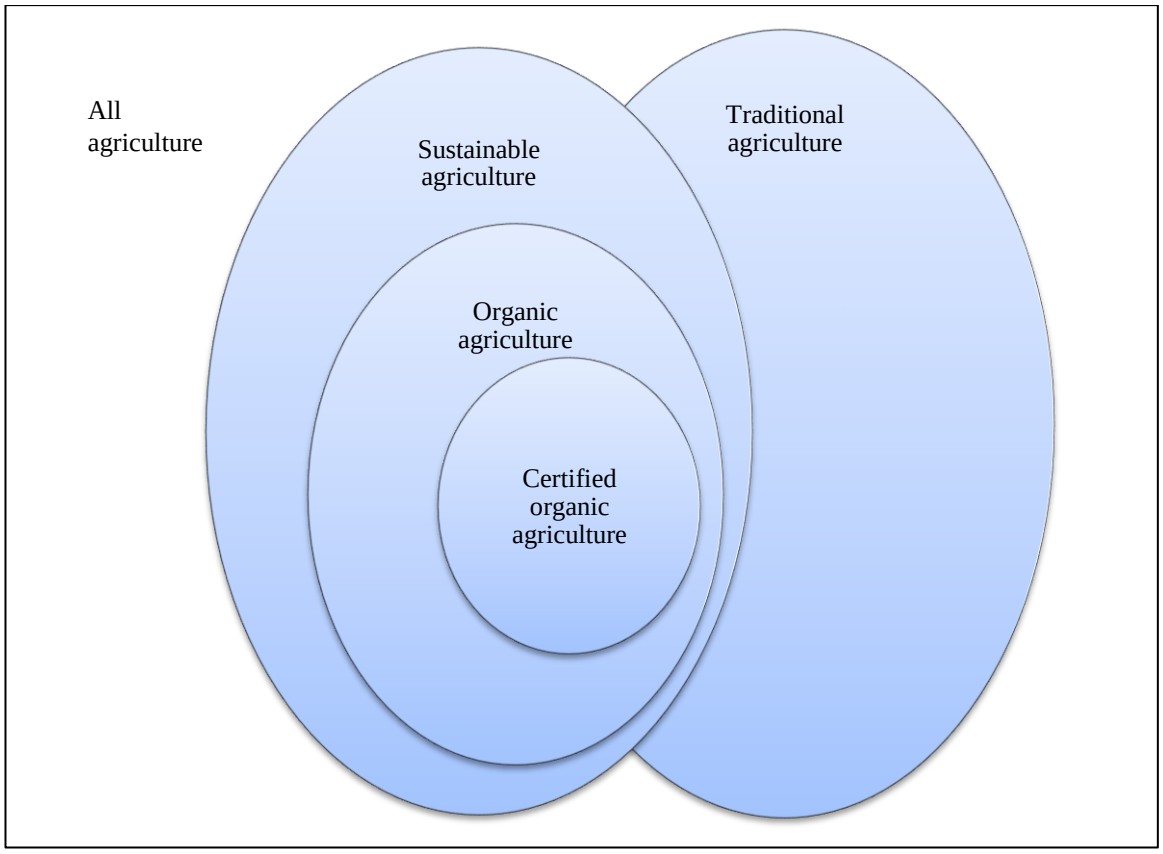


Figure 2.2 Categories of Agricultural practices in Developing countries

Source: Adopted from Twarog (2006) in UNCTAD Trade and Environment Review 2006.

2.5.1 Land under organic agriculture

Organic farming worldwide is developing rapidly with its share of agricultural land and farms continuing to grow in many countries, statistical information is now available from 141 countries of the world (FiBL, IFOAM and ITC, 2009). The global survey on certified organic farming show that, approximately 32.2 million hectares of agricultural land are managed organically by more than 1.2 million producers, including smallholders; there are 0.4 million hectares of certified organic aquaculture in addition to the agricultural land (FiBL, IFOAM and ITC, 2009).

Organic farming has gained importance in both developing and developed world as evidenced by the rapid growth in cultivated areas and the volume and value of trade. (IFOAM & FIBL, 2008). According to IFOAM and FIBL, (2008), the organic certified land area has increased by almost 1.8 million hectares compared to the consolidated data from 2005. The same report indicates the organic area on all continents has grown with Oceania/Australia witnessing the largest growth followed

by Asia; however the proportion of organically managed land compared to conventionally managed land is highest in the countries of Europe.

2.5.2 Markets for organic produce

The largest markets for organic foods are US and Europe, comprising about 98% of the global revenues; with Australia, Asia and Latin America being the important producers and exporters of the organic foods (USAID, 2007; IFOAM & FIBL, 2008; 2009). In developing countries, in particular Africa, the organic markets are limited or non-existent (Shilpi Saxena 2007, Rundgren and Lustig, 2007; Boon *et al*., 2010). Elsewhere in the world, since 1990 the market for organic products has grown at a rapid pace to reach $46 billion in 2007, driving a similar increase in organically managed farmland to approximately 32.2 million hectares worldwide - approximately 0.8 percent of total world farmland (Organic World, 2009). Organic sales have grown at a greater rate than expected in recent years (Organic World, 2009). The organic monitor, estimated international sales to have reached 38.6 billion US Dollars in 2006, double that of 2000, when sales were at 18 billion US Dollars (IFOAM & FIBL, 2008). However the Global Monitor report in November 2006, said exceptionally high market growth rates were pushing global organic food & drink sales towards 40 billion US Dollars that year; and with demand outpacing supply a number of regions were experiencing supply shortages. Generally, acute supply shortages in the global organic industry have been reported and regarded as an opportunity for the developing world to tap into the niche market in the developed countries (e.g. UNEP/UNCTAD, 2006; USAID, 2007; APO, 2010).

Marketing and distribution of organic produce has been reported by farmers as a major barrier for current and future prospects of the market (Foster and Latacz-Lohmann, 1997; Akyoo and Lazaro, 2008). In the UK for example, it was reported that the existing marketing structure dominated by the supermarkets was unable to effectively meet demand due to structural incompatibilities between organic farming and super-marketing; where as in Germany, increasing supply was not reaching the consumer because the prevailing niche marketing structure was unable to deal with large quantities (Foster and Latacz-Lohmann, 1997). The situation was thought to be created by production-oriented rather than market-oriented organic aid. These

setbacks call for solutions to meet the existing challenges without compromising the identity of the organic produce.

2.5.3 Certification in organic agriculture

The rapidly growing international trade in organic food encompasses issues of food scares, and questioning the quality of organic foods from other regions (Lampkin and Padel, 1994). In the UK for example, the demand for organic food has increased dramatically, much of which is met by the imports including many product categories from the developing world (Barret *et al*., 2002). The fact that, the added value that makes an organic product different from say, conventional cannot be seen by mere observation necessitates rules, guidance and requirements along the value chain to ensure the authenticity of the final produce. Consumer confidence in organic food's quality is considered a very important factor for the future development of organic farming as consumers believe in the credibility of organic producers and organic product quality due to its certification and control (Haring *et al.,* 2006). Due to the consumers' needs to be informed and assured of the quality and safety of the food they purchase, elaborate certification and accreditation institutions has evolved in line with the organic industry development. The definition of high standards and a robust organic certification system is thus necessary to conserve consumers' confidence and avoid scandals in organic farming (Haring *et al.,* 2006).

The first standards on organic agriculture were developed by private organizations; the IFOAM basic standards were first published in 1980 and have been continuously developed (IFOAM & FIBL, 2008). The numbers of organic certification bodies have grown at the same pace as organic farming, and in 2007 there was 395 organic certification bodies registered worldwide (Grolink, 2007). The big players with regard to turnover and number of certified farms include Soil Association, IMO, Bio Suisse, Bio inspecta and Naturland (IFOAM & FIBL, 2008).

The requirements for high standards that are obviously important for consumer assurance have proved difficult to achieve especially for smallholders in developing countries without organic support schemes (Larcher, 2005; UNEP/UNCTAD, 2006; Lazaro and Akyoo, 2007; Shilphi, 2007; COLEACP, 2007). Usually in smallholder organic farming arrangements in tropical Africa, the certification costs including

auditing and inspections costs are covered by the scheme operator who in most cases is a donor/exporter (Akyoo and Lazaro, 2007; Bolwig et al., 2009; Kazimoto, 2009; Mbote, 2009). These costs are then deducted from the produce sales (UNCTAD, 2008; Akyoo and Lazaro, 2008). Where donor support has phased out, many schemes were unable to continue paying the inspection and certification costs (Akyoo and Lazaro, 2008).

2.5.4 Re-defining organic agriculture

The Organic agriculture movement is believed to have stemmed out of the critique of the industrial values in conventional agriculture (Pollan, 2006b). With the increasing developments and industrialization in organic agriculture (Cross, 2008), there is rising criticism over its resemblance to the large scale conventional practices that it was initially supposed to replace (Guthman, 2004). In the same line of thoughts IFOAM (the international umbrella organization of Organic Agriculture movements worldwide) has redefined its organic principles (Cross *et al*., 2008). According to IFOAM, (2006) organic agriculture should be guided by four main principles that are:-

> **Principle of health**
> *Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.*
>
> **Principle of ecology**
> *Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.*
>
> **Principle of fairness**
> *Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.*
>
> **Principle of care**
> *Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.*

Soil Association (SA), the leading UK body in organic standards and certification has been spearheading more public participatory way of developing and redefining

its organic standards (Gibbon and Bolwig, 2007b). The debate on food miles and air freighted organic food for example has shaped the SA organic standards and others in the UK. Food miles, a concept taken to loosely mean the distance the food travels from the point of production to the end consumer (DEFRA, 2005; Edwards-Jones *et al.,* 2008) spurred a lot of debate around imported organic food. The concern was whether the food produced from a distant region and transported to the UK (airfreight or otherwise which involves burning of fossil fuels and considerable greenhouse gases (GHG) emissions) would still qualify as organic food that supposedly was to cause less emission of GHGs into the environment (DEFRA, 2005). Scientific difficulties in arriving to acceptable environmental accounting of food products (Edwards-Jones *et al*., 2008), concerns on the fairness, ethics and the impacts of banning the air-freighted foods and/or foods with large miles may have overrode the initial concerns for now, but the debate is far from over (Agritrade, 2008). The result of the debate has seen the Soil Association continue to certify air-freighted products, with possible mandatory requirement of fair trade certification (as part of its organic standards for air-freighted goods) and other labelling requirements (Agritrade, 2008).

2.5.5 Organic farming in East Africa and Tanzania

In many parts of Africa, natural agriculture i.e. farming without the use of off-farm inputs has been practiced since the domestication of plants began, the literature calls this form farming organic by default (Bolwig *et al.,* 2009; Shilpi, 2008; and AVRDC, 2009). Intensive agriculture involving the use of chemical fertilizers, pesticides and other off-farm inputs for increased productivity as proposed in green revolution was an alternative out of reach for most African smallholders due to lack of capital for the investment (Makanya, 2004). The majority of the smallholders in East Africa as well as the rest of SSA cannot afford synthetic inputs, since they account for roughly 80% of the farmers in the region; farming in this part of the world can generally be referred to as very low intensity agriculture (AVRDC, 2009; Bolwig *et al*., 2009).

Spotting the potential to use the low intensity agriculture situation to smallholders' benefits; the governments, donor community, development agencies and Community Based Organizations (CBOs) have taken an active role in promoting organic farming for poverty reduction, diversification of income generating activities and food

security reasons among others(Akyoo and Lazaro, 2007; USAID, 2007; Akyoo, 2009; Bolwig *et al*., 2009). Export Promotion for Organic Products from Africa (EPOPA), a programme funded by the Swedish International Development Agency (SIDA) from 1997-2008 worked with major players in the organic chains in Tanzania, Uganda and Zambia with the aim of giving African smallholder farmers a better livelihood through developing local and international organic markets (EPOPA, 2008). The Capacity Building Task Force (CBTF) under a joint initiative of the United Nations Conference on Trade and Development (UNCTAD) and the United Nations Environment Programme (UNEP) have also undertaken capacity building and promoted the growth of organic farming in East Africa (UNEP-UNCTAD, 2008). Other stakeholders in East African organic agriculture include USAID and East African Organic Agriculture Initiative which was implemented with the financial support of the European Union and SIDA (TOAM, 2009).

Notable developments from donor funded support include

- Training of farmers in organic farming
- Organization of the formation of contract farming schemes that linked farmers to export markets
- Formation of national organic agriculture movement bodies
- Development of organic standards and local certification bodies in the region
- Steering the process of formulation of organic policy in respective countries (EPOPA, 2008).

The formation of East African Organic Products Standards in 2007 marked a high step in the growth of organic agriculture in East Africa. The standard that become only the second regional organic standard after the EU, it was developed by a public-private sector partnership in East Africa, supported by the UNEP-UNCTAD Capacity Building Task Force on Trade, Environment and Development (CBTF), and the IFOAM (UNCTAD, 2007). Currently, the local certification bodies act as a stepping stone for achieving more internationally recognized certifications; sometimes carry out the auditing activities on behalf of recognized certifiers at a lower cost (TANCERT, 2009). The expectation is that, in the future if the standards become more harmonized, the domestic certification can be accepted for export purposes (TANCERT, 2009). Having been inspired by the success from participating

farmers, several groups being women groups, farmer cooperatives etc. have now organized for organic farming for local and export markets (UNEP/UNCTAD, 2006).

2.5.5.1 Area under organic agriculture

Statistics on the land under organic production in Africa are incomplete as most countries do not have comprehensive data collection system for organic farming, consequently data on the numbers of organic farms are not available for every country (IFOAM & FIBL, 2008). According to IFOAM & FIBL, (2008) survey, 417,059 hectares in Africa are currently managed and certified organic by at least 175,266 farms, the countries with the largest certified areas are Tunisia, Uganda, South Africa and Tanzania (see Table 2.5). Additionally, 8.3 million hectares are certified as forest and 'wild harvested' areas. The largest wild collection areas are in Zambia (7.2 million hectares), Sudan (490,000 hectares), Kenya (186,000 hectares) and Uganda (158,328 hectares).

Table 2.5 Countries with largest certified lands in Africa

Country	Area under certified organic agriculture (hectares)
Tunisia	154,793
Uganda	88,439
South Africa	50,000
Tanzania	23,732

Source: IFOAM & FIBL, (2008)

As noted earlier, there are difficulties in getting the correct data as some are completely missing, or shows discrepancies between sources. In Tanzania for example, according to Tanzania agricultural sector reforms report (URT, 2008a), it is estimated that there are more than 40,000 certified organic farmers with 64,000 ha under organic agriculture production in the country, while the IFOAM&FIBL (2008) suggest that only 23,732 hectares of land is certified. Uncertified organic farming is also being practiced along with the certified agriculture and is encouraged by NGOs and other community based organizations (CBOs) as a means for soil conservation and potentially improved productivity (Gibbon, 2006; Shilpi, 2007).

2.5.5.2 Organic products and markets

A wide range of organic products are produced in Africa for export (Table 2.6), their destination markets being mainly Europe and US (Kortbech-Olesen, 2006; USAID, 2007; IFOAM/FIBL, 2008, Shilphi, 2007). This is because domestic markets for organic products are small, with few recognized prospects in Egypt, South Africa, Uganda, Kenya and Tanzania (Rundgren and Lustig, 2007).

According to URT, (2008a), the crops under organic production include cash crops (cotton, black tea, coffee, cashews and cocoa); spices and herbs (ginger, cinnamon, vanilla, black pepper, cardamom, cloves, lemon grass, rosella etc.); fruits (pineapples, mango, orange, lemon, jackfruit, paw paws, guavas etc.) oil crops (sunflower, sesame, oil palms, coconuts) and vegetable (peas, onions, garlic, baby corn, tomatoes, baby carrots etc.). In Tanzania, a number of organic or 'natural products' as they are commonly known are available in the local market (Table 2.7) and are sold through some specialized and unspecialized outlets; these products are usually not certified (Mwasha, 2007). The specialized outlets are small shops that sell exclusive 'natural products' while unspecialized outlets include supermarkets and tourist hotels and restaurants. Consumers of these 'natural products' are mainly expatriates and tourists, a few well-off and educated Tanzanians would buy them for health reasons and others for medical reasons (Mwasha, 2007; Rundgren and Lustig, 2007).

Table 2.6 Organic produce exported from Africa (by type and country)

Product Group	Countries
Bananas	- Mali, Cameroon, Ghana, Rwanda, Senegal, Uganda
Cereals including rice	- Egypt, Ethiopia, Madagascar, Mozambique, Sudan
Citrus Fruits, Grapes (including Wine)	- Egypt, Morocco, South Africa
Cocoa	- Cameroon, Ghana, Madagascar, Tanzania, Uganda, Sao Tome and Prince
Coconut Oil	- Mozambique
Coffee	- Cameroon, Ethiopia, Kenya, Madagascar, Rwanda, Tanzania, Uganda
Cotton	- Benin, Burkina Faso, Egypt, Mali, Senegal, Sudan, Tanzania, Uganda, Zambia
Dried Fruits	- Algeria, Benin, Burkina Faso, Cameroon, Egypt, Ghana, Madagascar, Morocco, Tanzania, Togo, Tunisia, Uganda
Essential Oils	- Ghana, Kenya, Madagascar, Tanzania, Uganda, Zimbabwe
Fresh Vegetables	- Cameroon, Gambia, Egypt, Kenya, Madagascar, Malawi, Mali, Morocco, Rwanda, Sao Tome and Prince, South Africa, Tunisia, Zambia
Ground Nuts (peanuts)	- Cameroon, Mozambique, Tanzania, Zambia
Gum Arabic	- Chad
Herbs (culinary)	- Egypt, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Morocco, Mozambique, South Africa, Tunisia, Zambia, Zimbabwe
Honey	- Algeria, Malawi, Tanzania, Tunisia, Uganda, Zambia
Medicinal/Therapeutic Herbs and Spices	- Egypt, Morocco, Namibia, Tunisia, Zambia
Olive Oil	- Tunisia
Other tropical fresh fruits	- Cameroon, Egypt, Ghana, Madagascar, Senegal, South Africa, Tanzania, Uganda
Palm Oil	- Ghana, Madagascar
Processed fruits including Juices	- Ghana, Tanzania, Uganda
Sesame	- Burkina Faso, Mali, Mozambique, Senegal, Uganda, Tanzania
Spices (culinary)	- Cameroon, Egypt, Ethiopia, Madagascar, Malawi, Mozambique, South Africa, Tanzania, Uganda, Zimbabwe
Sugar	- Cameroon, Madagascar, Mauritius,
Tea	- Kenya, Tanzania, Rwanda
Tree Nuts (cashew, shea)	- Burkina Faso, Ghana, Kenya, Malawi, Mali, Morocco, Tanzania, Togo

Source: IFOAM /FiBL Survey 2008

Table 2.7 Organic/natural products available in the domestic market in Tanzania

Product group	Product type	Source (areas)
Vegetables	Broccoli, beetroot, carrots, tomatoes, cucumber, mushroom, cabbage, round potatoes dried vegetables	Lushoto, Kilimanjaro
Jams	Pineapples, passion fruits, mango, banana, strawberry, gooseberry.	Lushoto, Arusha
Spices	Ginger, cinnamon, turmeric	Lushoto
Beverages	Tea, coffee, wines	Arusha, Iringa, Kilimanjaro
Cereals/legumes	Brown rice, rye flour, wheat flour, lishe, soya, beans	Dar es Salaam, Lushoto, Arusha
Soft drinks	Passion fruits, rasp berries, oranges, soya	Arusha, Lushoto
Dairy products	Yoghurt, cheese	Lushoto
Edible oils	Macadamia, sunflower, palm oil, moringa	Kigoma, Lushoto, Dar es Salaam
Medicinal products	Aloe vera juice, moringa products (powder, seeds, roots and soaps), neem oil and soaps, cucumber soaps, sea weed, stingless bees honey	Dar es Salaam, Dodoma, Mbeya, Arusha

Source: Mujunguli, 2004. EPOPA Rapid Market Scan

Organic fruits and vegetables in Tanzania

Traditionally, fruits and vegetables in Tanzania have been produced by smallholders in a mixed farming cropping system that were basically organic, mainly for their own consumption and the excess sold in local markets (Nyange *et al*., 1994). Vegetable gardening has for long been considered as women's activity as there was no cash prospects associated with the activity while men concentrated on cash crops and main staples like maize (Hyder *et al.,* 2005). Most fruit trees grow naturally and the excess fruits are left to rot in the farms (Nyange *et al*., 2004). Lack of processing firms and other rural infrastructure including roads and storage facilities has driven on-farm and post-harvest losses in F&V sector as high as 40% (Barry *et al.*, 2008). Improvement in the transport infrastructure and growth of export markets have certainly changed the way the F&V sector was viewed in the past decades, from being a women only activity to the fast growing agribusiness sub-sector dominated

by the private sector(Temu and Marwa, 2007; Barry *et al.*, 2008). The introduction of the supermarket chains and establishment of a few processing plants in the country producing juices, concentrates, jams, jellies etc. has contributed to growth of the local market for F&V (Temu and Marwa, 2007; Tanzania Investment Website, 2008).

The organic production of fruits and vegetables in Tanzania is small but growing fast (URT, 2008a). According to TOAM (2008), organic production of F&V both certified and in-conversion process are practiced in northern Tanzania mainly Kilimanjaro, Arusha and Tanga. Other important areas for organic fruits and vegetables are Kagera, Pwani, Morogoro, Iringa and Mtwara regions (URT, 2008a). Most of the certified organic production is organized in schemes mainly by exporters and/or donor supported NGOs (EPOPA, 2008). A few groups of smallholder farmers are organized in some marketing or credit associations usually with some external support and engage in production and processing variety of organic fruits and vegetables mainly for domestic market but also for export (UNEP/UNCTAD, 2006).

2.5.5.3 Studies in Tanzanian organic farming

A few studies have been conducted in East Africa on organic farming, mostly on the status of organic farming, production opportunities and market prospects (e.g. EPOPA, 2004; Kortbech-Olesen, 2006; Shilphi, 2007; UNEP/UNCTAD CBTF, 2006; UNEP/UNCTAD, 2007a; b; c; Akyoo and Lazaro, 2008, Bolwig *et al.*, 2009). The studies have indicated good market prospects for organic produce from East Africa amid rising concerns on the carbon accounting and food miles. The peer reviewed literature on organic farming in Tanzania and majority of SSA is very limited or non-existent and some specific areas like farmers knowledge, motives and perceptions has received little or no attention. Comprehensive farm budget assessments studies for revenue assessment are lacking in tropical Africa (Gibbon and Bowling, 2007a; Bolwig *et al.*, 2009) and health effects of organic farming to farm workers and community have not been conducted.

2.6 Organic farming and farm income

In developed countries, studies have shown organic farming to have comparable incomes as conventional although the later are associated with reduced productivity. This is because the loss in productivity in organic systems is offset by organic premium prices and savings from the use of synthetic inputs (Padel & Lampkin, 1994; Lampkin, Padel and Ricker, 1997; Offermann and Nieberg, 2000; Nicolai and Ada, 2005; Greene and McBride, 2007). Organic farming in developing countries is seen as means to improve farm incomes and subsequently farmers' livelihoods (UNEP_UNCTAD, 2008). Two studies in East Africa, Bolwig *et al*. (2009) in Uganda and UNEP/UNCTAD (2008) across case studies in East Africa have reported better incomes on organic production systems. The improved incomes were however observed where the farmers were involved in the organic export schemes. On the other hand, no realization of the expected benefits for organic farmers was reported in a study by Akyoo and Lazaro, (2008) on the organic spice industry in Tanzania. Weak institutional support, loosely coordinated supply chains and unregulated market are among the problems found by Akyoo and Lazaro, (2007) in their Tanzanian organic industry and standards study.

Due to limited capacity of exporting firms at buying all the organic produce, many smallholder organic farmers sell their produce in domestic markets (Akyoo and Lazaro, 2009; Kazimoto, 2009; Mbote, 2009). Nonetheless, studies on organic farming in the region focus more on the exporting organic farmers. To date no study has comprehensively assessed the revenue impact of organic farming on domestic selling organic farmers.

2.7 Organic farming, productivity and food security

The growth of organic farming and its implication to food security has been a subject of interest to international bodies, the academic community and other environment and agricultural sector stakeholders. Scillaba and Hattam in (2006) observed that it was unclear how the rapid conversion of farmland into organic management systems will affect food availability and access among producers and societies. Studies in many developed countries where intensive agriculture is practiced have shown organic yields to be lower than those in conventional systems (e.g. Henning *et al*., 1991; Lampkin 1994; Padel & Lampkin 1994; Nicolai and Ada, 2005; Badgley *et al.*,

2006). Fallowing or resting the organic farms for one or two seasons where agricultural lands are not available indefinitely has been noted as a threat to food security.

Due to productivity limitation, the critics of organic farming argue that, organic farming practices can at most feed 4 billion people globally, after expanding cropland dramatically and destroying ecosystems in the process (Trewavas, 2001; Leonard, 2006). In SSA however, a recent study by Unite Nations Environment Programme (2008) across Africa concluded that, organic farming can be a solution to African food security problems. According to this study, a review of over a hundred crop comparisons argued that organic farming could produce enough food per capita to sustain the current human population. The difference in yields between organic and non-organic methods were small, with non-organic methods resulting in slightly higher yields in 'developed areas' and organic methods resulting in slightly higher yields in 'developing areas'. However, some criticisms has been made of the methodologies including comparing incomparable and also using results from studies that had no rigorous scientific credibility (Alex, 2007). The important question on the organic systems productivity in Africa might be on what is the production target for the region. Organic methods resulting into 'slightly more yield' in developing areas (already within the already LDCs) does not give any assurance on the ability of the farming system to in reducing the food insecurity.

Another study by Badgley *et al.* (2006) concluded that organic yields in developed countries are less than conventional ones where as the yields are more than conventional in developing countries. The study also modelled the global food supply that could be grown organically on current agricultural land use and concluded organic methods could produce enough food on a global per capita basis to sustain the current human population, and potentially an even larger population, without increasing the agricultural land base. However the methodology used in the estimation of production and consequently the conclusions have been outright criticized by Connor (2008) as overestimated and misleading. It is therefore obvious that the ability of organic farming to feed the world is still open to debates.

Panneerselvam *et al*. (2011a) noted that, food insecurity is not caused entirely by the lack of adequate food production but also by the inability of the poor to buy food. Their study in India suggested conversion to organic agriculture helps reduce debts and improve the purchasing power of the farmers without impairing overall food supply. Another study by Panneerselvam *et al*. (2011b) suggested that organic farming has the potential to improve smallholder farmers' food security by reducing their indebtedness due to lower production costs without affecting total farm production and farm income.

In Africa, Bolwig *et al.* (2009) stated that, "In general, where local food markets are functioning and organic conversion does not involve major risk taking by farmers, the integration of smallholders into international value chains for organic products does not normally constitute a threat to food security". In Tanzania and most other SSA countries there are no functional local markets and certainly the organic conversion involve major risk as the producers rely on the same volatile markets in developed countries. Under these circumstances, the assertion that the integration of smallholders into international value chains for organic products does not normally constitute a threat to food security becomes invalid. Detailed studies measuring the outcomes of organic farming systems and their holistic influence on the food security and ability to feed African growing population amidst the climate change threats are needed to warrant an understanding of the sector by planners, international community and main stakeholders in the development of the continent.

2.8 Organic farming and sustainability

Defining agricultural sustainability or sustainable farming systems has been a subject in the centre of most debates (Ikerd *et al.*, 1996; Rigby and Cacers, 1997; Edwards-Jones and Howells, 2000; Sydorovych and Wossink, 2008). Common aspects in the many definitions include soil fertility, energy efficiency, maintenance of yields, maintenance of genetic base of crops and animals, profitability, water quality, nature conservation and socio-economic (Edwards-Jones and Howells, 2000). Due to lack of social consensus on the precise meaning of sustainability (Gafsi *et al*., 2006) operationalization of the concept has also been difficult, but generally acceptable assessment dimensions include ecological, economic and social aspects. Within each

dimension of sustainability, one or more attributes are identified and then measured by the means of indicators (Sydorovych and Wossink, 2008).

Like any other farming system, the sustainability of organic farming has been questioned but many believe it provides more sustainable agriculture than most existing intensive farming systems (ISIS, 2010). Since the definition and even criteria for assessing sustainability of farming systems are not universally accepted, measuring the sustainability of any system is difficult (Gafsi *et al.,* 2006). Organic farming is meant to be more beneficial to the environment and the ecosystem, however studies have not been able to prove with absolute certainty that these benefits can be achieved (Kirchman, 2004; Hole *et al.,* 2005). It may be argued however that, it is rather the question of measurement difficulties than the system not yielding results. A number of studies have been able to prove the environmental and ecosystem benefits of organic farming systems compared to conventional and/or intensive farming systems (Scialabba and Hattam 2002).

Economic sustainability measured by profits and ability of the farm to continue and support itself has been vague. This is due to productivity limitation in organic farming systems in developed countries (e.g. Nicolai and Ada, 2005; Henning *et al*., 1991; Lampkin 1994, Padel & Lampkin 1994) where as studies in developing countries have shown mixed results depending on the level of input use before conversion. According to organic farming critics, assuming the organic farming grows in current rates and becomes mainstream farming system, lack of enough food will eventually force the worlds' agricultural lands expansion several folds in order to feed the entire population destroying the forest and other ecosystems in the process, the very aspects it was meant to conserve (Trewavas, 2001; Leonard, 2006). Likewise another dimension of sustainability, namely financial sustainability is also questionable. Few studies in developing countries have shown organic farming to be more profitable than conventional farming systems (UNEP-UNCTAD, 2008; Bolwig *et al.,* 2009). In developed countries, organic farming cannot be profitable without some form of support like conversion support, training and extension materials, certification and auditing, price support or direct income payments (Lampkin and Padel, 1994). The economic sustainability of organic farming systems therefore remains questionable.

2.9 Organic farming and farmers' health

Among the primary targets for organic farming is to sustain and enhance health of soil, plant, animal, human and planet as one and indivisible (Organic farming principle of health) (IFOAM, 2006). Studies have shown that, a good number of consumers buy organic produce for health and nutritional reasons in US, Europe and elsewhere (Yiridoe, 2005; Makatouni, 2002; London Evening Standard, 2009). However there is no solid proof that organic foods are better than conventional foods nutritionally or that they are any better for our health (Dangour *et al* 2009). In July 2009 the UK's Food Standards Agency announced that organic produce is no better for health than conventional food. This was the result of a study it had commissioned on the nutritional value of organic produce that concluded little to no nutritional benefit found in organic fruit and vegetables compared with "ordinary" equivalents (London Evening Standard, 2009; Daily mail, 2009; The Guardian, 2009). There has been arguments however that the study was set out to prove the claim that was never made in the first place, that organic products may not offer better nutrition, but there's no question that they are better for our health (Haaretz, 2009).

The social costs, benefits and health impacts of organic farming in SSA have so far not been addressed partly because the farming system was adopted for the purpose of accessing niche markets in developed countries rather than for enhancing domestic consumption of safe food for health reasons (Lazaro and Akyoo, 2008). In developing countries, organic farming is expected to improve farmers' health due to improved incomes. Income and health is known to have curvilinear relationship such that, there are diminishing marginal returns on health as the income levels increase (Mackenbach, 2005; Fritzell *et al*., 2004; Stronks *et al*., 1997). This means health status improves as the income increases but it does so at diminishing marginal rate for the higher income categories (Stronks *et al*., 1997; Fritzell *et al*., 2004; Mackenbach, 2005). No studies on health or nutritional benefits of organic farming have been done in Africa; one study has assesses farm workers health on local and international supply chains (Cross, 2008) but was not specific to organic systems. There is a need to conduct such assessments in order to inform the stakeholders on the health benefits of organic farming to farmers in developing countries.

2.10 The future of organic exports from Sub-Saharan Africa (SSA)

Tropical F&V including organic products have increasingly penetrated European markets in recent decades benefiting many smallholder producers from the region (MCulloh and Ota, 2002; Minot and Ngingi, 2004; Bolwig *et al*., 2007; The World of Organic Agriculture, 2008; Bolwig *et al*., 2009). This has caused governments and development agents in SSA to promote organic farming for export in order to improve farmers' incomes through access to niche markets (Simmons, 2002; Bakewell-Stone, 2006; Bolwig *et al*., 2009; APO, 2010). However, the rapid growth of the share of imported foods in the European consumer's food basket have raised concerns on their support for local economies and commitments to environmental conservation (DEFRA, 2003; DEFRA, 2005; Chamber *et al*., 2007; Morgan, 2010). The food that has travelled more miles from the production to consumption point is generally considered more ecologically destructive as it is believed to contribute significantly more CO_2 emissions from the transport process (DEFRA, 2006; Coley *et al*., 2009; Kemp *et al*., 2010). Food miles, a concept taken to loosely mean the distance the food travels from the point of production to the end consumer (Edwards-Jones *et al*., 2008; DEFRA, 2006) have thus become a powerful tool in policy discussions aiming to build sustainable agriculture (Coley *et al*., 2009). Approximately 50% of vegetables and 95% of fruits consumed in the UK are imported (Stacey, 2008). Subsequently, the food miles concept has been so important in UK news media, research and policy (Kemp *et al*., 2010).

Mode of transport is also reported to contribute substantially to GHGs emissions (Coley *et al*., 2011). Air-freighting in particular have caused a lot of concern over the certification of air-freighted organic produce (Mason *et al*. 2002; DEFRA, 2005; Sim *et al*., 2007; MacGregor and Vorley, 2006; Kemp *et al*., 2010). Local food movements encouraging buying food from wherever is geographically nearest in order to support local economies (Marsden *et al*., 2000; Hinrichs, 2000; CPRE, 2002; Weatherell *et al*., 2003; DEFRA, 2005; Chambers *et al*., 2007) pauses yet another threat to the future of tropical organic products in the European markets. Furthermore, studies have suggested consumers are more likely to buy local food as compared to imported due to association of local with quality and support of local economies (Arnout *et al*., 2007; Chamber *et al*., 2007). However, little has been done to assess the importance of the very same factors in the buying decision when there is

no local alternative. Understanding European consumers' knowledge, awareness of the product and trade-offs they make between products' attributes when there is no local alternative is important in assessing the future prospects of tropical organic fruits.

2.11 Conclusion

The review of the literature shows a large knowledge gap in the organic farming studies in LDCs especially SSA. Farming systems are location specific as they are affected by different environmental, economic, socio-cultural and political conditions. Conclusions from studies done in one part of the world cannot be assumed to apply to other parts of the world unless they share very similar settings. There is a need to conduct studies on knowledge, perceptions and awareness; health implications to farmers and community; productivity and profitability studies and hence food security implication of mass adoption of organic farming in SSA. The assessment of the future prospects of tropical organic produce in the European markets amidst unresolved debates in food miles, air-freighting of organic produce and current developments in carbon foot-printing is essential.

CHAPTER THREE: GENERAL METHODS, STUDY AREA AND RESPONDENTS' PROFILES

3.1 Introduction

This chapter presents the general methods that were used to collect data for chapters four through seven. The general methods, overview of study area and general descriptive statistics are presented here while specific details on data collection methods and analytical procedures are detailed in the respective chapters. A description of the existing supply chains in the study areas is also included here.

3.2 General methodology

3.2.1 Target population

Information was sought to answer the questions on the contribution of organic and export horticulture to smallholder farmers' livelihoods and welfare in Tanzania. To achieve this, a comparative analysis of smallholder farmers was adopted, organic vs. conventional farmers in the export and domestic orientated sectors. Crop choice was determined by the number of farmers farming organically and conventionally. Since the target population was smallholder fruit/vegetable farmers in Tanzania, pineapples stood out as the crop where sufficient numbers of smallholders were involved in its production and had active organic and export schemes as well as domestic selling farmers. There were also sufficient numbers of smallholder conventional pineapple farmers working alongside organic farmers which facilitated a comparative study. Pineapple production in Tanzania is undertaken mainly by smallholders and it is among the few crops where organic farming has been adopted by many farmers (TOAM, 2009). The crop can be cultivated in most regions of Tanzania which in turn presented a wide geographical study area, a range of infrastructure differences, market access, and social setting differences enabling generalizations of the study findings across the country. Smallholder farmers for the purposes of this study were defined as any farmer holding a pineapple plot of 0.25 – 10 ha.

3.2.2 Assessment method

A comparative survey was considered appropriate to generate important impact assessment outcomes of the two farming sytems i.e. comparative assessment of organic and conventional farmers on income (chapter 5), food security (chapter 6)

and health (chapter 7) dimensions. Conversely, the before and after method of impact assessment could have been employed here. However, this method was considered unreliable in the current context because organic farmers had been involved in the schemes for more than 5 years at the time of the survey and relying on their memory of the events 5 yrs earlier and now could be too subjective. Furthermore the "before and after" method presented a possibility of confounding factors that may influence the outcome in question other than organic farming per se. For example, the positive impact on the farmers livelihoods of a road built on the village within the past 5 years leading to improved market access due to easy transportation could be mistaken for the impact of the farming system whereas in comparative survey, the reporting of the same from conventional farmers would cancel out this impact.

3.2.3 Training of the assistants and questionnaire translation

The research assistants, holders of MSc. Agriculture Economics & Agribusiness degrees were trained for a day to assist in conducting the questionnaire surveys. The household survey questionnaires were initially developed in English and the assistants (who were all bilingual –English and Swahili) were trained both in English and Swahili. The translations from the English to Swahili version were agreed upon during the trainings. After the preliminary survey, more clarifications and corrections on the Swahili version were made to ensure the validity of the questionnaire and its clarity to the interviewees. The completed Swahili versions of the questionnaires were thus used for data input into the English coded version of the same by the researcher who is also bilingual (English and Swahili).

3.2.4 Preliminary survey

A preliminary survey was conducted with 38 pineapple farmers, 19 organic and 19 conventional; in the Morogoro region to pre-test the questionnaire. Respective adjustments were made to ensure relevance of the questionnaire to research questions and clarity of the questions to the interviewees. Units of measurements were harmonized with local understandings, ambiguous questions were clarified, local language differences noted and interview duration established.

3.2.5 Site selection and description of study areas

Three study sites were selected where organic and conventional pineapple farmers co-existed. These were Bagamoyo in the coastal region (eastern Tanzania), Njombe in the Iringa region (central-southern Tanzania) and Karagwe in the Kagera region (northern Tanzania) (Fig. 3.1). The sites were selected due to their locations which roughly covered the length and width of the geographical regions of Tanzania, and also because they contained a large number of organic and conventional pineapple farmers. A short description of each study site, economic activities and other relevant aspects is given below.

3.2.5.1 Karagwe

Karagwe is one of six districts of the Kagera region in northern Tanzania. It is bordered to the north by Uganda and to the west by Rwanda, and most of the eastern side by Lake Victoria. According to the 2002 Tanzania national census, the population of Karagwe District numbered 425,476 (URT, 2003). The principal economic activity in Karagwe district is agriculture; fishing and cross-border trade of food as well as cash crops are also common economic activities. Karagwe district is characterized by low temperatures and has a bimodal rainfall pattern (Fig. 3.2); making it suitable for production of a range fruits, vegetables, and food crops as well as cash crops (FAO, Local climate data, 2011). The main staple crops produced in Karagwe area include bananas, coffee, maize, beans, groundnuts, finger millet, green beans, cassava, Irish potatoes, sweet potatoes, soya beans and sorghum, while popular fruit crops are pineapples, bananas and pawpaw (Karagwe - District Agricultural and Livestock Development Officer (DALDO) records, 2009). Farmers in this area, whether organic or conventional, did not use chemical fertilizers or pesticides in their pineapple production.

The organic scheme in Karagwe is organized by the Matunda Mema Company which processes and exports organic pineapples, bananas and pawpaw from contracted farmers. Participation in the organic export scheme by smallholder farmers is open to

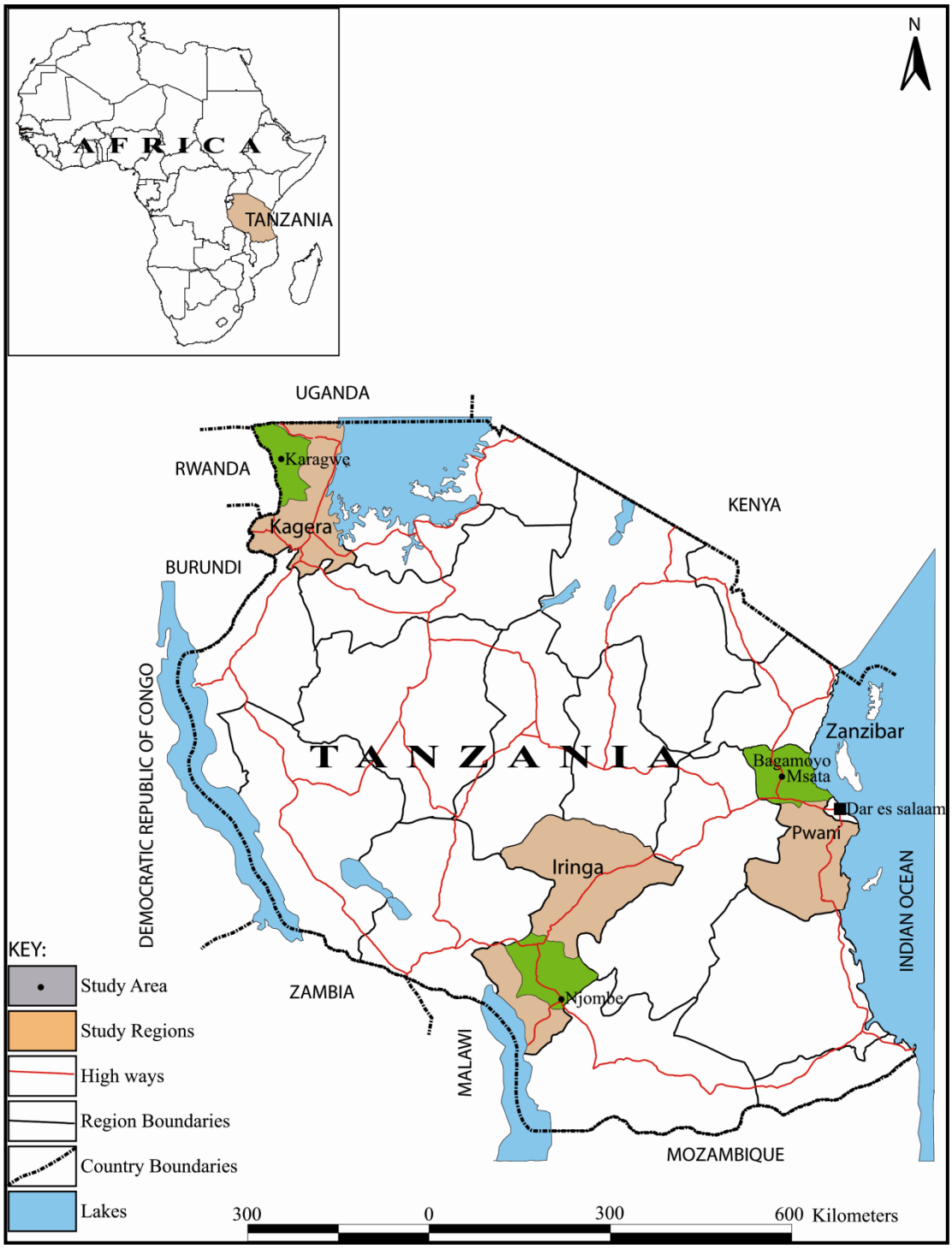


Figure 3.1 Map of Tanzania showing the study areas

any farmer in the locality that is producing the targeted crops and meeting the organic production criteria set by the firm. The company has been active since 2001 conducting regular training and follow-up with farmers to ensure compliance to organic criteria and providing group certification and regular buying of the produce from farmers. More than 290 organic farming households are involved in the scheme

(Kazimoto, 2009). The control, training and certification costs are born by the company and thus the company sets buying prices to compensate for these costs. The price offered by the firm is constant throughout the year. It is above market price during the peak harvest season and below in the off-season when demand is higher than supply (Kazimoto, 2009). Being a single buyer, the capacity of the firm is too small to absorb all organic pineapples produced during peak season and thus organic farmers sells part of their produce in domestic conventional outlets directly or indirectly though middlemen and traders.

Nine villages from three divisions containing farmers producing organic pineapple under Matunda Mema Organic Farming and Export Scheme were surveyed. The villages were selected based on number of co-existing organic and conventional farmers. The three divisions were Kituntu Ihanda, Bugene Nyaishozi and Kituntu Mabira. The villages selected from the divisions were Kagutu, Ihanda, Rukole, Chonyonyo, Chanyang'abwa, Itera, Katanda, Kihanga and Mhulule.

Due to their location, farmers in Karagwe have limited access to urban markets due to poor transport infrastructure. The nearest market is Mwanza city, which is separated from Karagwe by Lake Victoria. Mwanza City is accessible by more than 500 km of rough road around the lake, or over night by ship across Lake Victoria. The organic farming scheme is thus of great importance to farmers as the firm buys the produce from the farm gate and processes the produce locally for export, eliminating the infrastructural constraints for exporting organic farmers.

3.2.5.2 Njombe

Njombe is one of the seven districts of the Iringa region in the southern highlands of Tanzania (Fig. 3.1). It is bordered to the north by the Mufindi district, to the south by the Ludewa District, to the east by the Morogoro and Ruvuma regions, to the west by the Makete District and to the northwest by the Mbeya Region. According to the 2002 Tanzania National Census, the population of the Njombe district numbered 420,348 (URT, 2003). The main economic activity in Njombe is agriculture and forestry. Njombe district is characterized by very low temperatures compared to other parts of Tanzania and has one main rainy season from December to March (Fig. 3.2; FAO, Local climate data, 2011).

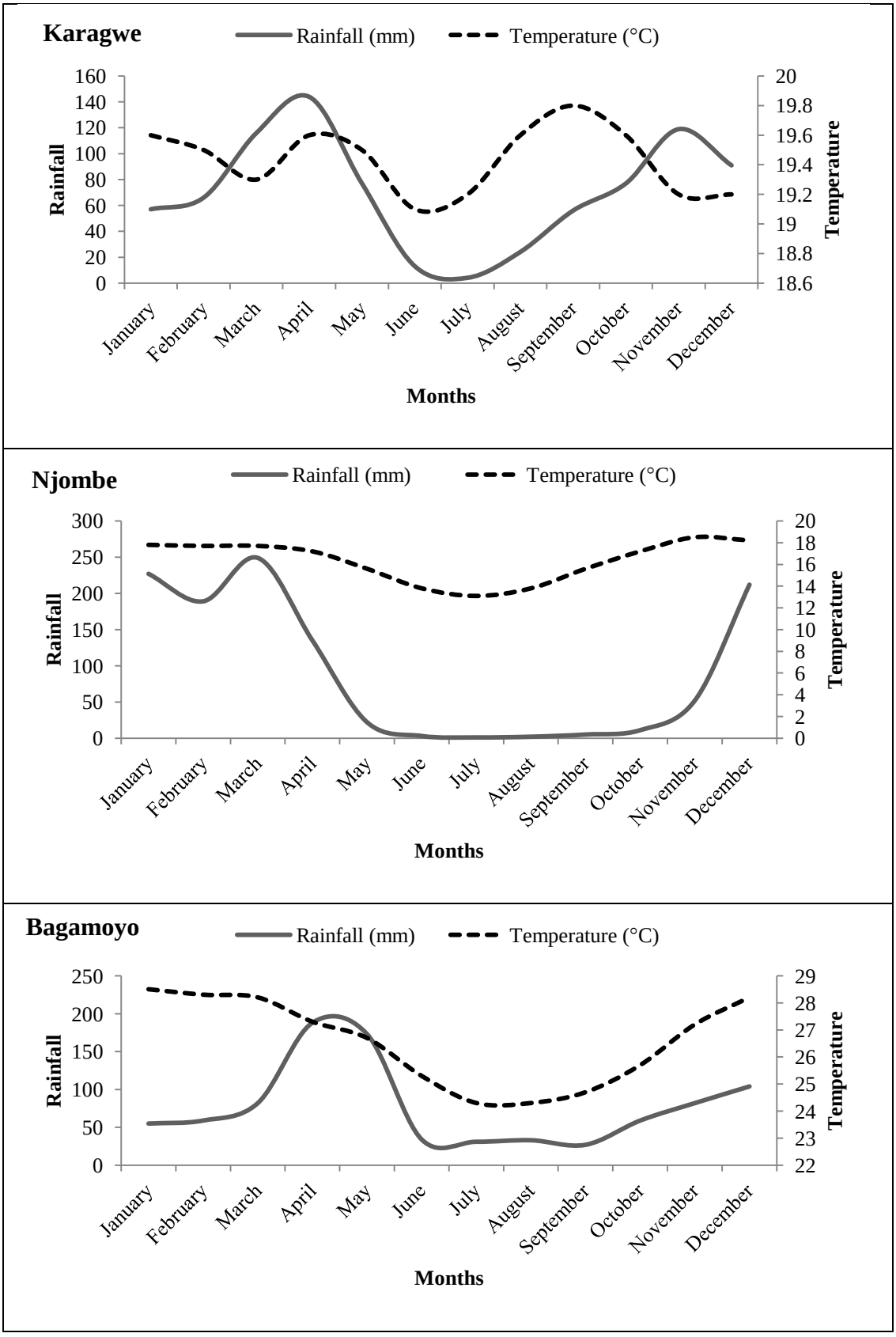


Figure 3.2 Local climate summary for the study areas (FAO LocClim Data)

The main crops produced in the area include maize, beans, tea, bananas, cassava, groundnuts, and pyrethrum; while popular fruit crops are pineapples and avocado (Njombe - District Agricultural and Livestock Development Officer (DALDO) records, 2009). The only villages where pineapples were produced in Njombe were Madeke and Ukalawa both in Lupembe Division with approximately 751 households and 3060 inhabitants (Lupembe Division records, 2009).

Madeke Organic Village Initiative was established as part of the Export Promotion of Organic Products from Africa (EPOPA) project in East Africa in 2003 where organic farmers were trained and linked to a processing and exporting firm and later certified by the Institute for Marketecology (IMO) (Madeke Organic Farmers Association, 2005). They formally started exporting their organic pineapples to the European Union in 2005 (Mbote, 2009). The exporting firm linked by EPOPA to these farmers was the DABAGA Vegetable and Fruit Canning Co. Ltd; operating in Iringa town. The EPOPA initiative funded the initial training, control and certification costs. The EPOPA project was phased out in 2007/08, afterwards the link between farmers and the exporter was weakened due to the economic recession causing market disruptions and low prices that led to the company's inability to buy and export pineapples regularly (Kishor, 2009). From then on the company only made occasional purchases of pineapples.

Key informant interviews revealed that farmers conversely blamed the firm for miscommunication and offering prices that were below the domestic market prices. Consequently, although organic pineapple farmers were IMO certified, the exporting company maintained an opportunistic relationship with farmers whereby they bought pineapples as and when the market conditions suited the firm. The exporting company reportedly bought once or twice and sometimes not at all in a whole season, meaning organic farmers were forced to sell all or a large part of their certified organic produce through local conventional outlets (Mbote, 2009).

Madeke village is approximately 19 km from the nearest weekly bus stop, and 110 km from the small town of Njombe. The neighbouring village – Ukalawa where conventional farming is practiced is also located approximately 110 km from Njombe town with roads that are impassable during the rainy season. Due to their

limited access to conventional inputs, farmers in the two study villages in Njombe, whether organic or conventional, were not using any chemical fertilizers or pesticides on their crops.

3.2.5.3 Bagamoyo

Bagamoyo is one of six districts in 'Pwani' (Swahili for Coastal) region in Tanzania. It is bordered to the North by the Tanga Region, to the West by the Morogoro Region, to the East by the Indian Ocean and to the South by Kibaha District (Fig. 3.1). According to the 2002 Tanzania National Census, the population of the Bagamoyo District numbered 230,164. The main economic activities in Bagamoyo include agriculture, fishing and tourism. The district is characterized by high temperatures compared to other parts of Tanzania and has one main rainy season from March to June (Fig. 3.2; FAO, Local climate data, 2011). The main crops produced in the area include cashewnuts, coconuts, cassava, maize and beans; popular fruit crops are pineapples, mangoes and oranges (Bagamoyo - District Agricultural and Livestock Development Officer (DALDO) records, 2009). Nine villages from Kiwangwa ward in the Msata division were involved in the study. The villages were selected on the basis of their pineapple production volumes and co-existence of organic farmers. The villages involved in the study were Kiwangwa, Masuguli, Twetemo, Bago, Fukayosi, Msinune, Mkenge, Mwavi and Kidomole.

Organic farmers in Bagamoyo formed their own association - Kiwangwa Organic Farming Farmers Association (KOFFA) in 2003 with over 200 active farmers. Farmers received training once in a while from NGOs, organic farming bodies and occasionally from government extension workers. They had neither a contract scheme nor attained certification as they had not yet secured a suitable exporter or government aid to help with certification costs though they have been active since 2004 (Mhana, 2009). Farmers received some organic farming training from government extension officers and in some cases from NGO's promoting organic farming. Most of the organic farming knowledge they had was from peers; while monitoring, motivation and control of adherence to organic practices was left to peer farmers and occasionally the NGO's. They sold almost all of their organic pineapples through domestic conventional outlets. A few fortunate farmers sold their produce to one or two small organic outlets in Dar es Salaam.

Unlike the other two sites, conventional farmers in Bagamoyo used industrial fertilizers and pesticides in their pineapple fields. Both organic and conventional farmers had the advantage of being close to Dar es Salaam (only about 67km from Bagamoyo) providing accessible markets for their pineapples and increased access to synthetic inputs. They were also located close to Kilimanjaro – Dar es Salaam highway that enabled domestic traders from other regions to source pineapples from Bagamoyo.

3.2.6 Sampling

Farmers in the three selected sites were stratified into organic and conventional groups. Sampling frames for organic farmers were obtained from the scheme operators or organic association/group leaders; whereas the conventional sampling frame was obtained from village leaders and/or extension officers. Representative samples were randomly drawn from each strata with replacements made for those farmers who were not available for interviews or refused to participate. A total of 488 pineapple farmers were selected and interviewed from the three sites comprising 123, 242 and 123 farmers in Njombe, Karagwe and Bagamoyo respectively. Approximately half organic and half conventional from each site.

3.2.7 Data collection

A cross sectional research design was used in this study. Both primary and secondary data were collected. The household surveys – face to face questionnaire surveys, key informant and focus group interviews were used to collect the primary data. Secondary data was collected from the district agricultural offices on production, sales and marketing, value addition, institutional support etc. Additional secondary data from the organic certifying bodies in Tanzania, different marketing channels, the revenue authority were also collected. Researcher's observations in the fields and market places were also used to supplement the information obtained.

3.2.7.1 Questionnaire surveys

Face to face questionnaire interviews were conducted. The surveys were conducted by the researcher and three assistants. Information was sent to the selected villages through village leaders and extension offices and visits were arranged. The surveys

were conducted from August 2009 – January 2010 in the three study sites by visiting the selected households at the times where the heads of households were available.

3.2.7.2 Group discussions and key informant interviews

Group discussions consisting of 10-20 members were conducted in each study area a few days before the questionnaire surveys. The members included village leaders, agricultural extension officers (‘*bwana/bibi shamba’*), health workers (‘*bwana/bibi afya*’), and selected members representing men and women in different age groups and socio-economic classes. Information was sought from the group in the form of discussions about the farming practices, perception of organic farming, production and marketing conditions, prices, local culture, and constraints and challenges facing the farmers. The information obtained was used to supplement the questionnaire surveys. Some information on the local food preferences, values and eating habits were incorporated on the food security section of the questionnaire. Interviews with key informants like organic farming group leaders/chairs, founder members of the farmers associations, the exporting scheme operators, and middlemen/buyers supplying domestic markets were also conducted.

3.2.8 Data analysis and presentation

The data was analysed using the SPSS, Excel, and STATA packages. The pattern of the data was investigated using the measures for normality, randomness, independence of the data and presence of outliers. Frequency distribution and measures of central tendency like means, median, range and standard deviation were used to summarize and explore the data. Student t-tests, Mann-Whitney U test or analysis of variance (ANOVA) were used to explore the differences between groups. Correlations, linear and logistic regressions were used to explore relationships between variables where necessary.

3.3 Descriptive statistics

A total of 488 smallholder farmers were interviewed from the three study areas, 123, 242 and 123 respondents from Njombe, Karagwe and Bagamoyo respectively. Of all the interviewed farmers, 262 were organic and 226 conventional. Since the heads of households were the targets for the interviews, only 9.4% of the respondents were female because most of the rural households in Tanzania are headed by males (URT,

2003). Approximately 91.7 % of the respondents in all the study areas were involved in crop production on a full time basis while the remaining 8.3% had other activities as their main occupation (Table 3.1).

In Karagwe, 130 exporting organic farmers and 112 conventional farmers were interviewed. Male respondents were 90.8% and 91.1% of the interviewed organic and conventional farmers respectively. The average age of the respondents was 42 years and more than 80% of the household heads had completed primary education in both farming groups. More than 92% of the surveyed smallholders in Karagwe reported crop production (farming) as their primary occupation. The organic farmers (exporting) did not differ significantly from conventional farmers in their primary occupation, head of household's level of education, total land owned, households' total workforce size and experience (proxied by the age of the head of household). Organic farmers however operated significantly larger pineapple farms ($p < 0.05$), produced more pineapple units ($p < 0.05$), suffered significantly less pineapple loss (unsold as a percent of total units produced) ($p < 0.05$); earned higher net pineapple income ($p < 0.05$), and higher total crop ($p < 0.05$) and total household revenues ($p < 0.05$) (Table 3.1).

In Njombe, 72 partly exporting organic farmers and 51 conventional farmers were interviewed. Respectively, 15.3% and 15.7% of the respondents in organic and conventional farmer's groups were female. More than 90% of the surveyed smallholders reported crop production (farming) as their primary occupation. The average age of the respondents was 37 years and only 56% of the conventional household heads had completed primary education while more than 76% of organic farmers had at least completed primary education. Organic farmers (partly exporting) were similar with conventional farmers in primary occupation, age of household head, household workforce size, the household head's level of education, total land owned, total crop revenue and total household revenues. Organic farmers however operated larger pineapple farms ($p < 0.05$), they produced more pineapples, and suffered more unsold pineapple losses ($p < 0.01$) (Table 3.1).

Table 3.1 Respondents profiles and descriptive statistics

		Site								
		Njombe			**Karagwe**			**Bagamoyo**		
Variable	**Unit**	**Organic**	**Conve.**	**X^2/t-statistics**	**Organic**	**Conve.**	**X^2/t-statistics**	**Organic**	**Conve.**	**X^2/t-statistics**
Sample characteristics										
Respondents (N)	Count	72	51	-	130	112	-	60	60	-
Sex										
Male	%	84.7	84.3		90.8	91.1		100.0	93.0	
Female	%	15.3	15.7		9.2	8.9		0	7.0	
Age of household head (mean)	Years	38.87	36.09	-1.24	42.5	42.8	0.17	44.92	42.93	-0.85
Education. of hh (mean)	No. of yrs	5.40	3.98	-2.34	6.74	6.66	-0.25	6.05	6.45	0.82
Level of education of hh										
Not completed primary education	%	23.6	43.1		7.7	9.8		22.0	12.3	
Completed primary education	%	75.0	56.9		86.9	82.1		71.2	82.5	
Secondary education or higher	%	1.4	0.0		5.4	8.1		6.8	5.3	
Farming as primary occupation	%	93.1%	90.2%	0.06	92.3%	95.5%	0.59	83.3%	91.7%	1.22
Good housing	%	50.0	13.7		100.0	97.3		55.9	57.9	
Total land owned (mean)	Acres	15.31	8.43	93.28	6.51	5.54	-1.68	11.73	9.33	-1.24
Pineapple farm size (mean)	Acres	2.69	1.13	-7.60*	1.23	0.79	-4.19*	2.63	3.98	2.99*
Hh workforce size (mean)	Count	2.18	2.14	-0.33	2.50	2.53	0.24	2.55	2.48	-0.31
Household revenue/year (means)										
Net pineapple revenue	1000Tshs	369.55	264.72	-2.08	1260.16	532.58	-6.35*	1874.92	6250.55	4.17*
Total pineapple units produced	Count	4395.83	2007.84	-5.23*	5634.88	2770.63	-6.59*	9340.00	24875.00	4.19*
Pineapple loss (unsold units as percent of units produced)	Percentage	36.20	17.17	9.54**	13.27	17.639	-3.99**	12.61	13.09	-0.30
Total crop revenue	1000Tshs	445.11	334.01	-2.05	1747.96	880.70	-7.14*	2154.48	6371.18	3.95*
Total household revenue	1000Tshs	533.39	459.94	-1.13	1989.19	996.42	-6.87*	2551.83	6866.14	3.75*

Notes: Total crop revenue was calculated as the sum of all other crop revenues plus net pineapple revenue. Total non-crop revenue equals the income from non-farming activities (including livestock sales). TShs are Tanzanian Shillings (US$1=1400Tshs as of 2009) All data refer to 2008/2009 season. Good housing mean a house with iron roofing rather than thatch grass roofing

*Significant at 5% level. **Significant at 1% level

In Bagamoyo, 61 domestic selling organic farmers and 62 conventional farmers were interviewed; one organic farmer and two conventional farmers were later removed from the analysis as they were extreme outliers. Respectively 100% and 93% of the heads of the organic and conventional heads of household interviewed were male. More than 83% of the surveyed smallholders reported crop production (farming) as their primary occupation. The average age of the respondents was 43 years and 77% and 87% of the organic and conventional farming household heads respectively had at least completed primary education. While the two groups of farmers were similar in most demographic characteristics, conventional farmers operated significantly larger pineapple plots ($p < 0.05$), produced more pineapple units ($p < 0.05$) and earned more net pineapple revenue($p < 0.05$), total crop income($p < 0.05$) and total household revenue ($p < 0.05$), than the domestic selling organic farmers (Table 3.1).

3.4 Existing supply chains

Pineapples, like many other fruits in Tanzania are sold mainly at the local markets, nearby towns and urban markets to domestic consumers. Smallholder pineapple farmers in Tanzania have the following selling options/channels:-

a) Sell at the local market – retail sale

This is the most common selling channel where farmers carry pineapples on head or bicycles to local markets where they sell the produce on retail to local consumers (Fig. 3.3).

b) Sell, wholesale, to small roadside and local market traders

This channel is also commonly used especially when the harvest is relatively large to sell on a day at the local market. Farmers sell directly to small trader, usually roadside or local market traders who in turn retail the fruits to final consumers (Fig. 3.4).

Figure 3.3 Organic and conventional pineapple sold at the local market in Msata.

Figure 3.4 Organic and conventional pineapple sold at by small traders at the roadside market in Chalinze.

c) Sell to larger traders who transports the produce to other regions and urban markets

Farmers sell to traders who mainly transport the produce to other regions and urban markets in search of better prices. They in turn sell the produce to traders in the urban and regional markets that are involved in the retail market (Fig. 3.5).

d) Sell to urban market traders directly

The farmers sometimes self-organize in small groups and hire a truck to take fruits directly to the urban markets and deal with the traders in order to avoid middlemen.

e) Sell to urban market traders through middlemen

With small farm sizes and small harvest at a time, it is usually expensive to hire a truck as a single farmer. Middlemen make arrangements with farmers where they pick the produce from the farm gate and sell it to the urban and other region traders. In return an agreed percent of money is deducted from each pineapple sold to cover - middlemen fees, transport, market levies and selling costs, and the urban trader margin. Any pineapple loss i.e. through rotting at the market place due to poor storage condition or damaged in the transport is carried by the farmer as the trader and middlemen obtain their margins from sold units.

f) Sell to processing/exporting firms

Farmers sell their produce to the few processing firms usually at the farm gate. This can be through contractual arrangements or non contracting firms sourcing produce directly from farmers.

a

b

Figure 3.5 a and b: Organic and conventional pineapple sold to traders - transported to other regions and urban markets.

CHAPTER FOUR: ADOPTION OF 'ORGANIC FARMING PRACTICES' AMONG SMALLHOLDER FARMERS IN TANZANIA

Abstract

Organic farming is often linked to improved food security, access to export markets, income generation and poverty alleviation for smallholders in Africa. Adoption of organic practices however has met with varying levels of acceptance. A survey on adoption of organic practices was conducted on 488 smallholder pineapple farmers in Tanzania. Tobit regression results suggests farmer age, total land owned, level of education and housing type (proxy resource endowment), were positive determinants of adoption intensity. Farmers that had smaller organic crop plots, had received a visit from extension/scheme worker, and their source of training was related to the buyer were likely to adopt more organic practices. Being in an organic farming scheme or perceiving economic and environmental benefits of organic farming were not material in determining the adoption intensity of the organic practices. However more than 63% of adopters mentioned economic or money related motives as reasons for their adoption, only 7.2% mentioned environmental reasons. Farmers with access to conventional markets showed overall low adoption rates, with higher earning farmers less likely to adopt most of the practices while visits by extension workers had negative influence on their adoption intensity. Where farmers were organized into well functioning marketing schemes with proper access to support and information, organic farming practices were adopted at high rates even by conventional farmers. Adoption of organic farming practices by smallholders in these areas thus remains dependent on the ability of the farming systems to offer economic/monetary returns compared to current practices. For effective policies encouraging smallholder organic farming, economic and financial aspects associated with the system as well as farmers' attitudes, and their socio and demographic aspects are key to success.

Key words: *Adoption, organic farming, fruits & vegetable, smallholder farmers, Tanzania.*

4.1 Introduction

Organic farming can generally be defined as a holistic farm management system that avoids the use of Genetically Modified Organisms (GMO), synthetic pesticides and fertilizers, antibiotics and growth hormones, and follows the principles of sustainable agriculture (e.g. IFOAM, 2003; USDA, 2000, Soil Association, 2005). Organic certification standards however have evolved with time and IFOAM (the international umbrella organization of Organic Agriculture movements worldwide) suggests organic farming should be guided by principles of health, ecology, care and

the principle of fairness (IFOAM, 2006). Certification of organic produce has developed as a means for consumer assurance that the produce is really organic as there is no other way of telling by physical inspection of the produce. Globalized and even long local supply chains mean consumers have no way of getting the information about the produce they purchase and thus certification becomes a necessity for building the consumer trust.

However, high organic certification costs including compliance, control and auditing particularly for smallholder farmers in Africa, have left them unable to attain organic certification (Opolot *et al*., 2007; COLEACP, 2007; Algra and Rijninks 2000; Harris, 2001; Kazimoto, 2009, Mbote, 2009). As a result, different organic production systems exist including internationally recognized certification, regional and local certification, no certification but peer-controlled farming groups, and no certification no peer-control farmer groups waiting for some form of assistance to obtain certification (Bakewell-Stone, 2006; UNEP-UNCTAD CBTF, 2007; Akyoo and Lazaro, 2008, and Bolwig *et al*., 2009). It can be argued that, organic certification does not make a farmer an organic farmer; rather the practices that he/she used in the production will make him/her one. In this sense, many studies on organic farming in developed countries have considered these farmers to be organic as long as they have consciously chosen to become organic farmers and follow organic farming principles but can't afford the formal certification (e.g. UNEP-UNCTAD, 2008; Bakewell-Stone *et al*., 2008; UNCTAD CBTF, 2007; UNCTAD CBTF, 2006; IFAD, 2003).

Organic farming has been linked to fewer environmental consequences of farming, in particular energy use and greenhouse gas emissions (Wood *et al*., 2005), biodiversity conservation (Hole *et al*., 2005), improvement of soil fertility (Pacini *et al*., 2003; Maeder *et al*., 2002), improved food supply/food security (e.g. UNEP-UNCTAD, 2008; Sciallaba, 2007; Bradley *et al*., 2007; Badgley and Perfecto, 2007; Hewlett and Melchett, 2008; and Peramaiyan *et al*., 2009), and overall sustainability (e.g. Pacini *et al*., 2003; Johannsen *et al*., 2005). However, there is no common understanding of the link between organic farming and sustainability, partly because of the lack of a common definition of the two and also due to the associated yield reduction that limits economic sustainability of organic systems (Rigby and Cáceres, 2001**;** Lein *et al*., 2006). There is an equal lack of consensus regarding the benefits of organic

farming (vs conventional agriculture) to food security or its ability to feed the world, its health benefits and potential improvements to soil fertility (Connor, 2008; Kirchmann *et al*., 2008; Williams, 2002; Heaton, 2001). There is however, a common understanding that organic farming limits the use of external inputs such as pesticides and fertilizers that can pose health risks to humans, livestock and general ecosystem.

Organic farming has received increasing attention across Africa in recent decades partly due to its purported potential to contribute to the achievement of Millennium Development Goals (MDGs) through improved health and food security, environmental conservation, and overall economic development (Edwards, 2005; Setboonsarng, 2006). Its adoption in most tropical African countries has mainly been as a means for income generation as it is believed to improve smallholder farmers access to high value markets (mainly export markets) in their bid to alleviate poverty (e.g. Johannsen *et al*., 2005; Bakewell-Stone *et al*., 2008; APO, 2010). Other purported benefits of organic farming are of secondary importance in these settings where income generation and poverty reduction are the main targets.

Organic farming for smallholders in tropical Africa is mainly organized as contract farming/out-grower schemes where the schemes operators/NGO prescribes a set of practices to be used in the farming systems as standard criteria for membership into such schemes (Bolwig *et al*., 2009; Akyoo and Lazaro, 2007; UNCTAD, 2008). These practices usually include not only standard organic practices but also other conservation and good agricultural practices relevant to the crop in question, and the particular environment as the scheme operators deem necessary (UNCTAD, 2008; Kazimoto, 2009; Mbote, 2009; Bolwig *et al*., 2009). To smallholder farmers in these areas, a combination of all these practices is what they regard as 'organic farming practices'. Though the schemes encourage adoption of these practices, it is not a mandatory requirement; a farmer can only be disqualified from the scheme if they use synthetic pesticides, fertilizers and other practices that may lead to contamination of organic produce, but not for non-adoption of some of the 'organic practices' (Mbote, 2009; Kazimoto, 2009; Bolwig *et al*., 2009).

In the adoption and diffusion of innovation literature, several models have been proposed and are used to predict the tendency of farmers to use and adopt conservation practices (e.g. Elihu, *et al*., 1963; Rogers, 1983; Soule *et al*., 2000; Pannell *et al*., 2006; Knowler and Bradshaw, 2007). These can be categorised into three main groups as socio-demographic models, farm structure models and diffusion models (Mccann *et al*., 1997). Socio-demographic models use demographic variables such as age, gender, education that explain farmers' attitudes and practices. Farm structure models on the other hand assert that, some attributes of the farm as a firm such as size and income, predict farmers' attitudes and practices; while diffusion models assume the adoption of innovation is determined by information and past experiences of the innovation having immediate beneficial impact. Recent studies suggest farmers' decisions are influenced by their socio-demographics, psychological make-up, characteristics of the farm household, structure of the farm business, the wider socio milieu and characteristics of the innovation (Edwards-Jones, 2006). In practice, more often than not, a combination of all or most of the categories is used to predict farmers' tendency to adopt innovations.

In developed countries for example, a study by Khaledi *et al*. (2010) in Saskatchwen, Canada found that, transaction costs were a limiting factor in the adoption of organic farming and that holders of small land portions were more likely to adopt organic farming. Education was immaterial in determining adoption while younger farmers were more likely to allocate less land to organic farming. In Europe, a study by Young (1998) found that, attitudes towards the sustainability of conventional practices and concerns about environmental issues strongly influenced the probability of adoption of organic farming in Spain and the UK. Another study by Burton *et al*. (2003) in the UK found gender, attitudes to the environment and information networks to be important in the adoption of organic practices in horticulture. Similar findings were reported by Best (2008) in Germany where direct and indirect effects of environmental concern on the probability of an adoption of organic farming were significant.

In developing countries, organic farming is seen as a means for income generation and access to high value markets that smallholder farmers would otherwise be excluded from. If the purported food security, increased productivity and

environmental benefits of organic farming are true, smallholder farmers in Least Developed Countries (LDC's) could use the opportunity to alleviate some of their developmental problems. Despite the promotion of organic farming for income generation, access to global markets and soil conservation by governments and non-governmental organizations in tropical Africa (Goldberger, 2008), the adoption of organic practices has been met with varying success. As organic farming is a relatively new concept in SSA, little has been done about adoption of organic practices in different areas under different institutional settings. Elsewhere in the developing world, an International Fund for Agricultural Development (IFAD), study (2003) involving 68 case studies in Latin America and the Caribbean found higher financial returns to be the main driving force that led small farmers to adopt organic agriculture. A different institutional setting for agriculture support and the differences in farmers' motivations for the adoption of organic farming between north and south (Johannsen *et al*., 2005), means generalizations cannot be made about factors affecting adoption of organic farming.

Like other tropical African countries, smallholder farmers in Tanzania receive organic farming information from different sources depending on the crop they are producing and who has interest in that particular crop or region (Goldberg, 2008). Sources of information include, but are not limited to, government agricultural extension officers, NGO's, civil societies, farmers association, private buyers (processing and/or exporting firm/scheme), churches and peers. The objective of this study was to assess the factors affecting adoption of organic practices among smallholder farmers Tanzania. An assessment of the overall farm operation sustainability of organic and conventional farms involved in this research is also reported.

4.2 Methods

4.2.1 Sampling and data collection methods

4.2.1.1 Study sites and support institutions

The target population was smallholder fruit/vegetable farmers in Tanzania. Pineapple production in Tanzania is undertaken mainly by smallholders and it is among the few crops where organic farming has been relatively more adopted by farmers. The crop

can be cultivated in most regions of Tanzania offering wide geographical distribution, a range of infrastructural market access, and social setting differences that enable generalization of the study findings across the country. There are also reasonable numbers of smallholder conventional pineapple farmers alongside organic farmers that enable a comparative study. Three study sites were selected where organic and conventional pineapple farmers existed alongside each other. These were Bagamoyo in the coast region (eastern Tanzania), Njombe in Iringa region (central-southern Tanzania) and Karagwe in the Kagera region (northern Tanzania). A detailed description of the sites locations, weather and economic activities is presented in the general methodology chapter – Chapter three.

In all three study sites, organic farmers were organized in some form of farmer's association for ease of access to support for training, market information and access. The level of institutional support and market linkages for organic farming varied between the sites. Karagwe organic farmers were linked to an active privately owned organic processing and export scheme. The firm/scheme provided training on organic practices to all pineapple farmers (organic and conventional), organic certification and monitoring, and bought pineapples from certified organic farms. In Bagamoyo area, organic farmers were organized into organic farmers' association but did not have any linkage to organic exporting schemes/firms/buyers. Farmers were not certified and they received a little organic agriculture training from government extension officers and in some cases from NGO's promoting organic farming. Most of the organic farming knowledge they had was from peers; while monitoring, motivation and control of adherence to organic practices was left to peer farmers and occasionally the NGO's. Njombe organic farmers on the other hand had organic certification, received organic farming training from Export Promotion for Organic Products from Africa (EPOPA) project and continued to get assistance from local government agricultural extension officers when the project phased out in 2007/08. Their link to the exporter/firm that was created with the help of EPOPA had deteriorated as they could not secure further contracts after the project phased out, from then on the buyer only made occasional purchases of their pineapples.

4.2.1.2 Sampling

Farmers in the three selected sites were first stratified into organic and conventional groups, and then lists of organic and conventional farmers were obtained from organic schemes/farmer associations and village leaders respectively. Representative samples were randomly drawn from each strata with replacements made for the farmers who were not available for interviews or refused to participate. A total of 488 pineapple farmers (123, 242 and 123 from Njombe, Karagwe and Bagamoyo sites respectively) comprising roughly half organic and half conventional from each site were selected and interviewed.

4.2.1.3 Data collection and analysis

A structured questionnaire was pretested to smallholder organic and conventional farmers in the Morogoro region (38 farmers were involved 19 organic and 19 conventional). Adjustments were made based on the local understanding and naming of the organic practices used in the area to ensure clarity of the questions where necessary. The questionnaires were then administered by the researcher and assistants to the head of household in the study areas. In the few cases where the head of the household was not available after two attempts, another adult in the household preferably the spouse was interviewed. In case the head of the household or another adult (spouse) were unavailable, replacement households were selected to reach the target number for that particular location. Interviews with scheme managers, village leaders, exporters, key informant group discussions and researcher observation were used to collect qualitative information to complement the questionnaire interviews. The questionnaires were then coded, entered into statistical software and analyzed using SPSS 14, Excel and STATA 10 packages.

4.2.2 Analytical methods

The study sought to identify farmers' characteristics, farm structure and institutional arrangements that make them more likely to adopt organic farming practices. All organic farmers in this study were participating in some form of organic farmers' association or organic scheme. The study was informed by the assumption that, participating and non-participating farmers (organic and conventional in this case) differ in some individual variables e.g. attitudes, perceptions and demographics, as well as factor endowments, these in turn predict their adoption of organic practices.

The study also investigated whether organic farms were more sustainable than conventional ones.

Participation in organic schemes (at least the ones covered in this study) was open to any farmer within the locality of the scheme as long as they met the organic farming criteria set by the scheme operators. In tropical Africa, the most important criteria to qualify for acceptance into organic schemes is none use of industrial fertilizers, pesticides or herbicides in the production and no chemicals in processing or storage (Kazimoto, 2009; Bolwig *et al*., 2009). Although farmers are encouraged to adopt a set of conservation practices as a means of environmental conservation and improving soil fertility, such practices are adopted on voluntary basis as they are not organic per se. The farmer can only be disqualified from the scheme for using synthetic inputs in production, processing or storage but not for none use of mulching, compost or terraces in their farms (Kazimoto, 2009; Bolwig *et al*., 2009). 'Organic practices' in this study thus refers to practices that are recommended for use to organic farmers by the organic schemes, associations, trainers and extension officers in tropical Africa. These include conservation farming practices as well as other good agricultural practices that can be argued as not being organic per se. Though refraining from use of chemical pesticides and fertilizers were among the organic practices prescribed, it was not included in this analysis because no farmer (organic or conventional) was using such inputs for pineapple production in Karagwe and Njombe sites in the first place. Only one site (Bagamoyo) had a few conventional farmers using synthetic fertilizers in their pineapple production.

The adoption of ten selected organic practices (shown in table 4.1) was assessed through the structured questionnaire. The responses were guided into i) Use of practice now, ii) Never used the practice, iii) Not applicable, iv) Used it in the past but not now, v) Never used it but plan to, and vi) Unfamiliar with the practice (adapted from McCann *et al*., 1997). The percentage adoption for individual practises between the two groups and numbers of practices used were compared. The association between the total number of organic practices used and some selected

variables[3] was explored using Spearman's rank correlations. For calculation of overall farming operation sustainability, the responses were scored as follows:

- Use of practice now = 2,
- Used it in the past but not now = 1,
- Never used it but plan to = 1,
- Never used the practice = 0,
- Unfamiliar with the relevant practice = 0.

Any practice that did not apply to a particular farm because of the nature of operation or typology was not included in the overall calculation. The overall score was then calculated for each individual farmer based on the percent of applicable practices (McCann *et al*., 1997) as follows:-

Overall farm operation sustainability =

$$\frac{2(\text{no. of OP used now}) + 1(\text{no. of OP used in the past and plan to use})}{2(\text{count of all possible OP}) - 2(\text{count of OP not applicable})}$$

where OP = 'Organic Practice'

The overall farm operation sustainability scores for organic and conventional farmers were then compared for each study site.

[3] Variables conceived to have influence on the decision to adopt organic practices.

Table 4.1 Selected practices for assessment of adoption of organic practices

Selected practice	Short explanation
Use contour	Farming across the hills rather than up the hills in a series of furrows to control erosion and preserve soil fertility
Hedge crops and windbreaks	Planting trees/grasses on the farm and around the hedges of the farm for control of soil erosion
Intercropping with Legumes	Intercropping the main crop with legumes in fields planting for nitrogen-fixing plants purposes
Use compost or green manure	Compost ranges from layering of compost materials (dry vegetation, green waste, animal manure, wood ash, soil, etc.) in a pit, open pile to allowing bedding (e.g., maize stalks, weeds, leaves, ashes) to soak up urine and droppings in the animal compound (*boma*). Green manure - plants (e.g., legumes) dug into the soil to improve soil structure and fertility.
Mulching	Placing loose materials (e.g., dry grass or leaves) around plant stems to protect soil from over-drying and to control soil temperature (Fig. 4.1).
Crop rotation	The practice of growing a series of dissimilar types of crops in the same area in sequential seasons for various benefits such as balance the fertility demands of various crops to avoid excessive depletion of soil nutrients and to avoid the build up of pathogens and pests that often occurs when one species is continuously cropped.
Use natural pesticides and biopesticides	Natural pesticides are pesticides made from plants and trees (e.g., tobacco, hot pepper, garlic, Neem tree, Mexican marigolds, and pyrethrum). Biopesticides - The control of pests by introducing their natural enemies (e.g., predators, parasites, micro-organisms).
Fallowing	Allowing land to rest for a season or more for purposes of moisture retention, soil nutrients replenishment and pest/pathogen control before planting again.
Use terracing	Creating terraces on the hill farms to control nutrient leaching and soil erosion (Fig. 4.1).
Use animal manure	Use of animal waste usually mixed with crop remains on the farm for improving soil nutrients

Source: Scheme operators in Karagwe (Matunda Mema firm-manager) and key informant interviews (2009) from all the three sites.

Figure 4.1 Terraces and mulching practiced by organic pineapple farmers in Njombe.

A Tobit regression model was used to predict the probability of a farmer adopting some proportion of all the organic practices applicable to their settings. Logistic regression has been frequently used in the prediction of adoption in conservation studies (Ayuk, 1997; Kizito and Twomlow, 2009), however the criterion of interest in these cases is the dichotomous variable - adoption (or not). In this study, the proportion of possible organic practices adopted was the criterion of interest, calculated by the number of practices adopted as a fraction of all applicable practices to a specific farmer. This means the criteria of interest now can only assume a value of 0 to 1, reflecting no adoption at all to adoption of all applicable practices respectively. Although ten selected practices were used in the questionnaire, not all of them were applicable to all farmers due to differences in topography and other settings requiring the use of this ratio instead of all ten practices. When the outcome criterion is censored, the appropriate regression model will be censored regression (commonly referred to as Tobit regression) (Tobin, 1958; Long, 1997). According to

Amemiya (1984), the standard Tobit model follows the latent variable modelling equation of the form:-

$$Y^* = \beta_0 + \beta_1 x_1 + \ldots + \beta_n x_n + \epsilon$$

$$Y = Y^* \quad \text{if } Y^* > 0,$$
$$= 0 \quad \text{if } Y^* \leq 0,$$

where Y^* = the censored outcome variable

β = coefficient

ϵ = error term

n = number of dependent variables.

The model uses maximum likelihood estimation (MLE) to estimate its parameters; the difference with other latent variable models is that, β estimates the effect of x on Y*, the latent variable, not Y. The log likelihood function of the standard Tobit model is:-

$$L = \sum_{t=1} \log(1 - F(\sigma Y_t - I_t) + \sum_{t=N+1} \log f(\sigma Y_t - I_t)$$

where F and f are the distribution and density function respectively of the standard normal variable. The model was derived from a combination of probit analysis and multiple regression by estimating from a set of explanatory variables, the probability of a dependent variable being at or below (above) a limit. If above (below) the limit, the expected value of the dependent variable is estimated. Details on the model derivation can be found in Tobin, (1958); Amemiya, (1984) and Long, (1997) among others. In this research, the proportion of the adopted practices can only assume a value between 0 and 1, all inclusive, meaning the outcome variable is right and left censored and will follow:

$$Y^* = \beta_0 + \beta_1 x_1 + \ldots + \beta_n x_n + \epsilon$$

and

$$Y = Y^* \quad \text{if } 0 \leq Y^* \geq 1,$$
$$= 0 \quad \text{otherwise.}$$

4.3 Results

4.3.1 Demographic profiles

Organic and conventional farmers in the three sites differed across a number of demographic characteristics as shown in Table 3.1 (Chapter Three). Organic and conventional farmers in Njombe were similar in primary occupation, age of household head, household workforce size and net pineapple revenue, total crop revenues and total household revenues. Organic farmers however operated larger pineapple farms and produced more pineapple units; they also suffered more pineapple loss (unsold units as percent total units produced). In Karagwe, organic and conventional farmers did not differ in their primary occupation, head of household's level of education, total land owned, households' total workforce size and experience (proxied by the age of head of the household). Organic farmers however operated larger pineapple farms, produced more pineapple units, and earned higher net pineapple incomes, total crop incomes and total household revenues. In Bagamoyo on the other hand, while the two groups of farmers were similar in most demographic characteristics, conventional farmers operated larger pineapple plots, produced more pineapple units and earned more net pineapple incomes, total crop incomes and total household revenues.

4.3.2 Use of organic practices and farm sustainability

The adoption of individual organic practices is summarized in Table 4.2. Overall, mulching was the most highly adopted practice with 82.9% and 40.4% of organic and conventional farmers respectively reporting use of the practice now, followed by use of contour, hedge crops and intercropping with legumes in that order. Crop rotation was the least adopted practice with 9.2% and 6.3% of organic and conventional farmers respectively reporting the use of the practice now. Terracing and fallowing were the second and third least adopted practices in all areas. Although the trend of adoption of organic practices was similar between sites, Karagwe had the highest rates of overall adoption with all organic farmers adopting at least one practice whilst 98.2% of conventional farmers also adopted at least one organic practice. In all three sites and overall, a significantly larger proportion of organic farmers used more than two organic practices at the time of the survey compared to their conventional counterparts i.e. 66.8% and 37.2% respectively, $p \leq 0.001$. The total number of organic practices used by organic farmers was also significantly

higher than conventional farmers across the sites and overall, $p \leq 0.001$. The assessment of overall farm operation sustainability revealed organic farmers operated significantly more sustainable farms than conventional farmers in all the three sites and overall, $p \leq 0.001$(Table 4.3).

Though not obvious in the results presented in Table 4.2, it is worth noting that none of the pineapple farmers in Ukalawa village in Njombe site (the conventional farming village used for comparison) adopted mulching as they believed that leaving dry grasses lying around increased risk of wild fires. Key informant interviews revealed that, farmers in this village often experienced wild fires that destroyed their crops and homes (Fig. 4.2). The recent wild fire experience prompted the villagers to ban the use of mulching to the extent of playing guard to one another to reduce such risk.

Table 4.2 Use of individual organic practices among smallholder pineapple farmers

Area	Njombe		Karagwe		Bagamoyo		All sites	
F. practice	Organi	Conve.	Organic	Conve.	Organic	Conve.	Org	Conve.
N	72	51	130	112	60	60	262	223
Use contour	79.2%	2.0%	66.2%	27.7%	3.3%	0.0%	55.3%	14.3%
Hedge crops	47.2%	43.1%	53.1%	44.6%	31.7%	6.7%	46.6%	34.1%
Legumes	12.5%	0.0%	60.8%	75.0%	33.3%	35.0%	41.2%	47.1%
Use compost	9.7%.	2.0%	36.2%	17.0%	0.0%	0.0%	20.6%	9.0%
Mulching	93.1%	17.6%	79.2%	53.6%	78.3%	35.0%	82.8%	40.4%
Crop rotation	2.8%	2.0%	16.9%	11.6%	0.0%	0.0%	9.2%	6.3%
Nat.pesticds	0.0%	0.0%	33.8%	24.1%	0.0%	0.0%	16.8%	12.1%
Fallowing	5.6%	0.0%	17.7%	9.8%	5.0%	10.0%	11.5%	7.6%
Use terracing	30.6%	0.0%	6.2%	1.8%	0.0%	0.0%	11.5%	0.9%
Ani.manure	0.0%	2.6%	48.5%	49.1%	6.7%	5.0%	25.6%	26.5%

Notes: All data refer to 2008/2009 season.

Table 4.3 Use of organic practices and farm sustainability among smallholder pineapple farmers

Area	Njombe			Karagwe			Bagamoyo			All sites		
F. pract	Org	Con	Chi/t	Org	Con	Chi/t	Org	Con	Chi/t	Org	Con	Chi/t
Use no OP (%)	4.2	43.1	25.6**	0.0	1.8	0.7	10.0	33.3	8.3**	3.4	19.7	31.2**
Use ≥ 2 OP (%)	66.7	2.0	49.5**	90.0	72.3	11.5**	16.7	1.7	6.4*	66.8	37.2	41.1**
Total OP. used (*m*)	2.81	0.69	12.6**	4.19	3.14	5.9**	1.58	0.92	4.3**	3.21	1.98	8.4**
Farm ope. Sust. (*m*)	0.34	0.10	15.8**	0.52	0.42	4.9**	0.23	0.14	5.5**	0.27	0.40	7.7**

Notes: All data refer to 2008/2009 season. *m* = mean, OP = organic practices.
*Significant at 5% level **Significant at 1% level

Figure 4.2 Destruction by wild fires of crops and homes in Ukalawa Village in Njombe

4.3.3 Variable associations and estimates of Tobit model

An examination of the relationship between variables in Table 4.4 shows a significant positive association between the number of organic practices adopted and participation in an organic farming scheme/association ($p \leq 0.001$); total land owned

($p \leq 0.05$); duration in organic farming ($p \leq 0.001$) across the sites. The number of practices adopted was positively associated with years of education ($p \leq 0.001$); pineapple farm size ($p \leq 0.001$); training within the last 12 months ($p \leq 0.001$); iron roofing (type of housing) ($p \leq 0.001$); duration in pineapple farming ($p \leq 0.05$), training from buyer ($p \leq 0.001$); perception of economic benefits of organic farming ($p \leq 0.001$) and perception of environmental benefits ($p \leq 0.001$) in Njombe study area. Data from the Karagwe site indicated significant positive association between adoption intensity and pineapple plot size ($p \leq 0.05$); training within the past 12 months ($p \leq 0.001$); duration in pineapple farming ($p \leq 0.001$); training from buyer ($p \leq 0.001$); age of the household head ($p \leq 0.05$); perception of economic benefits of organic farming ($p \leq 0.001$); visits by scheme/extension worker ($p \leq 0.001$); and household income ($p \leq 0.001$).

In Bagamoyo area there was significant positive association between the adoption intensity and being in organic association ($p \leq 0.001$); perception of environmental benefits ($p \leq 0.05$); duration in organic farming ($p \leq 0.001$); total land owned ($p \leq 0.05$); and workforce size ($p \leq 0.05$). Household income however had a negative influence on adoption ($p \leq 0.001$), i.e. the richer the household the less likely were they to adopt organic practices in this area.

Table 4.4 Spearman rank correlation for selected variables with total number of organic practices used

Area	**Njombe**		**Karagwe**		**Bagamoyo**	
	Number of organic practices used		Number of organic practices used		Number of organic practices used	
	Coeffi	Sig.	Coeffi	Sig.	Coeffi	Sig.
Farming practice	0.7658* *	0.0000	0.3830**	0.0000	0.3573**	0.0001
Sex of hhh	0.0673	0.4596	-0.0881	0.1720	0.1614	0.0783
Age of hhh	0.0423	0.6420	0.1303*	0.0429	0.1225	0.1826
Education in yrs(hhh)	0.2805* *	0.0017	-0.0741	0.2510	-0.0045	0.9610
Work-force size	-0.0178	0.8453	0.0887	0.1690	0.2569**	0.0046
Total land owned	0.1990*	0.0274	0.2113**	0.0009	0.2657* *	0.0034
Pineapple plot size	0.5405**	0.0000	0.1546*	0.0161	-0.1572	0.0865
Iron roofing	0.2518**	0.0050	0.0611	0.3438	-0.0200	0.8282
Total household income	0.1320	0.1455	0.2781* *	0.0000	-0.2947**	0.0011
Received training (within last 12 months)	0.4786**	0.0000	0.3343* *	0.0000	0.1098	0.2324
Buyer related source of training	0.7448* *	0.0000	0.3522* *	0.0000	-	-
Extension worker visits (in the past 6 months)	0.0493	0.5882	0.2844* *	0.0000	-0.1664	0.0693
Duration in pineapple farming	0.1889*	0.0364	0.3313**	0.0000	-0.0048	0.9589
Duration in organic farming	0.6583* *	0.0000	0.3250* *	0.0000	0.2866* *	0.0015
Total recommended practises used	1.0000		1.0000		1.0000	
Perceive economic benefits of OF	0.6811**	0.0000	0.3664* *	0.0000	0.1553	0.0902
Perceive environmental benefits of OF.	0.4401**	0.0000	0.0757	0.2409	0.1924*	0.0352

Notes: Spearman rank correlation (rho) calculated in STATA 10 reported. Buyer related source of training was considered present when farmers received training from the buyer or other trainers contracted by the buyer, otherwise absent. Buyer related source of training was dropped in Bagamoyo because none received training from the buyer related source. All data refer to 2008/2009 season.
*Significant at 5% level. **Significant at 1% level

Table 4.5 summarises the output of the regression analysis and the results indicated location (site), sex of household head, whether they received training in the past year or not and perception of economic and environmental benefits of organic farming were not significant predictors of 'organic practices' adoption intensity. Households headed by older household heads, with more years of education and iron roofs in their houses (proxy for resource endowment); were more likely to adopt most of the organic practices applicable to their settings. Receiving training from buyer/buying scheme and visit by scheme supervisor/extension worker in the past six months were

also positive significant determinants of adoption rate on the overall model though the visits seemed to have negative impact on the adoption in Bagamoyo site.

Table 4.5 Tobit estimates for 'organic practices' adoption intensities

Area	**Njombe**		**Karagwe**		**Bagamoyo**		**All sites**	
	Adoption intensity		Adoption intensity		Adoption intensity		Adoption intensity	
	Coeffi	t	Coeffi	t	Coeffi	t	Coeff	t
Farming practice	.199	3.09 **	0.114	1.86	0.018	0.82	0.024	1.00
Area	-	-	-	-	-	-	0.01	0.75
Sex of hhh	0.005	0.22	-.0270	-0.89	0.022	0.49	0.01	0.45
Age of hhh	0.001	1.02	0.002	1.87	.0004	0.48	0.002	3.27**
Ed. in years (hhh)	0.002	0.65	0.001	0.01	.0044	1.37	0.005	2.30*
Work-force size	-0.007	-0.58	-0.003	-0.30	.0186	2.53*	0.006	0.96
Total land owned	0.001	2.87 **	-0.001	-0.24	.0033	3.46**	0.001	1.45
Pineapple plot size	-0.001	-0.00	-0.029	-2.46*	.0063	1.11	-0.023	-4.50**
Iron roofing	-0.032	-1.81	-0.026	-0.35	.0031	0.20	0.076	5.09**
Total hh income	3.93	1.53	2.10	2.47*	-8.14	-3.42**	0.920	0.33
Received training last year	0.013	0.57	0.034	0.81	0.023	0.97	-0.004	-0.19
Buyer related training source	0.0142	0.27	0.058	1.40	-	-	0. 125	5.42**
Ext. worker visit (in past 6 mnths)	0.008	0.30	-0.006	-0.27	-0.046	-2.25*	0.046	3.18**
Duration in pineapple farming	-0.003	-1.55	0.013	4.75**	-0.0001	-0.03	0.001	1.05
Duration in OF.	-0.009	-0.67	-0.027	-2.81**	0.001	0.42	-0.003	-1.30
Perceive Econo. benefits of OF.	0.008	0.24	-0.001	-0.02	.0037	0.12	0.033	1.37
Perceive Env. benefits of OF.	0.078	3.06 **	0.035	0.61	.0321	1.27	0.031	1.36
Constant	0.035	0.86	0.224	2.43	.0001	0.00	0.001	0.02
Sigma	0.079		0.126		0.080		0.127	
Chi-squared(16)	137.02**		82.18**		50.42**		307.74 **	
Log likelihood	136.99		157.30		132.43		312.88	

Notes: Censored regression model estimated in STATA 10 reported, regressors were coded as 1 when present and 0 otherwise (dummy variable coding), e.g. farming practice 1=organic, 0=conventional. Buyer related source of training was considered present when farmers received training from the buyer or other trainer contracted by buyer, otherwise absent. Adoption intensity was the ratio of adopted practices to all applicable practices to a particular farm, with a value of 0 for none of the applicable practices adopted to 1 for all applicable practices adopted. All data refer to 2008/2009 season. *Significant at 5% level. **Significant at 1% level

Pineapple plot sizes on the other hand had a negative impact on adoption, i.e. the larger the pineapple farm the more likely that the farmer would not adopt most of the organic practices.

On specific sites, farming practice, total land owned and perception of environmental benefits of organic farming were significant and positive determinants of adoption intensity in Njombe, while only workforce size and total land owned were significant positive determinants of adoption in Bagamoyo. Notably, total household income and visits by government extension workers had a negative influence on the adoption of organic practices in the Bagamoyo area. In Karagwe study area farmers with larger pineapple plots were less likely to adopt most of the 'organic practices', likewise the more years farmers spent in the organic farming the less likely were they to adopt most of the practices. While total household income and duration in pineapple production were positive determinants of adoption rates, farming practice and age of household head did not seem to influence adoption intensity (Table 4.5).

4.3.4 Motivation for and limitations to adoption of organic farming

The results for reasons/motivations for adoption of organic farming are summarised in Table 4.6 where overall (across the sites) at least 30% of adopters mentioned assured market (to secure the contract) as the reason behind their adoption of 'organic practices'. Cost was a common motivation for adoption as 6.2% of adopters mentioned saving costs on expensive chemical fertilizers, while another 5.4% thought an organic farm was cheaper to run. Another 6.1% of farmers adopted organic farming in the hope of getting better prices; the remaining reasons were mentioned by less than 5% of the adopters. Grouping the adoption reasons into broader categories revealed more than 60% of adopters had economic or monetary motivations while only 6.7% mentioned environmental/conservation reasons; no health reasons were mentioned. A similar trend was observed within the three sites with some variation in Bagamoyo. Unlike the other two sites where none or very few farmers mentioned lack of money as a reason for adoption, 25% and 17.5% of organic farmers in Bagamoyo adopted organic farming practises because they had no money to buy chemical fertilizers or they thought organic was cheaper respectively.

Table 4.6 Motivation for organic farming adoption

Area	Njombe		Karagwe		Bagamoyo		All	
Motivation	N	%	N	%	N	%	N	%
Assured market (contract)	35	28.5	102	42.2	10	8.4	147	30.3
Free training and follow the majority	7	5.6	16	6.6	1	0.8	24	4.9
To improve yield	23	18.7	1	0.4	0	0	24	4.9
Good quality product	17	13.8	1	0.4	0	0	18	3.7
Preserve ecosystem	11	9	4	1.6	0	0	15	3.1
Improve soil fertility and moisture	6	4.8	2	0.8	12	10	20	4.1
Cheaper to run than conventional	5	4			21	17.5	26	5.4
Dislike chemicals	1	0.8			1	0.8	2	0.4
Avoid transport cost			19	7.8	0	0	19	4.0
Increase profit margin			12	5	0	0	12	2.4
Better prices			30	12.4	0	0	30	6.1
Good keeping quality of OP					1	0.8	1	0.2
Can't afford chemical fertilizer					30	25	30	6.2
Avoid indebtness in case of market failure					1	0.8	1	0.2
Economic/monetary motivations	80	65	165	68.2	62	51.7	307	63.2
Environmental/conservation motivations	17	13.8	6	2.4	12	10	35	7.2
Other motivation	8	6.4	16	6.6	3	2.4	27	5.5

Notes: Economic/monetary motivation was the sum of all the mentioned motivations related to money or economics, while environmental motivation was the sum of all environment/conservation related motives, the rest were termed others. All data refer to 2009 season.

On the other hand, 14% of non adopters as shown in Table 4.7 mentioned lack of knowledge/training as the limiting factor while 12% were 'yet to be accepted' into the schemes due to stringent requirements. Another portion of non-adopters had no intention of adopting as they thought the small size of organic fruits led to lower prices (9.5%); long time involved for organic fruits to mature was a loss (4.1%); there was too much labour involved in organic farming (4.1%); and their infertile soils were no good without synthetic fertilizers (1.4%). The inability of the schemes to buy all the organic produce; unavailability of organic fertilizers and pesticides; no difference in incomes; and restriction of use of chemical fertilizers and pesticides even on other crop fields not in the organic scheme were among the reasons for non adoption but mentioned with less frequency (less than 1%).

Table 4.7 Reasons for non-adoption of organic practices

Area	**Njombe**		**Karagwe**		**Bagamoyo**		**All**	
Motivation	N	%	N	%	N	%	N	%
Have not qualified	0	0	59	24.4	0	0	59	12.1
Small fruit size (fetch low price)	0	0	0	0	46	38.3	46	9.5
Stringent requirements	2	1.6	11	4.5	1	0.8	14	2.9
Low yield without chemical fertilizers	1	0.8	0	0	9	7.5	10	2
Longer maturation period for organic fruit	0	0	0	0	30	25	30	6.2
Infertile soils (can't do without fertilizer)	0	0	1	0.4	6	5	7	1.4
Organic fertilizers are scarce and expensive	0	0	0	0	1	0.8	1	0.2
Satisfied with conventional practices	2	1.6	0	0	0	0	2	0.4
Too much labour in organic farming	17	13.8	3	1.2	0	0	20	4.1
Lack of knowledge/training	34	27.6	34	14.1	0	0	68	14
Too small farms	0	0	7	2.9	0	0	7	1.4
The scheme can't all the organic produce	0	0	2	0.8	0	0	2	0.4
Restrict use of chemicals on other crops	0	0	2	0.8	0	0	2	0.4
Organic practices are expensive	0	0	4	1.7	0	0	4	0.8
No difference in terms of income	0	0	1	0.4	0	0	1	0.2

Notes: All data refer to 2009 season.

4.4 Discussion

Individual organic farming practices were adopted at varying levels between the three sites. Farmers tended to adopt individual organic practices as they were considered cheaper to implement i.e. requiring little or no extra investment costs compared to their current farming practice. For example, mulching was adopted by more than 80% of pineapple farmers because most farmers used the same grass weeded from their farms for mulching; whereas terracing was the least adopted even on mountainous farming plots like Njombe and Karagwe due to high cost of hired labour involved in making terraces. This finding was re-affirmed by personal interviews where farmers reported avoiding the practices that brought additional costs to what they were currently incurring. Similar findings have been reported by Khaledi *et al*. (2010) in Saskatchewan, Canada where cost seemed to be a limitation to adoption of organic practices. This finding appears to agree with the theories/models that propose that characteristics of the innovation i.e. it's economic, divisibility and technical aspects have influence in the adoption decision (Jones, 1963). In this case both economic (perceived cost compared to current option) and

technical (ease of use) aspects seems to influence the farmer's decision to adopt organic practices.

Fallowing was among the least adopted practices partly because farmers faced land ownership restrictions and couldn't afford to rest their farms as revealed in the key informant interviews. Most smallholder pineapple farmers' primary occupation was farming and they depended on their farms for food, income and other needs. According to a Tanzanian household survey in 2002/2003, 56% of agricultural households experience food insufficiency problems (URT, 2006). This suggests the majority of smallholder farmers don't produce enough food to feed their families throughout the year l*et al*one catering for their income needs. Fallowing (in absence of subsidies or farmland expansion option) is therefore not a viable option for many farmers. It would appear from this finding that encouraging smallholders in such circumstances to adopt organic farming practices that require more land may be problematic.

Farmers' attitudes towards innovations have been shown to influence their decision making (Willock *et al*., 1999). Beliefs and local experience also play an important role in the adoption decision as demonstrated in one village in Njombe where none of pineapple farmers adopted mulching due to wild fire risks. In such situations, considerable input might be needed to change the mindset of these farmers before they agree to adopt such practices. The level of extension, information flows, and the structure and impact of a range of institutions as noted by Solano *et al*. (2003) influences the farmers' decision making process. In this study, although conventional farmers adopted some organic farming practices, a higher proportion of organic farmers tended to adopt more practices as they had more access to information and support from their organic farming associations or schemes. Poor access to information and lack of government support have been found to be barriers to diffusion of organic farming elsewhere in developed and developing countries (Wheeler, 2008). If organic farming is to be more widely adopted by smallholders in tropical Africa, relevant policies will have to improve on provision of information and support infrastructure to the target farmers.

Among the key farmer characteristics that are known to be important in adoption decisions is gender (Edwards-Jones, 2006; Bett *et al*., 2009). In this study however, gender was found to be immaterial in the prediction of adoption intensity. A study by Goldberg, (2008) in Kenya found mixed results where gender was significant in adoption of some organic practices but not others. Other studies on adoption of conservation/organic practices found gender to be important in the adoption of organic practices (e.g. Anjichi *et al*., 2007, and Burton *et al*., 1999). Adoption of any innovation appears to be specific to locality and thus generalizations should be made with caution. Although the age of the head of household was found to be a positive predictor of adoption rate, the nature of its relationship with adoption of innovation is usually a subject of discussion as there is a limit after which the returns from increment in age start to diminish, prompting suggestions of quadratic relationship (Mazvimavi, 2004).

In common with other studies, as the size of farm increased, farmers were less likely to adopt organic practices (e.g. Khaledi, *et al*., 2010; Burton *et al*., 1999). This is partly explained by the increased labour requirements for larger farms making organic farming more expensive when most of the tasks have to be done manually. But also economies of scale brought by the farm size give larger farm operators more alternatives for marketing compared to very small producers who see organic as their only option to access better markets. Increased labour requirements in organic farming, was mentioned as a limiting factor for adoption especially for farmers with relatively larger farm sizes. This suggests that smallholder farmers may be a better target for policies encouraging adoption of organic farming practices. Due to higher use of organic/conservation practices compared to conventional farmers, organic farmers scored higher for overall farm operation sustainability, similar finding was reported by McCann *et al*. (1997). It is important to note that this overall farm operation sustainability measure applies only to operations on pineapple farms, while most farmers had other farm plots with other crops nearby or in distant locations where they were/were not practicing organic farming. Some factors were found to have a significant association with adoption intensity in the spearman rank correlation but were not material determinants of adoption in the regression. This is because the censored regression model, like OLS regression, allows controlling for

other factors i.e. observing the impact of one variable on the outcome, holding all others constant.

Unlike organic farming adoption studies in developed countries where perception of environmental benefits of organic farming was the main motivation for adoption (e.g. Burton, 2003; Best, 2008), such was not the case for smallholders in this study. Economic or monetary related reasons were the main driver for smallholder adoption of organic farming practices with about two-thirds of adopters mentioning the same. This finding is similar to organic adoption studies in other developing parts of the world like Latin America and the Caribbean (IFAD, 2003). It emphasizes the observation by the German NGO Forum (Johhansen *et al*., 2005) that, *"In poverty conditions, it has to be borne in mind that improvements in income that will only materialise in the long term are of little value to families suffering from poverty and hunger right now, and that they may represent a considerable obstacle to lasting success with conversion".* Lack of knowledge and 'not yet accepted' into the schemes being the most frequently mentioned reasons for non-adoption demonstrate the potential for wider adoption if the correct infrastructure can be laid down. These farmers as noted by Fairweather, (1999) may have no negative views about organic farming and would be easier to persuade if the aim of the policy was to support and encourage organic farming.

An interesting finding was that farmers with access to conventional markets and synthetic inputs showed low adoption rates to organic practices. The higher earning farmers by household income in these areas were less likely to adopt most of the practices whilst visits by extension workers had a negative influence on the adoption intensities of such farmers. This group of farmers appears to be satisfied with their current farming and marketing system and see little reason to change to another system. These farmers are difficult to persuade as noted by Fairweather, (1999); unless the new system can prove to offer better performance in the dimensions that they consider important. The suggestion here is that, if all farmers could gain access to markets, even domestic markets, most would not opt to farm organically. Organic farming is mostly practiced in remote rural areas where access to urban markets is limited hence seen as an opportunity to access better markets (Johansen *et al*., 2005; Bakewell-Stone, 2006; TOAM, 2009;). This suggests that, for organic farming to be

more widely accepted in areas where access to urban markets is relatively better, it has to offer something better than their current market access status. It may thus be reasonable for governments, policy makers and organic farming promoters to focus their efforts on these remote rural areas where the benefits to farmers are more likely (as opposed to promoting across the board).

It also remains unclear why visits by extension workers (that were in most cases government employee) had a negative influence on adoption. The study did not determine the type of information the extension workers were providing to farmers. Like studies elsewhere, the key informant interviews revealed cases of conflicting government plans with private firms organizing farmers for organic export where the government encouraged the use of synthetic fertilizer and supply it at a subsidized price unintentionally luring organic farmers away from their schemes (IFOAM, 2007; Mhana, 2010).

4.5 Conclusion

The adoption of organic farming by smallholders in tropical Africa is unique to each locality and more often than not, strongly dependent on the initiative of farmers and private scheme operators, as infrastructural support for organic farming is lacking or insufficient. There are few qualified trained extension officers for organic farming; no government support for conversion to organic or any other organic related subsidies; and the sector depends extensively on privately led organic farming and export schemes. Poor smallholder farmers seek to adopt practices that present the possibility to enhance their productivity and incomes with minimal investment and time. Unfortunately, only a few benefits of organic farming like premium prices for example, can be realized in the short run. Organic farming may be one possible route out of smallholder poverty in Africa, but only when there is proper support infrastructure and geared links to export markets. Adoption of organic farming or other farming practices by smallholders still remains very dependent on the ability of the farming systems to offer economic/monetary returns as well as the supporting environment in terms of information and supporting infrastructure that comes with the system. For effective policies encouraging smallholder organic farming, economic and financial aspects associated with the system as well as farmers' attitudes, and their socio-demographic aspects are key to success.

CHAPTER FIVE: IMPACTS OF ORGANIC FARMING ON SMALLHOLDER FARMERS' INCOMES UNDER DIFFERENT FORMS OF FARMERS ORGANIZATION AND SECTORS

Abstract

Organic farming is seen as potential route out of income poverty and food insecurity in developing countries. While a few studies assessed the contribution of organic farming to smallholder farmers' incomes under contracts/export schemes in tropical Africa, no previous attempts have been made to assess organic farming under different settings e.g. domestic selling vs. exporting organic farmers. This study aimed to assess the revenue impacts of organic farming on smallholders in three different systems in Tanzania. The three systems comprised an exporting scheme (Karagwe site); a system with links to an exporter but no contracts (relied on opportunistic exporters) (Njombe site); and finally domestic selling farmers (Bagamoyo site). A sample of 488 farmers was selected from the three sites; half of the sample was organic and half conventional in each system. The regression analysis was adopted in which Heckman's selection models were used to control for endogenous selection. The results indicated that organic farming was a significant and positive predictor of net household revenues. However, this was only true when organic production was contractually linked to an active exporter. Where the exporter/buyer linkage was opportunistic, the partly exporting organic farmers were significantly worse off compared to conventional farmers. Organic farming was not a significant predictor of net revenues in the domestic selling sector. This implies export contracts schemes rather than the farming method are responsible for net revenue improvements. The suggestion from this study is that although organic farming has a role to play, it does not provide an easy solution to multitude of problems facing smallholders in SSA, nor should it be viewed as a panacea for poverty alleviation. The governments, NGOs, international agencies and policy makers promoting organic farming may wish to consider investing in developing more export market links for smallholder organic farmers if poverty alleviation and environmental conservation objectives are to be achieved simultaneously.

Key words: *Organic farming, Farm revenues, Fruits&Vegetables, Tanzania, Tropical Africa.*

5.1 Introduction

Most Sub-Sahara African (SSA) economies largely rely on agriculture with about two-thirds of their populations employed in the sector (Scialabba, 2007; World Bank, 2007; Chen and Ravallion, 2007). Other than natural resources, a substantial amount of these countries' foreign income is generated from agricultural exports (FAO, 2003). In the past three decades traditional exports from SSA (mainly cash crops) have faced strong competition from larger/capital intensive emerging economies in

Asia and Latin America resulting in declining prices and consequently loss of an important source of export earnings (FAO, 2003; UNCTAD, 2003; UNCTAD, 2004; URT, 2008a). This has left a revenue gap that needs to be filled either though innovations in agriculture to develop specialized products that can exploit niche markets, or increased investment in the sector to generate capital intensive sectoral economy to improve competitiveness in international markets.

Markets for organic products, particularly certified products have seen rapid growth over the past few decades. In Europe for example, organic sales were estimated to have reached 14.3 billion Euros in 2008 with similar trends being seen in Australia and North America (The World of Organic Agriculture, 2008). The rising demand for organic and tropical products continues to cause some governments, donors and non-governmental organizations to promote organic farming for export in SSA and other least developed countries (LDCs) (UNCTAD, 2008; URT, 2008a; Danielou and Ravry, 2005). Other than differences in the use and non use of synthetic inputs, conventional and organic farming systems have been characterised as different in their factor intensity between labour and capital. Organic farming is more labour intensive as it require more manual work in the use and re-use of the on-farm inputs whereas conventional systems requires more capital to buy the off-farm inputs to enhance production (MacRae, *et al*., 1990; Lampkin and Padel, 1994; Egri, 1999; Bakewell-Stone *et al*., 2008).

Since conventional farmers in developed countries use relatively higher levels of synthetic inputs in their production compared to LDC farmers, their conversion to organic farming implies a serious reduction in the use of these inputs and is usually associated with yield reduction. This reduction has been considered one of the setbacks for wider adoption of organic farming in developed countries (Lampkin and Padel, 1994; Lampkin *et al.,* 1997; and Greene and McBride, 2007). On the other hand, conversion in most LDCs involve only minor adjustments to farming practices because most farmers use little or no synthetic inputs in the production and have been considered ‘organic by default’(UNEP-UNCTAD CBTF, 2007). In light of the above, LDCs in SSA have sought to take advantage of the rapid market growth (APO, 2010; Subramanian and Matthijs, 2007; Larcher, 2005; Danielou and Ravry,

2005) as their agriculture is already labour intensive and not industrial in nature removing both labour requirements and conversion period setbacks.

Evaluating the potential for organic agriculture to contribute towards alleviating poverty in SSA and sustain livelihoods has been the subject of increased research in recent years (Bakewell-Stone, 2006; Bolwig *et al*., 2007; Sciallaba, 2007; UNEP_UNCTAD, 2008; 2010; Bakewell-Stone *et al*., 2008; Bolwig *et al.*, 2009). A study conducted in 2006 by Bakewell-Stone suggested organic agriculture was making efficient use of resources in the current institutional context. However the study also noted that the international trade focus on organic farming and efforts to commercialize smallholder agriculture carried significant risks. Another study in Africa by UNEP-UNCTAD (2008) concluded that, *"Organic agriculture can be more conducive to food security in Africa than most conventional production systems and it is more likely to be sustainable in the long term".*

Comparative assessment of organic and conventional farming systems in developed countries (where agriculture is more intensive compared to LDCs) have shown little or no differences in revenues between organic and conventional farmers as the reduction in productivity in organic systems seems to be offset by premium prices and savings from industrial input costs (Padel & Lampkin, 1994; Nicolai and Ada, 2005; Lampkin *et al*., 1997; Offermann and Nieberg, 2000; Greene and McBride, 2007). In SSA however, only a handful of studies have been conducted and they have been criticized as lacking comprehensive farm budget related survey data and for non use of rigorous analytical statistical methods (Bolwig *et al*., 2009). Two studies in SSA to-date have used comprehensive farm budget data, Bowlig *et al.* (2009) and Akyoo and Lazaro, (2008). Akyoo and Lazaro, (2008) concluded farmers of organic spices did not realize any benefits that were initially believed to come with organic farming. Bolwig *et al*. (2009) on the other hand found a positive revenue effect for organic coffee farmers in Uganda both from participation in the scheme (organic contract scheme) and more modestly, from applying organic farming techniques. Both studies compared conventional vs. organic farmers in contract scheme settings/linked to an exporter. No similar attempts to-date have been made to make similar comparisons of organic and conventional farmers under

different contractual settings e.g. without contract scheme participation or an established exporter link.

Assessment of organic vs. conventional farming systems in SSA needs to be viewed in a different context than in developed countries due to fundamental differences in agricultural systems that exist between them (Bolwig *et al.*, 2009). In developed countries there is more elaborate institutional support for agriculture and the sector is characterised with high use of industrial inputs such as fertilizers and pesticide unlike the SSA context. These differences have implications on the conversion period from conventional to organic systems, productivity differences and marketing arrangements that in turn affect the final revenue comparisons between the two farming systems.

The growth of supermarkets and globalization of supply chains in recent decades has threatened exclusion from the value chains of smallholder farmers that depend on farming sector for food and income generation (Temu and Marwa, 2007). The nature of smallholders in sub-Saharan Africa owning very small farms typically 0.25 to 3ha. of land (Temu and Temu, 2005), coupled with poor institutional support, have seen many being excluded from high value chains due to their dis-economies of scale (Temu and Marwa, 2007). To address this problem, farmers have often been organized, or encouraged to organize themselves, into contract farming schemes and marketing associations (Mugerwa, 2005; Mwenda, 2005; Kirsten *et al.*, 2005, World Agroforestry, 2006). Access to niche markets and income generation has been central motivations for many smallholders joining organic farming schemes in SSA (ref. Chapter 4; Simmons, 2002; Bakewell-Stone, 2007; Temu and Marwa, 2007; APO, 2010; Bolwig *et al.*, 2009). This implies organic farming is largely seen as a means to access better and high value markets rather than other benefits of the farming system itself.

The majority of smallholder export initiatives in SSA including organic farming exports are organized into contract schemes. The exporter farmer contract is such that, the farmer produces the produce according to standards required by the importer whilst the scheme/exporter buys the produce and sells it to the importer mainly in developed countries. The relationship is such that, while the farmer assumes all the

production risks, the exporter/scheme links the farmer to the importer by enforcing the adherence to agreed standards. In turn, the scheme/exporter sets the price (of buying from farmers) such that their training, certification, enforcement and other linkage costs are recovered (Mnenwa, 2009; Bakewell-Stone, 2007; and Simmons, 2002). This kind of structural organization has in many cases helped smallholders access high value markets and demand prices that are in most cases higher than existing domestic market prices (Kirsten *et al*., 2005, Mnenwa *et al*., 2007). Since the whole structural organization, contract farming and organic farming goes together; it is important that the impacts of organic farming are not confused with the impacts of contract farming or export production. In other words could the results observed with schemes involvement have been the same if organic farming was not coupled with contract farming? More importantly, is the organic farming solving the marketing problem or improving the production system or both?

This study aims to evaluate revenue impact, if any, of organic farming to smallholder farming households. The study aims to assess the impacts on smallholders in three different settings, i) with an active organic scheme and contractual links to an exporter, ii) with link to an opportunistic exporter but no contracts and last iii) domestic selling organic farmers with neither schemes nor contracts; relative to their conventional counterparts.

5.2 Methods

5.2.1 Sampling and data collection methods

5.2.1.1 Study sites and crop selection

The target population was smallholder farmers in organic farming. Pineapple farmers were selected as they suited the criteria of availability in numbers that would enable drawing reasonable conclusions. Smallholder organic pineapple farmers also existed alongside conventional farmers enabling comparisons. Three study sites were selected that included a range of different farming sectors and contractual arrangements in different geographical locations in Tanzania. These were Bagamoyo in Coastal region (eastern Tanzania), Njombe in Iringa region (central-southern Tanzania) and Karagwe in Kagera region (northern Tanzania). Organic farmers in the three sites were different in their nature of organization and linkage to

exporter/organic scheme. Karagwe organic certified farmers were contractually linked to an active, privately owned processing and export scheme. Njombe organic certified farmers were linked to processing/export firm with no contracts involved and thus buying of the produce from farmers was only occasional as the export opportunities arise. Bagamoyo organic farmers (not certified) were not linked to any processing/exporter scheme or permanent buyer; they sold all their organic produce through domestic market channels.

Detailed descriptions of the sites' locations, weather and economic activities is included in Chapter three. One notable aspect of these sites is their location relative to the main markets (major cities and towns). Bagamoyo, being in a coastal region is about 67km from Dar es Salaam, the largest city in Tanzania giving farmers increased access to urban markets than the other two sites which were located further from the urban markets.

Karagwe

The organic scheme in Karagwe is organized by the Matunda Mema Company which processes (Fig. 5.1) and exports organic pineapples, bananas and pawpaw from contracted farmers. The company has been active since 2001 conducting regular training and follow-up with farmers to ensure compliance to organic criteria and providing group certification and regular buying of the produce from farmers. The control, training and certification costs are born by the company and thus the company sets buying prices to compensate for these. The price offered by the firm is constant throughout the year; it is above the domestic market price during the peak harvest season but below domestic market price in the off-season when demand is higher than supply (Kazimoto, 2009). Being a single buyer, the capacity of the firm was too small to absorb all organic pineapples produced during peak season and thus organic farmers sold part of their produce through domestic conventional outlets directly or indirectly though middlemen.

Figure 5.1 Organic pineapple processing at Matunda Mema plant in Karagwe for European Market.

Njombe

Madeke Organic Village Initiative was established as part of the Export Promotion of Organic Products from Africa (EPOPA) project in East Africa in 2003 where organic farmers were trained, linked to the processing and exporting firm and later the Institute for Marketecology (IMO) certified (Madeke Organic Farmers Asssociation, 2005). They formally started exporting their organic pineapples from Njombe (Fig. 5.2) to European Union countries in 2005 (Mbote, 2009). The exporting firm linked by EPOPA to these farmers was DABAGA Vegetable and Fruit Canning Co. Ltd. operating in Iringa town. The EPOPA initiative funded the initial training, control and certification costs. The EPOPA project was phased out in 2007/08, afterwards the link between farmers and the exporter was weakened due to the economic recession causing market disruptions and low prices that led to the company's inability to buy and export pineapples regularly (Kishor, 2009).

Figure 5.2 Organic pineapple fields in Njombe hills (Madeke organic village)

Conversely farmers blamed the firm for miscommunication and offering prices that were below the domestic market prices (Mbote, 2009). Consequently, although organic pineapple farmers were IMO certified the exporting company maintained an opportunistic relationship with farmers whereby they bought pineapples as and when the market conditions suited the firm. The exporting company reportedly bought once or twice and sometimes not buy at all in a whole season, meaning organic farmers were forced to sell all or large part of their certified organic produce through local conventional outlets. Madeke village is about 19km from the nearest weekly bus stop, and around another 110km from the small town of Njombe on roads that are impassable in the rainy season. The neighbouring village (conventional farming) is also about 110km from Njombe with similar roads that are impassable in the rainy season.

Bagamoyo

Organic farmers in Bagamoyo formed their own association - Kiwangwa Organic Farming Farmers Association (KOFFA) in 2003 with over 200 active farmers. They received training once in a while from NGOs, organic farming bodies and rarely

from government extension workers. They have neither a contract scheme nor certification as they have not yet secured a suitable exporter or government aid to help with certification costs though they have been active since 2004 (Mhana, 2010). They sell almost all of their organic pineapples through domestic conventional outlets; a few fortunate farmers sell their produce to one or two small organic outlets in Dar es Salaam. Unlike the other two sites, conventional farmers in Bagamoyo use synthetic fertilizers and pesticides in their pineapple fields. Both organic and conventional farmers have the advantage of being close to Dar es Salaam city (about 67km from Bagamoyo), providing accessible markets for their pineapples and increased access to synthetic inputs. They are also located close to Kilimanjaro – Dar es Salaam highway that enables domestic traders from other regions to source pineapples from Bagamoyo.

5.2.1.2 Sampling

The three study sites were first stratified into organic and conventional farmers, and then lists of organic and conventional farmers were obtained from organic schemes/farmer associations and village leaders respectively. Representative samples were randomly drawn from each strata with replacements sought for those farmers who were not available for interviews or refused to participate. A total of 488 pineapple farmers were selected from the three sites. With half being organic and half conventional from each site, a total of 123, 242 and 123 in Njombe, Karagwe and Bagamoyo respectively were interviewed from August to December 2009.

5.2.1.3 Data collection and analysis

A questionnaire was administered by the researcher and assistants to the head of household where available and in a few cases where the head of household couldn't be found after two attempts, another adult in the household preferably the spouse was interviewed. Interviews with scheme managers, village leaders, exporters, key informant group discussions and researcher observation were used to collect qualitative information to complement the questionnaire interviews. The questionnaires were then coded, entered into statistical software and analyzed using SPSS 14, Excel and STATA 10 packages.

5.2.2 Analytical methods

Participation in organic schemes in this study was open to any farmer within the locality of the scheme on a condition that they met the organic farming criteria set by the scheme operators. In SSA, the most important criteria to qualify for acceptance into organic schemes is non-use of industrial fertilizers, pesticides or herbicides in the production and no chemicals in processing or storage (Kazimoto, 2009; Bolwig *et al*., 2009). No farmer (organic or conventional) was using such inputs for pineapple production in Karagwe and Njombe sites and thus non-use of synthetic inputs was not included in this analysis as one of the organic practices. Although farmers were encouraged to adopt a set of conservation practices as a means to improve soil fertility, such practices were adopted on voluntary basis as they are not organic *per se*. The farmer could only be disqualified from the scheme for using synthetic inputs in production, processing or storage but not for non-use of mulching, compost or terraces in their farms (Kazimoto, 2009; Bolwig *et al*., 2009). Self-selection into the schemes and the requirement to meet a set of criteria may mean farmers who choose to join the organic schemes posses some similar characteristics (variables). These variables may predispose farmers to better (or worse) performance in their farming enterprise and potentially confound the outcome of participation. Since the nature of this study indicated the possibility of endogenous selection it was important to check for and correct the selection bias if present.

To establish the revenue effects of organic farming in this study, empirical analysis was guided by the following hypotheses: -

- There is no significant difference in revenues between organic and conventional pineapple farmers, and
- Organic farmers without contract schemes/link to buyer earn more revenue than their conventional counter parts.

The hypotheses are concerned with evaluating the effects of type of farming (organic or conventional) on household revenue. The type of farming can be viewed as kind of intervention (analogous to, say, training programme) allowing the analysis to proceed as treatment evaluation. Considering the organic farmers as a treatment group and conventional ones as the control group, the appropriate analytical method

will depend on how members were selected into these two groups. If random selection into the organic schemes from the same population can be assumed, then there would not be systematic differences between the two groups that could confound the outcome of the treatment effect hence no selection bias. The nature of the treatment (organic) and non-treatment (conventional) groups imply random selection into the treatment group cannot be assumed with any certainty. This indicates selection bias possibility which can be caused by the existence of systematic differences between organic and conventional farmers that are related to their revenues. According to Econ-MIT, (2010) "*The principal econometric problem in the estimation of treatment effects is selection bias, which arises from the fact that treated individuals differ from the non-treated for reasons other than treatment status per se*." That is to say, if, for example, organic farmers choose to participate in organic farming because they were more entrepreneurial in nature and thus predisposed to better performance, the outcome of participation could be confounded. This would mean that the choice to participate in organic farming is endogenous and it requires the outcome of the participation to be modelled explicitly.

If the selection into the schemes can be traced to observable differences between the treatment and control group, ordinary linear regression or propensity score matching techniques can be used (Dehejia and Wahba, 2002). Otherwise Heckman selection models which enables testing and adjustment for unobserved differences in between the groups is appropriate (Heckman and Robb, 1985; Heckman, 1979; Heckman, *et al* 1999). Since there are no obvious indications to suggest ruling out the presence of unobservable variable that may confound the outcome of participation, Heckman selection methods as well as Ordinary Least Squares (OLS) regression were employed here.

The treatment effects can be estimated using social experiments, regression models, matching estimators and instrumental variables. The literature on treatment effects model is wide and each of the named methods has its strengths and weaknesses ranging from underlying assumptions to nature of experiment/survey (Ashenfelter, 1978; Heckman, 1979; Barnow, *et al*. 1981; Maddala, 1983; Heckman and Robb, 1985; Angrist and Imbens, 1995; Heckman, *et al.*, 1999; Greene, 2003; 2008). The model estimates the effect of an endogenous binary treatment, *Zj* (in this case being

an organic farmer or not), on a continuous, fully-observed variable *yj* (income), conditional on the independent variables *xj* (observable variables) and *wj* (unobservable variables). The outcome equation of interest is the regression function of form:-

$$yj = xj\beta + \delta zj + \epsilon j$$

where *zj* is an endogenous dummy variable indicating whether the treatment is assigned or not (being an organic farmer or not). The binary decision to obtain the treatment i.e. become organic farmer *zj* is modeled as the outcome of an unobserved latent variable, zj*. It is assumed that *zj** is a linear function of the exogenous covariates (unobservable variables) *wj* and a random component *uj*. Specifically,

$$zj^* = wj\,\gamma + uj$$

and the observed decision is zj = 1 if zj* > 0; otherwise 0.

The error terms, u and ϵ, are assumed to be bivariate, normally distributed with correlation coefficient, ρ, and γ and β are the parameter vectors (Heckman, 1979; Heckman *et al.*, 1999, Greene, 2003). Two forms of the treatment regression model have been derived, maximum likelihood and two-step estimators (e.g. by Maddala, 1983); the two stage estimator was used rather than Full Information Maximum Likelihood (FIML) to minimize collinearity effects.

In the first step, a probit model was estimated where the dependent variable in the analysis is the dummy variable indicating whether or not the respondent is farming organically. The regressors in the model were the relevant observable characteristics of the respondents that may influence the decision to farm organically; mainly resource endowment indicators and other related respondent profile information. These included level of education, age of the head of household, total land owned, number of household members working in the farm (size of work force), housing type and other crops income. In this model, the decision to farm organically is explained by observable and unobservable farmer characteristics. The coefficients of the explanatory variables in the probit analysis give information on the effects of measured variables on the decision to farm organically while the residuals of the probit analysis gives information on unmeasured variables. In other words the variation which remains in the dependent variable after removing the effect of the

known factors can only be caused by the influence of unknown factors. The residuals of the selection are thus used to construct a selection bias control factor, Lambda (equivalent to Mill's Inverse Ratio) which is then used in the second step as an additional regressor in the OLS regression (Maddala, 1983; Heckman, 1979; 1999; Greene, 2003). Since the selection bias control factor reflects the effects of all unmeasured characteristics of respondents which are related to the choice of farming practice, its inclusion in the OLS regression captures the part of the effects of these characteristics that is related to revenue. Having a control factor in the analysis for the effect of the revenue related unmeasured characteristics (that are also related to the farming type decision), frees the other predictors in the equation from this effect and the regression analysis produces unbiased coefficients for them.

5.3 Results

A comparison of selected respondents' variables between conventional and organic farmers in the study sites was undertaken to find out the differences between the two groups. The results show that in Njombe, the partly exporting organic farmers operated significantly larger pineapple plots than their conventional counterparts ($p \leq 0.05$); but did not differ significantly in total land ownership (Table 5.1). There also was no significant difference in their primary occupation (which was farming); age of household head (proxy for experience); level of education of the household head; household workforce size (members that work on the farm); other crops revenue and non-crop revenue. A significantly larger proportion of organic farmers (95.8%) used recommended organic practices ($p \leq 0.01$); where-as almost half of conventional farmers used no such practice. Although organic farmers produced significantly more pineapple units ($p \leq 0.05$), there was no significant difference between organic and conventional farmers total household revenue, total crop revenues or even net pineapple revenue. Organic farmers however incurred significantly higher variable production costs and suffered significantly more loss in unsold units (percent) than conventional farmers (Table 5.1).

Table 5.1 Means and percentage comparison of selected variables between conventional and organic farmers in the three sites

		Site								
		Njombe			**Karagwe**			**Bagamoyo**		
Variable	**Unit**	**Organic**	**Conve.**	**X^2/t-statistics**	**Organic**	**Conve.**	**X^2/t-statistics**	**Organic**	**Conve.**	**X^2/t-statistics**
Sample characteristics										
Respondents	Count	72	51	-	130	112	-	60	60	-
No use of organic practices	% Group	4.2%	43.1%	25.64**	0.0%	1.8%	0.67	10.2%	33.3%	7.88**
Use >2 organic practices	% Group	66.7%	2.0%	49.49**	90.0%	72.3%	11.48**	16.9%	1.8%	6.13*
Farming as primary occupation	% Group	93.1%	90.2%	0.06	92.3%	95.5%	0.59	83.3%	91.7%	1.22
Household characteristics (means)										
Age of household head	Years	38.87	36.09	-1.24	42.5	42.8	0.17	44.92	42.93	-0.85
Education of household head	No. of yrs	5.40	3.98	-2.34	6.74	6.66	-0.25	6.05	6.45	0.82
Total land owned	Acres	15.31	8.43	93.28	6.51	5.54	-1.68	11.73	9.33	-1.24
Pineapple plot size	Acres	2.69	1.13	-7.60*	1.23	0.79	-4.19*	2.63	3.98	2.99*
Household workforce size	Count	2.18	2.14	-0.33	2.50	2.53	0.24	2.55	2.48	-0.31
Household revenue (means)										
Net pineapple revenue	1000Tshs	369.55	264.72	-2.08	1260.16	532.58	-6.35*	1874.92	6250.55	4.17*
Total pineapple units produced	Count	4395.83	2007.84	-5.23*	5634.88	2770.63	-6.59*	9340.00	24875.00	4.19*
Pineapple loss(unsold units as percent of units produced)	%	36.20	17.17	9.54**	13.27	17.639	-3.99**	12.61	13.09	-0.30
Total non-crop revenue	1000Tshs	88.28	125.93	1.20	241.22	115.72	-1.90	397.35	494.97	0.36
Total other crops revenue	1000Tshs	75.56	69.29	-0.45	487.80	348.12	-2.13	279.57	120.63	-1.38
Total crop revenue	1000Tshs	445.11	334.01	-2.05	1747.96	880.70	-7.14*	2154.48	6371.18	3.95*
Total household revenue	1000Tshs	533.39	459.94	-1.13	1989.19	996.42	-6.87*	2551.83	6866.14	3.75*
Pineapple production variable costs (means)										
Hired labour for pineapple farming activities	1000Tshs	49.00	2.51	-5.276*	3.31	5.87	-5.04*	139.83	341.38	2.28
Material and input costs	1000Tshs	4.26	1.15	-1.398	42.94	11.61	-4.16*	59.00	504.32	6.25*

***Notes*:** Net pineapple revenue was calculated as pineapple sales less sales expenses and pineapple specific costs category (d), family labour costs and fixed costs like land purchases were not involved in the calculation. Total crop revenue was calculated as the sum of all other crop revenues plus net pineapple revenue. Total non-crop revenue equals the income from non-farming activities (including livestock sales). TShs = Tanzanian Shillings (US$1=1400Tshs as of 2009) All data refer to 2008/2009 season.
*Significant at 5% level **Significant at 1% level

In Karagwe, the exporting organic farmers and conventional farmers did not differ in their primary occupation; head of household's level of education; total land owned; households total workforce size and experience (proxied by the age head of household). Organic farmers however had significantly larger pineapple plot sizes ($p \leq 0.05$); and a larger proportion of the farmers (90.0%) used more than two organic farming practices ($p \leq 0.01$). The high use of organic practices was widespread across the board as 72.3% of conventional farmers used more than two of the recommended practices. Organic farmers had significantly larger net pineapple revenues ($p \leq 0.05$); higher total crop income and total household revenues ($p \leq 0.05$); and they didn't differ in non-crop incomes. Exporting organic farmers incurred significantly higher variable costs in their pineapple production ($p \leq 0.05$); produced more pineapple units, ($p \leq 0.05$); and suffered less loss in unsold units (percent) compared to conventional farmers ($p \leq 0.01$) (Table 5.1).

In Bagamoyo, the domestic selling organic farmers used significantly more organic practices ($p \leq 0.05$), although as many as 10.2% used none of the recommended practices. The two groups of farmers also differed in the size of pineapple plots where conventional farmers operated significantly larger plots than organic ($p \leq 0.05$). Unlike Njombe and Karagwe study areas, conventional farmers in Bagamoyo produced more pineapple units than organic farmers, ($p \leq 0.05$); and earned significantly higher net pineapple revenues, total crop income and total household revenues ($p \leq 0.05$). Conventional farmers also incurred significantly higher variable costs in their pineapple production ($p \leq 0.05$) (Table 5.1).

The examination of the presence of observable factors that influenced participation in the organic farming in the probit analysis revealed years of education ($p \leq 0.05$) and housing type (factor endowment) ($p \leq 0.001$) were significant predictors of participation in organic farming in Njombe (Table 5.2). None of the selected variables were significant predictors for participation in Karagwe and Bagamoyo. The probit model for Njombe had significant chi-squared and explained 18% of the variation in the participation decision while Karagwe and Njombe models had insignificant chi-squared and explained only a small part of the variation (2% and 3% respectively) in the decision to farm organically.

Table 5.2 Probit regression for selection equation in the three sites (i.e. selection into organic farming)

Site	**Njombe**			**Karagwe**			**Bagamoyo**		
	Coeff.	Std. error	z	Coeff.	Std. error	z	Coeff.	Std. error	z
Age of household head	0.02	0.01	1.90	-0.01	0.01	-0.83	0.01	0.01	0.21
Years of education	0.10	0.45	2.32*	-0.00	0.03	-0.01	-0.02	0.05	-0.44
Workforce size	-0.17	0.19	-0.90	-0.01	0.08	-0.06	0.01	0.117	0.09
Total land owned	0.02	0.01	1.31	0.23	0.02	1.06	0.01	0.017	0.40
Housing type	-1.02	0.29	-3.54**	-	-	-	0.07	0.24	0.27
Other crops income	-1.87	1.86	-1.01	2.98	2.14	1.39	5.32	4.02	1.32
Total non-crop income	-1.30	7.10	-1.82	2.76	1.75	1.58	-2.04	1.54	-1.32
Constant	1.09	0.90	1.21	0.07	0.42	0.17	-0.18	0.75	-0.24
No. of respondents		123			239			120	
Log-likelihood		-68.26			-160.22			-80.13	
Pseudo R^2		0.18			0.03			0.04	
Chi-squared		30.39**			9.04			6.09	

Notes: OLS standard errors reported, total non-crop revenue is the income from non-farming activities including livestock sales. Housing type was dropped in Karagwe because all but three households had brick walls and iron roofing. All data refer to 2009 season.
*Significant at 5% level. **Significant at 1% level

The coefficients in the OLS and treatment regression estimators for Njombe are compared in Table 5.3 and indicate similar estimates in magnitude, direction and significance across the models. Both models show overall strong goodness of fit as indicated by highly significant χ^2 and F statistic, where as the OLS models explains about 60% of the variation in net pineapple and total crop revenues.The lambda for treatment regression model on total crop income is significant (λ=1.77; $p \leq 0.05$) but for net pineapple revenue it is non-significant. Significant lambda indicates the correlation coefficient (rho) between the un-observable variables that determine selection into organic farming and the un-observables variables that determine the revenue is not zero. The un-observables in the selection and outcome equations are positively correlated in both net and total crop revenue equations i.e. rho 0.414 and 0.589 respectively. The results of the two stage selection model are thus used here. Age of household head, level of education and size of the pineapple plot were

positive significant predictors of net pineapple revenue and total crop revenues ($p \leq 0.05$). The negative coefficients for farming practice indicated organic farmers were likely to earn significantly less than conventional farmers in Njombe both in net pineapple revenue and total crop revenues across the two models.

Table 5.3 OLS and treatment regression results for effect of organic farming on net pineapple revenue and total crop revenues in Njombe

Dep.var.	**Net pineapple revenue**				**Total crop revenue**			
Model	OLS Regression		Treatment regression (two step)		OLS Regression		Treatment regression (two step)	
	Coeff.	t/z	Coeff.	t	Coeff.	t	Coeff.	t
Outcome eqn.								
Farming practice	-212033	-3.45**	-333126	-2.86**	-239291	-3.76**	-426238	-3.41**
Age of hh. head	3355	1.91	4297	2.24*	3534	1.94	4989	2.40*
Education	13647	2.08*	18786	2.40*	15827	2.33*	23760	2.81**
Workforce	-54320	-1.94	-55520	-1.98	-55463	-1.91	-57316	-1.88
Total land owned	-2892	-2.84**	-2572	-2.45*	-1555	-1.47	-1061	-0.94
Pineapple land	141569	6.61**	144221	6.96**	159988	7.22**	164084	7.65**
Pineapple prod. VC	1.04	2.31 *	1.06	2.43*	0.85	1.82	0.87	1.93
No. of OP used	18093	0.82	14428	0.67	18878	0.82	13220	0.60
Constant	53935	0.56	64112	0.67	78642	0.79	94353	0.91
Selection eqn.								
Age of hh. head			0.023	1.90			0.022	1.90
Education			0.103	2.32*			0.104	2.32*
Workforce			-0.17	-0.90			-0.17	-0.90
Total land owned			0.015	1.31			0.016	1.31
Housing			-1.02	-3.54**			-1.02	-3.54**
Other crops inco.			-1.87	-1.01			-1.87	-1.01
Non-crop income			1.30	-1.82			-1.30	-1.82
Constant			1.09	1.21			1.09	1.21
Lambda			85987	1.22			132748	1.77*
rho			0.414				0.589	
Sigma			207697.41				225025.43	
lambda			85987.14				132748.23	
N	123		123		123		123	
R^2	0.59				0.6076			
F/X^2 stat.	20.55**		181.70**		22.06**		190.68**	

Source: Authors' survey data – calculation using regression/treatment regression in Stata 10. VC=Variable Costs. OP=organic practices. All data refer to 2009 season.
*Significant at 5% level. **Significant at 1% level

In Karagwe both models show strong goodness of fit as indicated by highly significant χ^2 and F statistic and the OLS models explain 56% and 48% of variation in the net pineapple and total crop revenue respectively. The significant lambda for total crop revenue (λ= -2.91; $p \leq 0.05$) indicates association between un-observable variables determining the selection equation (decision to farm organically) and outcome equation (revenue) meaning the OLS estimates could be biased. The significant predictors of the net pineapple income in the two-step regression model were farming practice ($p \leq 0.05$), pineapple plot size ($p \leq 0.001$) and variable costs used in the pineapple production ($p \leq 0.001$). Farming practice, pineapple plot size and number of organic practices used were material determinants of the total crop revenue ($p \leq 0.001$) (Table 5.4).

The insignificant lambdas for net pineapple and total crop revenues (Table 5.5) indicated there was no association between un-observable variables that influences the decision to farm organically (selection equation) and un-observables that influence the revenue (outcome equation) in Bagamoyo. The OLS estimators can thus be considered unbiased as there is no evidence that the selection and outcome equations cannot be considered separately. The OLS models explain a large amount of variation in the revenues (about 84%) and show strong goodness of fit displayed by their highly significant F values. Farming practice was not a significant predictor of net pineapple or total crop revenues; only size of the pineapple plot and amount spent in variable production costs were positive significant predictors of the revenues ($p \leq 0.001$). The number of organic practices used was a significant predictor for both net pineapple income ($p \leq 0.05$) and total crop income ($p \leq 0.05$) but the coefficient was negative indicating the revenues decreased with the increase in number of the organic practices used.

Table 5.4 OLS regression results for effect of organic farming on net pineapple revenue and total crop revenues in Karagwe

Dep. variable	**Net pineapple revenue**				**Total crop revenue**			
Model	OLS Regression		Treatment regression (2-steps)		OLS Regression		Treatment regression (2-steps)	
	Coeff.	t/z	Coeff.	t	Coeff.	t	Coeff.	t
Outcome eqn.								
Farming practice	331746	3.4**	586155	1.21*	456644	3.9**	3175093	2.97**
Age of hh. head	-5117	-1.3	-4599	-1.14	-7774	-1.7	-2241	-0.25
Education	19180	1.0	17463	0.92	42800	1.9	24455	0.56
Workforce	-30415	-0.7	-30261	-0.74	-18728	-0.4	-17084	-0.18
Total land owned	-12800	-1.2	-16780	-1.29	38914	3.1**	-3612	-0.13
Pineapple land	689555	11.7**	697631	11.73**	564912	8.2**	651207	7.48**
Pineapple prdctn. VC	1.7	3.0**	1.62	2.92 **	1.4	2.2*	0.85	0.33
No. of OP used	2281.5	0.1	597.68	0.02	35082	0.8	17090	2.97**
Constant	190683	0.8	67463	0.20	182097	0.6	-1134546	-1.53
Selection eqn.								
Age of hh. head			-0.006	-0.83			-0.006	-0.83
Education			-0.000	-0.01			-0.000	-0.01
Workforce			-0.004	-0.06			-0.005	-0.06
Total land owned			0.023	1.06			0.023	1.06
Housing			-6.126	-14.52**			-6.17	-14.52**
Other crops inco.			2.983	1.39			2.98	1.39
Non-crop inco.			2.764	1.58			2.76	1.58
Constant			6.198				6.19	
Lambda			-162980	-0.54			-1741506	-2.61**
rho			-0.24182				-1.00	
Sigma			673963.64				1547538	
lambda			-162980				-1741506	
N	242		242		242		242	
R^2	0.56				0.48			
F/X^2 stat.	37.25**		240.60**		26.66**		95.12**	

Source: Authors' survey data – calculation using OLS regression in Stata 10. VC=Variable Costs. OP=organic practices. All data refer to 2009 season. *Significant at 5% level. **Significant at 1% level

Table 5.5 OLS and treatment regression results for effect of organic farming on net pineapple revenue and total crop revenues in Bagamoyo

Dependent variable	**Net pineapple revenue**				**Total crop revenue**			
Model	OLS regression		Treatment regression (two step)		OLS regression		Treatment regression (two step)	
	Coeff.	t/z	Coeff.	t	Coeff.	t	Coeff.	T
Outcome equation								
Farming practice	-135446	-0.24	-2203264	-0.71	-153822	-0.27	439915.8	0.15
Age of hh. head	22532	0.97	23635	0.98	25796	1.11	25479.55	1.13
Years of education	60681	0.62	31119	0.28	107991	1.10	116479.1	1.13
Workforce size	347928	1.48	342045	1.41	219215	0.93	220904.6	0.97
Total land owned	-6042	-0.20	8240	0.22	42948	1.43	38847.48	1.10
Pineapple plot size	710277	4.57**	706669	4.69**	731434	4.70**	732470	4.89**
Pineapple prod. VC	4.34	8.42**	4.27	8.45**	4.13	8.00**	4.143912	8.22**
No. of OP used	-709220	-2.25*	-725980	-2.39*	-746492	-2.37*	-741680	-2.44*
Constant	-1830372	-1.37	-731004	-0.34	-2168105	-1.62	-2483770	-1.24
Selection equation								
Age of hh. head			0.003	0.24			.0027	0.24
Years of education			-0.023	-0.44			-.0228	-0.44
Workforce size			0.011	0.09			.0108	0.09
Total land owned			0.007	0.40			.0070	0.40
Housing type			0.065	0.27			.0651	0.27
Total other crops income			5.32	1.32			5.32	1.32
Total non-crop inco.			-2.04	-1.32			-2.04	-0.32
Constant			-0.181	-0.24			-.1809	-0.24
Lambda			1295137	0.68			-371876	-0.21
rho			0.486				-0.149	
Sigma			2664410				2487376	
lambda			1295137				-371876	
N	120		120		120		120	
R^2	0.8366				0.8395			
F/X^2 stat.	71.02**		485.04**		75.55**		525.53**	

Source: Authors' survey data – calculation using regression/treatment regression in Stata 10
VC=Variable Costs. OP=organic practices. All data refer to 2009 season.
*Significant at 5% level. **Significant at 1% level

The null hypothesis that there is no difference in revenues between organic and conventional farmers is rejected in Njombe and Karagwe, where the farming practice was significant predictor of the net pineapple and total crop revenues. Since the dummy coding was used i.e. 1 = organic farmer and 0 otherwise (conventional); the negative coefficient for farming practice in Njombe indicates organic farmers were likely to earn less than conventional farmers whereas in Karagwe organic farmers were likely to earn more. In Bagamoyo the null hypothesis of difference in revenues between organic and conventional farmers cannot be rejected as farming practice is not a significant predictor of the revenues.

5.4 Discussion

The initial investigation (Table 5.1) indicated that, exporting organic farmers in Karagwe earned significantly more than conventional farmers; the revenue impact was evident on the organic crop as well as total crop and total household revenues. The partly exporting organic farmers in Njombe showed no significant differences in revenues with their conventional counterparts; whereas the domestic selling organic farmers in Bagamoyo had significantly lower revenues than conventional farmers. However, the differences between organic and conventional farmers' household and respondent characteristics as shown in Table 5.1 indicated the possibility of the presence of selection bias (Caliendo and Hujer, 2005). The investigation of the selection bias (endogenous selection) through probit regression (Table 5.2) indicated the presence of some observable variable differences. Further investigation into unobservable differences between the two farmer groups through Heckman selection models (Table 5.3-5.5), indicated some systematic differences between the farmers that may confound the outcome of participation in organic farming. There was therefore a need to use the two stage regression models for the unbiased analysis of the revenue impact of organic farming.

In Karagwe, exporting organic farmers were likely to earn 331,746Tshs and 456,664TShs more than conventional farmers per season in net pineapple and total

crop incomes respectively[4]. This was expected as the organic export scheme in the area was well organized and actively buying organic crop from the contracted farmers at a relatively higher price[5]. The positive participation effect was evident in the total crop income indicating positive spill-over effects from training and use of good farming practices into other crops within organic farming households. The scheme conducted regular trainings on good farming practices aimed at improving soil fertility (on pineapple and other crops as well) which may have contributed to increased production and consequently the observed incomes. A study by Bolwig *et al*. (2009) in Uganda found that revenue effects were limited to the organic crop in question; no effect was observed on the total household income. These differences can be explained partly by differences in the rates of adoption and the use of the organic and associated good agricultural practices to other crops. The importance of the organic crop to the total household income can also contribute to the observed revenue impact. In this study, 46.6% of all farmers ranked pineapples as their most important crop, any positive or negative revenue impact on such crop can be expected to reflect on the total household crop and household incomes.

In Njombe, the partly exporting organic farmers were likely to earn 212,033Tshs and 239,291Tshs less than conventional farmers in their net pineapple incomes and total crop incomes. This may seems surprising as the scheme participation, training advantages and access to better markets were expected to give them an edge above their conventional counterparts. However given the nature of the scheme and its failure to buy pineapple from contracted farmers over most of the period of study (2008-2009 season) this outcome was to be expected. Logically, organic farmers incurs more costs and family labour inputs in the organic crop in order to comply with the export organic standards but end up selling the produce through local conventional outlets that do not pay the organic premium leading to reduced revenues. This proposition is supported by the findings in Table 5.1 where organic farmers had significantly greater variable costs in production and also suffered

[4] OLS coefficients used for simplicity since the treatment regression coefficients cannot be used directly.
[5] The firm offered a constant named price throughout the year, the price was well above existing market price in peak harvest but the same or slightly lower in low harvest season when there were very few pineapples in the market.

significantly greater losses in unsold pineapples (unsold units as percent of total produced units). The negative participation effect in this scheme was also significant on total crop revenue due to the fact, that the pool of labour and other resources available for use in the organic crop production is the same pool used for other household economic activities. Allocating these resources to the organic crop production presented an opportunity cost that materialized when the organic crop couldn't yield enough revenues to cover for the foregone revenues from other crop production and other household economic activities.

A different side of organic farming was observed in Bagamoyo where organic farmers sold all of their produce to domestic markets. Farming practice was not a significant predictor of the household revenues, because being an organic farmer was not accompanied by any of the usual benefits such as premium prices, training and access to export markets. This finding was similar to Lazaro and Akyoo's (2008) study on the organic spice industry where organic farmers earned less than conventional farmers in the absence of exporter/schemes support after the end of the donor support period. It should be noted that Bagamoyo was the only site where conventional farmers used synthetic inputs in pineapple production and thus their yields were also significantly higher. In an ideal situation, the difference in the yield would be offset by the benefits from organic premium prices, assured markets and trainings in the organic farming group; unfortunately none of these were available to Bagamoyo organic farmers.

Overall these findings indicate that organic farmers are better-off than conventional farmers in revenues only when the organic farming is coupled with a contract scheme that actively buys and export the produce. Organic farming does not improve incomes for partly exporting (opportunistic exporting links) and domestic selling organic farmers relative to their conventional counterparts. Studies elsewhere in SSA have reported smallholder farmers in contract schemes to be better-off in revenues compared to their conventional counterparts (Bijman, 2008), although smallholders in these cases were not necessarily organic farmers. Bolwig *et al*. (2009) reported significant improvements in income for exporting and contractually linked organic farmers relative to conventional farmers in Uganda. The governments, NGOs, international agencies and policy makers promoting organic farming may wish to

invest in developing more export market links for smallholder organic farmers if poverty alleviation and environmental conservation objectives are to be tackled simultaneously.

Poor access to marketing and production information; no links to markets; lack of credit; lack of processing and storage facilities; low productivity and poor supporting infrastructure ranging from roads to subsidies have been widely reported as problems hindering development of smallholder agriculture in tropical Africa (Amani, 2005; Johannsen *et al*., 2005; Temu and Temu, 2005, FAO, 2006; Jama and Pizarro, 2008). It is thus reasonable to assume that a more efficient farming system can alleviate a number of these problems for the smallholder farmers. As seen in this study, organic farming on its own does not necessarily solve many, if any of these problems. The contract farming and export schemes that comes with the organic farming achieves the goal[6] through linking farmers to the markets; providing farmers with production and marketing information; training; certification and even provision of small loans for crop production and processing. Findings from this study echo the conclusions drawn by the German NGO forum (Johannsen *et al*., 2005) that, agricultural production methods alone cannot eliminate the multitude of causes of rural poverty (including income poverty) as it also requires external framework conditions of fair land distribution and political support for agricultural research, extension services and infrastructure.

Notwithstanding the aforesaid; soil fertility improvement, biodiversity conservation and health benefits of non-use of synthetic inputs that comes with organic farming cannot be overlooked. As noted by Johannsen *et al*, (2005), in the long run, organic farming promises higher yields as well as yield security and also avoids the risks of dependence on agrochemicals and the accompanying indebtness in case of market

[6] Note that, contract farming has also been criticized as being selective in its outreach and often restricted to locations near big cities and major roads. Furthermore, the critics contend that, socially, overtime it tends to exclude smaller, poorer producers, and focuses primarily on export rather than food staples. Though it can undoubtedly benefit some farmers, it is not a panacea to low productivity and food insecurity for the majority of African peasant farmers (e.g. Havnevik *et al*., 2007).

failures. However, to smallholder farmers who are not sure of their next meal, the benefits that can only materialize in the long run, or environmental conservations concerns are of little importance. The challenge is thus to find a balance between meeting smallholders' immediate need to sustain their livelihood through agriculture and environmental/biodiversity conservation needs in a holistic approach that focuses on the farming system as well as other aspects of the supply chain.

5.5 Conclusion

The study has shown the contribution of organic farming in the farm revenues of contractually linked exporting organic farmers, partly exporting organic farmer and domestic selling organic farmers. Organic farming improves smallholder farmers revenues, however this finding should be interpreted with caution as this is only true when the organic production is contractually linked to an exporter. This implies it is the link to an exporter scheme rather than the farming method that is responsible for revenue improvements. Smallholder organic farmers without an active contractual link to exporters were no better in incomes than their conventional counterparts and at times were worse where conventional farmers had access to synthetic inputs. The governments, NGOs, international agencies and policy makers promoting organic farming may wish to invest in developing more export market links for smallholder organic farmers if poverty alleviation and environmental conservation objectives are to be tackled simultaneously. Developing domestic organic markets that can pay premium prices could be a long term solution, however underlying agricultural sector support, information access, infrastructural and marketing problems facing smallholders in SSA needs to be addressed in order realize the rewards of any farming system.

CHAPTER SIX: INFLUENCE OF ORGANIC FARMING ON SMALLHOLDER FARMING HOUSEHOLDS' FOOD SECURITY

Abstract

The persistent food insecurity in SSA is thought to be caused mainly by poor performance of the agriculture sector in which two thirds of the population is employed or depend on for their livelihoods. Organic farming has been recommended to revitalize the sector and improve food security in Least Developed Countries (LDCs) due to its purported ability to improve productivity, incomes and crop diversity. Tanzania is among the LDCs with large amounts of land certified for organic farming with many smallholders practicing certified and non-certified organic farming. A survey on 488 smallholder farming households in three regions in Tanzania was conducted to assess the impact of organic farming on household food security. Roughly half of the surveyed households were organic and half conventional from each area. The areas represented organic farmers with active contracts, exporting their produce (Karagwe); selling locally with no contracts (Bagamoyo); and lastly with an opportunistic exporter, no contracts (Njombe). The coping strategy index (CSI) was used to measure the household food insecurity. Exporting organic farming households were significantly more food secure than conventional farming households, while the domestic selling and partly exporting organic farming households were not significantly different in food insecurity status than their conventional counterparts. In the region where all farmers had access to urban markets (Bagamoyo), conventional farming households were more food secure than domestic selling organic farmers although the difference was not significant. Domestic selling of organic produce does not appear to solve any of the underlying market access and poor supporting infrastructure problems facing smallholder farmers. Since the food security improvement potential of organic farming is only material for exporting organic farmers; efforts needs to be directed in securing and maintaining export markets if organic farming is to contribute to household food security for smallholder farmers in the LDCs.

Key words: *Organic farming, Food security, Smallholder farmers, Tanzania, Tropical Africa.*

6.1 Introduction

The poor economic performance of African agriculture and the relationship to poverty and food insecurity has been a subject of interest for academicians and other development stakeholders over the years (e.g. FAO-AHP, 2002; FAO, 2006; wsws.org, 2006; Havnevik *et al*., 2007; Boon, 2007; WDR, 2008; FAO, 2008; UK Food Group, 2008; FAO, 2009; Boon and Semakula, 2010). According to the FAO (2006) the level of food security in developing countries has continually eroded over

recent decades leading to calls for renewed efforts to improve the situation. Sub-Saharan Africa (SSA) has notably been the most affected area having the world's poorest people, living in marginalized areas, with low levels of agricultural growth and persistent food insecurity problems (FAO, 2009; WDR, 2008; Johansen *et al*., 2005). African agriculture is dominated by smallholder farmers owning 0.25 to 3ha plot of land (Temu and Temu, 2005; Zhang *et al*., 2007), with only few medium and large scale farmers mainly involved in cash crop agriculture. About two thirds of the population in SSA is employed in agriculture and/or depend on agriculture for their livelihoods (World Bank, 2000; 2007), Estimates of the number of economically active individuals employed in agriculture are as high as 79% in Tanzania (URT, 2002). According to World Development Report (WDR) (2008), 70 to 75% of the poor and hungry in developed countries live in rural areas and rely on the same poor performing agriculture sector for their livelihoods.

Food security as a concept has been defined in many ways. According to Smith *et al*. (1992), there are more than 200 different definitions of the concept. Maxwell *et al*. (1999) noted most of the food security definitions revolve around the World Bank (1986) definition which proposes "access by all people at all times to sufficient food for an active, healthy life". Building on the series of previous definitions, The State of Food Insecurity 2001 report refined the definition to *"... a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"* (FAO, 2002). In a broader sense food security encompasses food availability or supply, access and utilization/consumption. The state of food security can therefore be analysed at any unit from an individual to national or regional level (Maxwell and Frankberger, 1992; Hoddinoh, 1999; Ericksen, 2008b).

Measurements of household food security rely on two categories of indicators, namely process indicators which encompass food supply and access, and outcome indicators which reflect food consumption (Maxwell and Frankberger, 1992; Hoddinoh, 1999). According to Frankenberger, (1992), indicators that reflect food supply include input and measures of agricultural production; access to natural resources; institutional development and market infrastructure; and exposure to regional conflicts or its consequences. Food access indicators are strategies used by

households to meet their household food security needs, whilst food consumption indicators include direct measures e.g. food frequency and expenditure, and indirect measures like nutritional status and subsistence potential ratio (Frankenberger, 1992).

A guide to analysis of food security by Hoddinoh, (1999) conceptualized food security being framed in physical, policy and social environments as shown in Figure 6.1 represented by letters C, B and A respectively (no. 1). The household resources are then grouped as labour and capital that can be employed in food production, cash crop production or other income generation activities (no. 2); these three sources together with income transfers determine household income (no. 3). Households in turn face a set of prices that determines what level of consumption can be supported with the given level of income (no. 4). Consumption is then divided between all other goods and those goods that affect household or individual food security (no. 5) including food consumption or acquisition at the household level, and health care and health environment at individual level. These directly or indirectly affect individual food intake and illness, which depend on care behaviours and the public health environment. These in turn dictate food utilization or nutritional status (no. 6). Household food acquisition, food intake, and food utilization represent food security and nutrition outcomes commonly used for measurement of household food security.

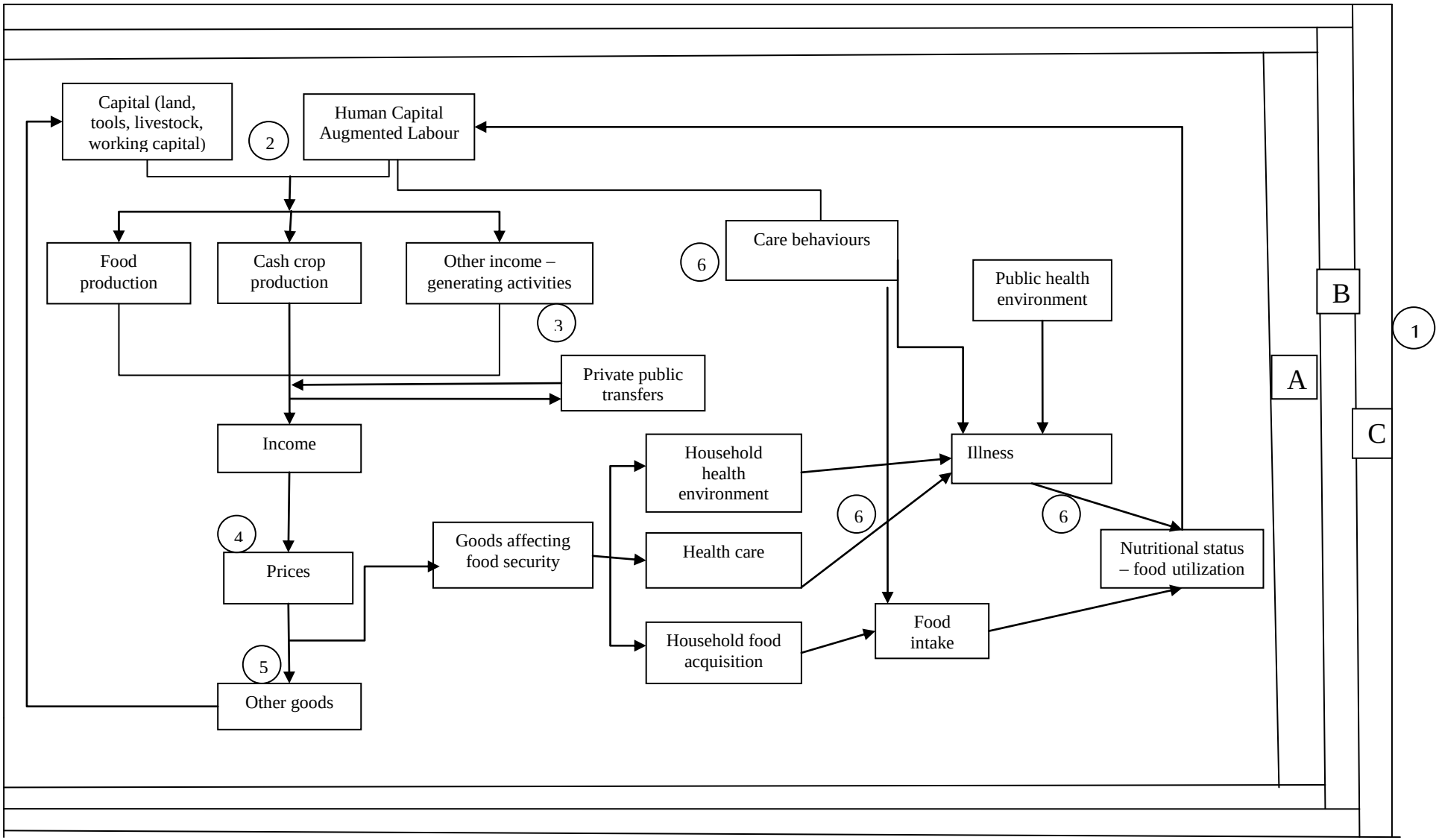


Figure 6.1 The determinants of household food security ***Source***: Adopted from Hoddinot, (1999).

Organic agriculture is believed to have the potential to tackle food insecurity by simultaneously addressing many different causes of the insecurity through improving productivity (yield), increase crop diversity, building up natural resources, strengthening social capital and human capacity (Bakewell-Stone *et al*., 2007; UNEP-UNCTAD, 2008; Parrot and Mardsen, 2002; Pretty *et al*., 2003). Boon and Semakula (2010) through Ugandan experience argues that, greening agriculture, especially through organic agriculture is among the most feasible sustainable ways to address food insecurity in Africa. Elsewhere organic farming has been linked to improvement of food security in a number of studies. A recent study by Panneerselvam *et al*. (2011b) reported organic farming improved incomes and thus reduced household food insecurity in India, while Mpeleka, (2007) reported a potential positive contribution of organic farming to household food security. A study by IFAD (2006) suggested that organic agriculture improves local food security by producing diverse products at a low input cost compared to conventional farming. According to a study by UNEP-UNCTAD, (2008) that involved 15 case studies across Africa, organic farming was found to have improved incomes and food security and was thus recommended amongst other solutions, to tackle poverty and food insecurity in Africa.

Tanzania is among the few countries in Africa with large numbers of farmers involved in certified organic agriculture with over 100,000 certified farmers in 2006 (Helga and Yussefi, 2006) and many more involved in non-certified organic farming. Other countries include Uganda with the largest number of certified organic farmers in the world, with over 200,000 and Ethiopia with over 150,000 (Helga and Yussefi, 2006). Tanzania also ranks fourth in Africa in terms of organic agricultural land area with 62,180 hectares, after Uganda, Tunisia and Ethiopia (Bouganimbeck 2009). Despite the growing numbers of certified and uncertified organic farmers in Tanzania, food insecurity has remained a common phenomenon over recent years (USAID, 2009; Nazir *et al.,* 2010). The pathways under which organic agriculture influences food security are not well understood (Bakewell-Stone *et al*., 2007) and organic agriculture in SSA is reportedly under-researched and thus knowledge on its technical details is often scarce (Kilcher, 2007; Boon, *et al.,* 2010). The study on the impact of organic farming on households' food security in Tanzania could therefore

provide valuable information on the purported prospects of the farming system in food security improvement.

In the existing literature, the link between organic farming and food security is such that, in the long run, organic farming is believed to lead not only to yield increments but also yield security (e.g. Johannsen *et al*., 2005; UNEP-UNCTAD, 2008) due to better quality soils resulting from good soil management practices. The yield increase and security is thus assumed to reflect food availability which serves as a proxy for household physical access to food. Furthermore, the cost savings from purchasing expensive synthetic inputs is thought to improve household's financial access to food (Panneerselvam *et al*., 2011b) as it enables them to buy foods that they either don't produce on their farms or produce too little to meet their consumption needs. Above that, if a farmer produces surplus organic produce, they can sell it at a better price (organic price premiums) thereby improving the economic/financial access to food for that particular farmer or household.

Previous studies on the impact of organic farming on food security in developing countries have used varying methodologies to link organic farming and food security. A study by Panneerselvam *et al*. (2011a) noted that, food insecurity is not caused entirely by the lack of adequate food production but also by the inability of the poor to buy food. They concluded that large scale conversion to organic agriculture helps reduce debts and improve the purchasing power of the farmers without impairing overall food supply and therefore leads to improvement in overall food security. Another study by Panneerselvam *et al*. (2011b) compared farm production, crop yield, input cost, and income in organic and conventional farming systems in three states of India in an attempt to assess their food security. Their results suggested that organic farming has the potential to improve smallholder farmers' food security by reducing their indebtedness due to lower production costs without affecting total farm production and farm income. Both studies used indirect measures of food security like cost savings or income generated and diversity of crops produced through organic farming, no direct measures of the food security were made. Cost saving or increased income may be good indicators of food security but the allocation of that income in a household does not necessarily mean food purchases gets the first priority. In other words, a household may have increased their

income from the crop under organic farming but yet remains in the same level of food insecurity depending on how they choose to allocate this income between competing household needs. In this respect, more direct measurements of food security status are important to ascertain the impact of organic farming on food security.

In a study by UNEP-UNCTAD (2008) involving approximately 15 case studies from East Africa involving organic or near organic initiatives, participants in organic projects were asked to report on their changes in productivity (yield), market infrastructure, social, human and physical capital. In all these cases, no complete farm survey data were reported and no direct measurements of household food security were made. The improvement in food security in this study was thus assumed to come about as a result of improvement in the aforementioned elements which were then linked to potential poverty reduction and subsequently improvement in food security.

Improvement of household food security accrued from cost savings from purchasing expensive off-farm inputs is material only when farmers were initially using these off-farm inputs (before conversion to organic farming) in reasonable amounts in their crop production. This is not the case for many African smallholder farmers where, for example, fertilizer use has been reported to be as low as 12.3 kg/hectare against 106.6 kg/hectare for South Asia and 89.5 kg/hectare for Latin America (World Bank, 2006). More importantly, organic farmers most likely do not have enough organic inputs from within their farms, the situation that forces them to buy organic fertilizers. Due to the novelty of organic farming technology in SSA, organic seeds, fertilizers and pesticides are reportedly more expensive that synthetic inorganic substitutes (Boon and Semakula, 2010) implying organic farmers buying their inputs incur more cost than conventional ones. Likewise, selling of the surplus organic crop to obtain premium prices is only realised when farmers have access to export markets in developed countries where consumers pay premium prices for organic produce (chapter. 5). When organic farmers sell their produce locally, especially in developing countries, they do not receive premium prices (chapter. 5) and sometimes they fetch even lower prices than conventional produce (Boon and Semakula, 2010; Mbote, 2009; Mhana, 2010). Among the challenges facing organic agriculture in

SSA according to a study by Boon and Semakula (2010) was limited domestic markets such that, in Uganda "surplus organic crops sold did not fetch higher incomes than conventionally grown crops and in some cases even less, yet per unit production costs (i.e. time and energy) of organically grown crops were relatively higher than those of conventionally grown ones". Such findings and realities underscore the importance of more studies on organic farming under different settings, market arrangements and localities to establish its purported contribution to food security and improved incomes.

African smallholder farmers are thought to have an added advantage in adopting organic farming because their traditional agriculture are near organic in the sense that they use little or no off farm inputs (World Bank, 2006; Johannsen *et al*., 2005; Bolwig *et al*., 2009) and more importantly they are believed to posses surplus labour (UNEP-UNCTAD, 2008; 2010). What is normally left out is the fact that, the pool of labour available in a particular household is not unlimited. If much of this needed labour is invested in the particular crop under organic farming, the same amount of labour has to be withdrawn from production of other crops or other household activities. The implication of this is that, any benefits obtained as a result of the increased production or income from the organic crop will first have to cover for the foregone benefits from alternative crops or household activities where the labour is withdrawn before they can contribute to food security or poverty alleviation in the household. It is important to note that, the majority of the smallholder farmers apply organic farming to particular crop/s out of their total crop portfolio and some studies have reported that the increase in income from the crop under organic regime does not necessarily reflect on the total household income (Bolwig *et al*., 2009). Furthermore, according to USDA (2000), traditional income and poverty measures do not provide clear information about food security, even though food insecurity and hunger stem from constrained financial resources. Against this background, this study aimed to evaluate if organic farming improved food security for smallholder farming households in domestic and export sectors by measuring their household food security status instead of performance of a particular organic crop or income proxy.

The study was guided by the following research questions:-

- Is there a significant difference in household food security between organic and conventional farming households?
- Does organic farming significantly improve household food security among organic farming households relative to their conventional counterparts?
- Does the package of organic farming (e.g. with contract farming or not, exporting schemes or selling domestically) significantly affect these differences in household food security?

6.2 Methods

6.2.1 Sampling and Data collection methods

6.2.1.1 Study sites

The study population was smallholder fruit/vegetable farmers in Tanzania. Pineapple production in Tanzania is done mainly by smallholders and it is among the few crops where organic farming has been relatively more adopted by farmers. The crop can be cultivated in most regions of Tanzania (Nyange et al., 1994) offering wide geographical distribution, a range of infrastructural, market access, and social setting differences that enable generalization of the study findings across the country. There are also reasonable numbers of smallholder conventional pineapple farmers alongside organic farmers for comparative purposes of this study. Three study sites were selected where organic and conventional pineapple farmers co-existed alongside each other. These were Bagamoyo in coastal region (eastern Tanzania), Njombe in the Iringa region (central-southern Tanzania) and Karagwe in the Kagera region (northern Tanzania). A detailed description of the sites' locations, weather and economic activities are presented in the general methodology chapter – Chapter three.

6.2.1.2 Choice of data collection method and development of questionnaire

Food security studies commonly use outcome indicators to measure the individual or household food security; these include individual food intake, household calorific acquisition, dietary diversity and indices of household coping strategies (Hoddinoh, 1999). Maxwell and Frankberger, (1992) noted that, the choice of indicators for use in monitoring household food security depend on the specific purpose of the study,

however the common criteria include resource availability, relevance, accuracy and timeliness. In this study, the indices of household coping strategies were used to measure the household food security. The method has been suggested as a good rapid measure of household food security as it is cost effective, saves time and convenient for both researcher and participants in the study (Hoddinoh, 1999; Maxwell *et al.,* 1999; Maxwell *et al.,* 2003). According to Maxwell *et al*. (1999), compared to the more traditional food security indicators like consumption, poverty and nutritional benchmarks; coping strategy indicators perform best at ruling out cases i.e. minimizing the risk of classifying a food insecure household as food secure. The coping strategies method has therefore been suggested as both alternative and complementary measure of food security (Maxwell *et al.,* 1999).

The coping strategies indicator is location specific because the means for coping with food shortages vary from place to place depending on available alternatives and local culture (Hoddinoh, 1999). Through key informant interviews in the selected study sites, a number of coping strategies that have been previously applied in similar studies in the region were assessed and improved upon where necessary to suite the local circumstances. Information was sought on the type of coping strategies normally used during food shortages; the implication of each strategy related to the severity of the food insecurity, what foods were most frequently consumed during hardship and what the normal eating routine was when the household had sufficient food. The information was incorporated in the food security section of the questionnaire and different responses to the coping strategies were assigned counts as follows, 'Never' = 0, 'Rarely' = 1, 'From time to time' (2-3 times) = 2 and 'Often' (≥ 4 times) = 3 (Table 6.1).

Weights were assigned to different coping strategies depending up on the degree of food insecurity severity they indicated. According to focus group discussions and key informant interviews in the study areas, consuming less preferred foods was a common coping strategy and meant the food insecurity was not that severe and thus assigned a weight of one. Reducing own quantity of food consumption and reducing the quantity served to children (rationing) were the second commonly used coping strategies and indicated a progressively more severe insecurity and hence was assigned the weight of two. The person responsible for meal preparation in these

areas were reported not to normally ration the men's share of food unless the situation was critical, as men were considered bread winners and thus needed more energy for physical work (Key informant interviews). Reducing the quantity of food served to men was therefore an indication of more severe food insecurity and hence was assigned the weight of three. The whole household skipping a meal or meals and skipping meals the whole day were progressively more severe actions and consequently were assigned weights of four and five respectively (Table 6.1). The overall score for the household Coping Strategy Index (CSI) was calculated as the total (count × weight) from each coping strategy. The CSI indicates the level of the household food insecurity i.e. the higher the score the more food insecure was the household.

Table 6.1 The counts and weights for scoring the Coping Strategy Index (CSI)

Coping strategy	**Count**	**Weight**
Consuming less preferred foods	0 – Never 1 – Rarely 2 – From time to time 3 – Often	1
Reducing own consumption of food	0 – Never 1 – Rarely 2 – From time to time 3 – Often	2
Reducing the quantity of food served to children	0 – Never 1 – Rarely 2 – From time to time 3 – Often	2
Reducing the quantity of food served to men	0 – Never 1 – Rarely 2 – From time to time 3 – Often	3
Skipping meals in a day	0 – Never 1 – Rarely 2 – From time to time 3 – Often	4
Skipping meals for the whole day	0 – Never 1 – Rarely 2 – From time to time 3 – Often	5

6.2.1.3 Sampling

Farmers in the three study sites were first stratified into organic and conventional groups, and then lists of organic and conventional farmers were obtained from organic schemes/farmer associations and village/ward leaders respectively. Representative samples were randomly drawn from each strata with replacements made for the farmers who were not available for interviews or refused to participate. A total of 488 pineapple farmers (123, 242 and 123 from Njombe, Karagwe and Bagamoyo sites respectively) comprising roughly half organic and half conventional from each site were selected and interviewed.

6.2.1.4 Data collection and analysis

A structured questionnaire was pretested to smallholder organic and conventional farming households in Morogoro, 19 organic and 19 conventional. The person responsible for preparation of households meals (in most cases the mother) was interviewed. The questionnaires were then administered by the researcher and assistants to the person responsible for household's meals preparation in the study areas. In case they were unavailable after two attempts, replacement households were selected to reach the target number for that particular location. Interviews with division health officers (bwana afya), village leaders, key informant group discussions and researcher observation were used to collect qualitative information to supplement the questionnaire interviews. The questionnaires were then coded, entered into statistical software and analyzed using Excel and SPSS 14 packages. To investigate the differences, means for the CSI scores were compared between sectors and farming systems.

6.3 Results

6.3.1 Demographic profiles

Organic and conventional farmers in the three sites showed some differences in a number of demographic characteristics (Table 3.1 – in chapter three). The partly exporting organic farmers in Njombe were similar with conventional farmers in primary occupation, age of household head, household workforce size and total household revenues. Organic farmers however owned more land, operated larger pineapple farms, household heads were more educated; they produced more

pineapples and earned higher net pineapple and total crop revenues. In Karagwe, exporting organic farmers did not differ from conventional farmers in their primary occupation, head of household's level of education, total land owned, households' total workforce size and experience (proxied by the age of the head of household). Organic farmers however operated larger pineapple farms, produced more pineapple units, and earned higher net pineapple, total crop and total household revenues. In Bagamoyo area on the other hand, while the two groups of farmers were similar in most demographic characteristics, conventional farmers operated larger pineapple plots, produced more pineapple units and earned more net pineapple, total crop and total household revenues than the domestic selling organic farmers.

Figure 6. 2 Typical organic farming household in Madeke village, Njombe. Tanzania.

6.3.2 Household food security

The Coping Strategy Index (CSI) score captured the frequency of use of the coping strategies, meaning the household that used more coping strategies and the heavily weighted ones (indicating more severe food insecurity) scored higher. The

households with zero score meant they did not use any of the coping strategies during the time studied and thus were considered food secure. In all the surveyed households, only 8.7% were food secure (reported not using any of the coping strategies); the remaining 91.3% had used one or more of the coping strategies at varying levels indicating short-term or even long-term food insecurity problems (Table 6.2). Abour 10.3% of organic farming households and 6.7% of conventional farming households did not use any of the copping strategies. In specific study areas, 13.3% of all farmers in Bagamoyo used none of the coping strategies i.e. were food secure; the distribution was the same for conventional farmers and domestic selling organic farmers reporting 13.3% each.

Table 6.2 Coping strategy index score among organic and conventional farming households

Area	Grouping	N. food secure households	% food secure households	N. food insecure households	% food insecure households
Njombe	All	10	8.1	113	91.9
	Organic	6	8.3	66	91.7
	Conventional	4	7.8	47	92.2
Karagwe	All	16	6.6	226	93.4
	Organic	13	10.0	117	90.0
	Conventional	3	2.7	109	97.3
Bagamoyo	All	16	13.3	104	86.7
	Organic	8	13.3	104	86.7
	Conventional	8	13.3	52	86.7
All	All	42	8.7	443	91.3
	Organic	27	10.3	235	89.7
	Conventional	15	6.7	208	93.3

In Njombe area, 8.1% of all the surveyed households reported to be food secure with 8.3% and 7.8% of partly exporting organic farming and conventional farming households respectively reporting no use of any of the coping strategies. Karagwe area showed higher levels of food insecurity overall with only 6.6% of the surveyed households reporting to be food secure, the remaining 93.4% households had used at least one of the copping strategies. Exporting organic farmers in Karagwe were however more food secure as 10% reported no use of the copping strategies while only 2.7% of conventional farming households reported no use of such strategies (Table 6.2).

The CSI mean scores for exporting organic farming households were significantly smaller than conventional farming households in Karagwe area, ($t = 3.266$, $p \leq 0.01$, $df = 220$; Fig. 6.3 and Table 6.3 and 6.4) indicating organic farming households were, on average, more food secure than conventional farming households. The partly exporting organic farmers in Njombe area also scored lower than conventional farmers indicating they were more food secure although the difference was not statistically significant. The story was different in Bagamoyo site where conventional farming households were more food secure than the domestic selling organic farming households. The difference was however not significant. Overall i.e. combining the three areas, there was no significant difference in food security status between organic and conventional farming households as indicated by their CSI scores ($t = -1.840$, $p \leq 0.066$, $df = 479$) although the p-value is quite small.

Table 6.3 Group statistics for Coping Strategy Index (CSI) in the three sites and overall

Farming practise	Area	N	Mean CSI	Std. Dev.	S. Error Mean
Conventional	Njombe	51	5.57	3.45	0.48
Organic		72	5.44	3.92	0.46
Conventional	Karagwe	112	5.21	3.82	0.36
Organic		130	3.71	3.28	0.29
Conventional	Bagamoyo	57	4.28	3.66	0.49
Organic		59	4.83	3.54	0.46
Conventional	All	220	5.05	3.71	0.25
Organic		261	4.44	3.59	0.22

Table 6.4 Coping strategy Index (CSI) mean score comparisons between organic and conventional farmers within sites and overall

		Levene's test for eq. of var.		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tl)	M - Diff.	SE Diff.	95% CI of the Difference	
									Lower	Upper
CSI **NJ.**	Eq.var. assumed	2.54	0.113	0.18	121	0.856	0.12	0.68	-1.23	1.48
	Eq.var. not assu.			0.19	115.3	0.853	0.12	0.67	-1.20	1.45
CSI **KR.**	Eq.var. assumed	7.24	0.008	3.30	240	0.001	1.51	0.46	0.61	2.41
	Eq.var. not assu.			3.27	220.4	0.001	1.51	0.46	0.60	2.42
CSI **BG.**	Eq. var. assumed	0.352	0.554	0.82	114	0.413	0.55	0.67	-0.76	1.88
	Eq. var. not assu.			0.82	113.5	0.413	0.55	0.67	-0.78	1.88
CSI **All**	Eq.var. assumed	0.127	0.722	-1.84	479	0.066	-0.61	0.33	-1.27	0.04
	Eq.var. not assu.			-1.84	459	0.067	-0.61	0.34	-1.27	0.04

Notes: **NJ**. = Njombe, **KR.**= Karagwe, **BG.**= Bagamoyo, **All** = the three sites combined.

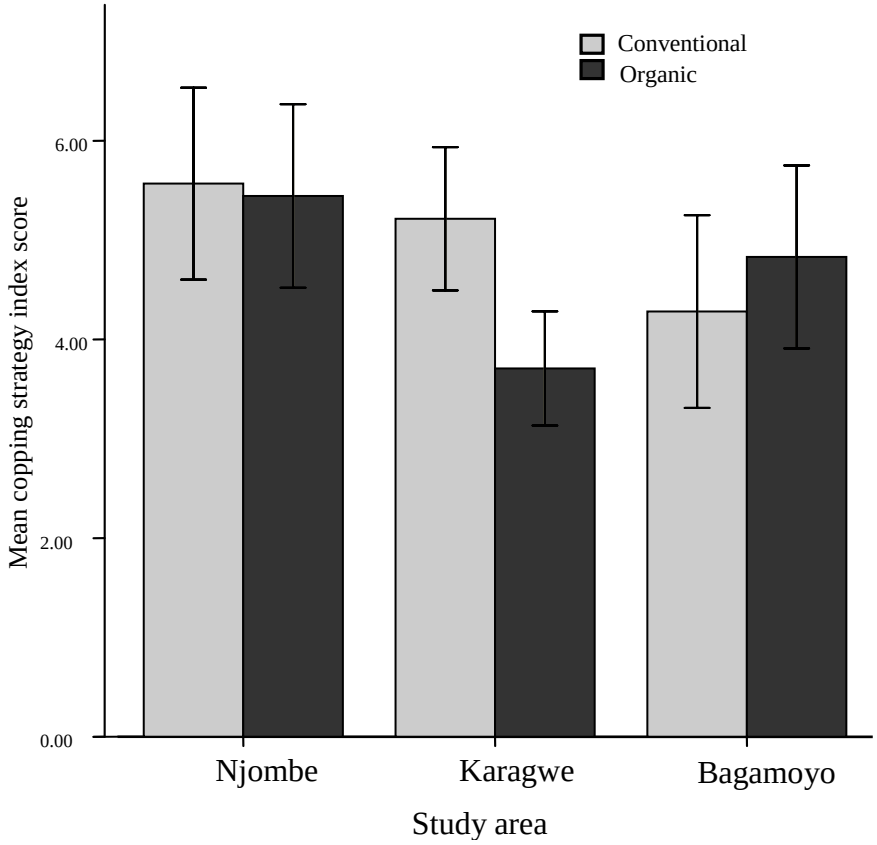


Figure 6.3 Copping strategy index score between organic and conventional farming households (Error bars –SD)

In the respective study areas, organic farming was significant and negatively correlated to CSI score only in Karagwe area where organic farmers were exporting their produce. This meant organic farming households were more likely to be food secure that conventional farming households (Table 6.5). Organic farming also explained 20% of the variation in household food security in this area. However, in the remaining two study areas and overall, organic farming was not significantly correlated to household food security (CSI scores) and was even inversely related to household food security in Bagamoyo area (where organic farmers were selling domestically) meaning being organic increased the likelihood of a household being food insecure. Age of the household head did not seem to influence the household food security in respective areas or overall. Level of education on the other hand was negatively correlated to CSI score indicating as the households headed with more educated farmers were more likely to be food secure though this relationship was only significant overall and not in respective areas (Table 6.5).

Table 6. 5 Pair-wise correlations of selected household economic and socio-demographics with the coping strategy index (CSI)

	CSI score			
	Njombe	**Karagwe**	**Bagamoyo**	**All**
Organic farming	-0.017	-0.209**	0.077	-0.084
Age of the household head	0.000	-0.079	0.083	-0.040
Education in yrs	-0.153	-0.005	-0.095	-0.104*
Household size	0.291**	0.121	0.167	0.141**
Type of housing	-0.022	0.029	-0.034	0.056
Iron roof	0.022	-0.029	0.034	-0.056
Pineapple revenue	-0.017	-0.148*	-0.130	-0.096*
Total crop income	-0.040	-0.166**	-0.140	-0.110*
Total non-crop income	-0.207*	-0.141*	-0.143	-0.129**
Total household income	-0.127	-0.200**	-0.158	-0.127**
Duration in OF (yrs)	0.016	-0.220**	0.110	-0.004
No. of OP used	-0.027	-0.049	0.006	-0.065

Note: Pearson correlation displayed. * Correlation is significant at the 0.05 level 2-tailed. ** Correlation is significant at the 0.01 level 2-tailed. OF=organic farming; OP=Organic practices.

Households with many members were more food insecure than small-sized households and explained at least 14.1% of the variation in the household food security (Table 6.5). The income from the organic crop, total crop and total household revenues were as expected increasing in the same direction as household food security in all areas and overall although this relationship was only significant in Karagwe area and overall. Non-crop income was also found to explain at least 12.9% of the variation in household food security and its correlation with CSI was negative and significant in Njombe, Karagwe and overall. With the exception of Karagwe area, duration in organic farming was not significantly correlated to household food security (Table 6.5).

The results also indicated that the unsold pineapple as percent of all units produced (used here as an indication of poor market access), varied between organic and conventional farmers as well as between study areas. There was no significant difference in postharvest losses between organic and conventional farmers in Bagamoyo area although conventional farmers had slightly more losses (Fig. 6.3 and Table 6.7). Exporting organic farmers had significantly lower post harvest losses compared to conventional farmers in Karagwe (mean org. =13.27, mean conv. =17.64; $t = 3.999$, $p \leq 0.01$, $df = 240$), while in Njombe the partly exporting organic farmers had significantly more postharvest losses compared to conventional farmers (mean org. = 36.195, mean conv. = 17.171; $t = -9.539$, $p \leq 0.01$, $df = 120$); (Fig. 6.4, Table 6.6 and 6.7).

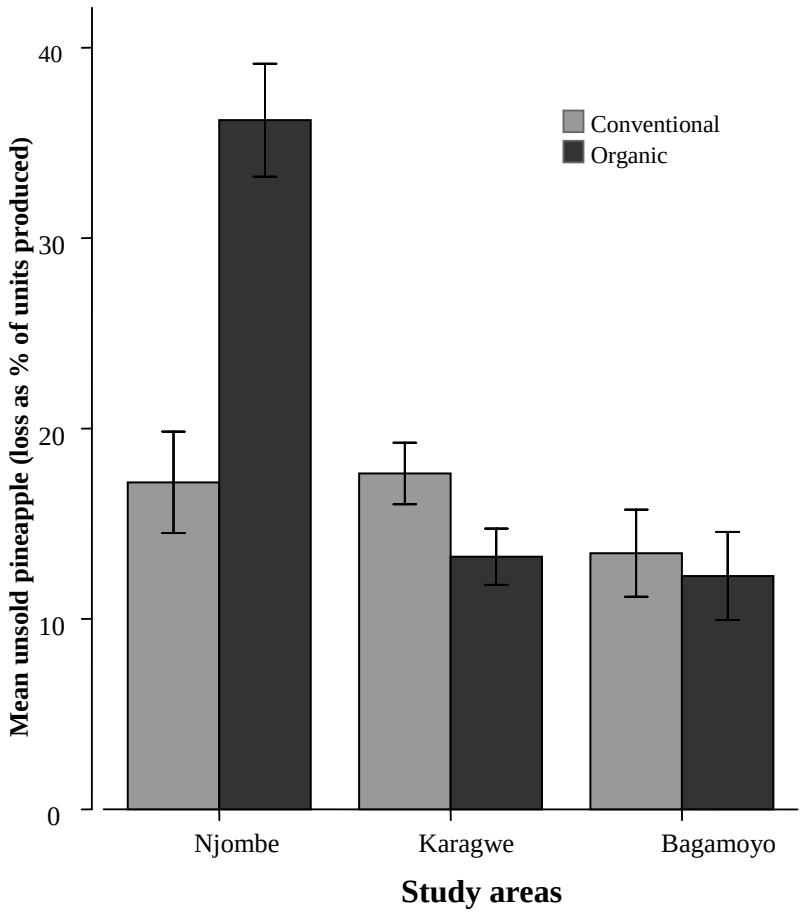


Figure 6.4 Pineapple losses between organic and conventional farmers as an indicator of market access (Error bar = SD)

Table 6.6 Pineapple post-harvest losses between organic and conventional farmers

		N	Mean % loss	Std. Deviation	Std. Error Mean
Njombe	Organic	51	36.20	9.51	1.33
	Conventional	72	17.17	12.60	1.48
Karagwe	Organic	130	13.27	8.42	0.74
	Conventional	112	17.64	8.56	0.81
Bagamoyo	Organic	59	12.25	8.89	1.16
	Conventional	57	13.45	8.63	1.14

Table 6.7 Comparison of post harvest losses between organic and conventional farmers

		Levene's test for equality of variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2tail)	Mean Diff.	SE Diff.	95% CI of the difference	
									Lower	Upper
%loss Njombe	Eq. variance assumed	6.68	0.01	-9.10	121	<0.001	-19.03	2.09	-23.16	-14.89
	Eq. variance not assumed			-9.54	120	<0.001	-19.03	1.99	-22.97	-15.08
%loss Karagwe	Eq. variance assumed	0.01	0.91	3.99	240	<0.001	4.37	1.10	2.22	6.53
	Eq. variance not assumed			3.99	233	<0.001	4.37	1.10	2.22	6.53
%loss Bagamoyo	Eq. variance assumed	0.01	0.96	0.74	114	0.463	1.19	1.63	-2.03	4.42
	Eq. variance not assumed			0.74	113	0.463	1.19	1.63	-2.03	4.42

The analysis of variance (ANOVA) between areas for differences in percentage of postharvest losses revealed significant differences, $F = 79.624$, $p \leq 0.01$, df. = 2. Njombe area had the highest postharvest losses followed by Karagwe while Bagamoyo had the least losses. Post harvest losses in Njombe were significantly higher than those in Karagwe ($p \leq 0.01$), and Bagamoyo ($p \leq 0.01$) areas, while postharvest losses between Bagamoyo and Karagwe areas were not significantly different although the p-value was very small ($p \leq 0.10$) (Table 6.8).

Table 6.8 Multiple comparisons for mean % loss difference between study areas

(I) Study area/district	Means	(J) Study area/district	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Njombe	28.31	Karagwe	13.02*	1.18	<0.001	10.25	15.78
		Bagamoyo	15.47 *	1.37	<0.001	12.24	18.69
Karagwe	15.29	Njombe	-13.02*	1.18	<0.001	-15.78	-10.25
		Bagamoyo	2.45	1.20	0.103	-0.369	5.27
Bagamoyo	12.84	Njombe	-15.47*	1.37	<0.001	-18.69	-12.24
		Karagwe	-2.45	1.20	0.103	-5.27	0.37

* The mean difference is significant at the 0.05 level.

6.4 Discussion

The results indicated that, exporting organic farming households in Karagwe were significantly more food secure than conventional farming households in the same area. The difference in household food security between the two groups could be attributed to improved incomes obtained by organic farmers as a result of improved market access through the organic export contract scheme which offered farmers assured markets (assuming the additional income was used in household food expenditure). Assured markets, apart from reducing the post-harvest losses that most farmers face due to lack of links to the markets and the nature of their produce being perishable; also motivates farmers to put more effort in to the organic crop production because of the selling assurance. In this way organic farmers with export contracts not only produce more, but also sell more, as shown by the results of this study where the proportion of crop post-harvest loss was significantly smaller for exporting organic farmers compared to conventional ones in the same area (Fig. 6.3 and Table 6.7). USDA, (2000) noted that, "*traditional income and poverty measures do not provide clear information about food security, even though food insecurity and hunger stem from constrained financial resources*". However findings from this study area concurs with the study by Peramaiyan *et al*. (2011b) on Indian smallholder organic farmers that linked improvement in incomes with improved food security.

Another reason for the better household food security observed among exporting organic farming households in Karagwe could be improved productivity in the organic crop and also other crops due to the use of good agricultural production and management methods which are part of the organic farming trainings offered to contracted farmers (e.g. Bolwig *et al.*, 2009; Kazimoto, 2009; Mbote, 2009). The current study did not however measure or monitor productivity changes on the organic crop or other crops produced by the household to enable pointing out whether any of these factors contributed to better performance of the exporting organic farming household's food security.

Presence of an opportunistic organic produce buyer/exporter in Njombe area (which increased the chances for organic farmers to sell their produce) may have caused the

slight difference in improving the incomes and consequently household food security status for organic farming households though the difference was not significant. This emphasises the fact that, without contractual links to exporting buyers, organic farming on its own does not improve farmers' incomes or their food security status relative to conventional farmers.

In Bagamoyo area, although the difference was not significant, conventional farming households were on average more food secure than their domestic selling organic farming household counterparts. In this area both organic and conventional farmers had better access to the markets compared to the other two areas due to location of Bagamoyo which is close to the city of Dar es salaam. More traders, middlemen and processing firms were sourcing pineapples form Bagamoyo area and individual farmers could even choose to sell their produce at the city markets. Their close proximity to urban markets (only 67km from Dar es salaam) was reflected in the post-harvest losses where Bagamoyo area suffered the least compared to other study areas. This meant farmers in Bagamoyo area had a higher chance of selling their produce and also access to better prices in urban markets unlike the other study areas that were more rurally located. Such finding suggest that, given better market access to both groups of farmers, the difference between organic and conventional farmers' food security and even income (see chapter 5) may be marginal or non-existent. Conventional farmers in this area used synthetic inorganic fertilizers sparingly unlike the other two study areas where inorganic fertilizers were not used at all. These made their pineapples larger in size and have shorter maturation cycle compared to organically grown pineapples (Mhana, 2010). Since both organic and conventional farmers sold at domestic urban markets (no exports), conventional farmers had an advantage as an average Tanzanian consumer (including processing firms) pay more for larger pineapples as the pineapples are sorted and priced on weight basis regardless of production method (Kishor, 2009; Kazimoto, 2009; Kariakoo and Buguruni market fruit traders, 2010).

It should be noted that, organic farmers in Bagamoyo had no contractual links to exporting schemes and were selling their produce locally to a few organic outlets in Dar es Salaam or through conventional outlets with no premium prices. It would thus be equally important to study a similar setting i.e. where all farmers have better

access to markets with organic farmers having contractual links to exporting schemes. Currently, in Tanzania, most of the organic exporting schemes operate in rural locations where smallholder farmers access to markets is mainly limited (Tancert, 2010; EPOPA, 2008) and thus they, in many cases, see organic farming as the only way out of their marketing and transport infrastructure problems.

Comparison of household food security status between organic and conventional farmers across the three study areas revealed no significant differences. This says a number of things about organic farming policy and future prospects. Firstly, organic farming on its own does not improve food security among smallholder farming households unless it is aimed at export markets accompanied by selling contracts that ensure better prices and market assurance. Secondly, where smallholder farmers had access to synthetic inorganic inputs, conventional farming households were more food secure. The unprecedented indication of this is that, organic farming only addresses the food insecurity issue if the farmers are poor and have limited access to markets and synthetic off-farm inputs. This suggests that, if domestic infrastructural, information and input access issues are properly addressed for the purposes of alleviating poverty and improve food security, there would be no point worrying about the farming system being organic or conventional. However, if the policy objective is to achieve these in a way that is less destructive to the environment, then the development of export markets for organic produce is vital.

Market access has always been a major problem for development in SSA (ODI, 1997; RIU, 2005; Temu and Temu, 2005; Lothoré and Delmas, 2009). Why then organic farming is so heavily promoted as a panacea to development in the region when a focus on market access may prove more profitable? This could be partly because organic farming is seen as a way to gain access to high value markets and premium prices (USAID, 2007, UNEP-UNCTAD, 2008; EPOPA, 2008). But as shown in this study, organic farming does not seem to improve market access for domestic selling farmers as the premium price or saving costs advantage are not available.

6.5 Conclusion

Organic farming's ability to improve food security status in Sub Saharan Africa (SSA) remains a potential that is yet to be realised by many organic smallholder farmers. Only a few lucky ones that are in organic export contract farming schemes have seen the improvements in incomes and food security. In areas where smallholder farmers have better access to markets, there seems to be little or no differences in food insecurity status between organic and conventional farming households with conventional farmers being better off. The unprecedented indication of this is that, organic farming only addresses the food insecurity for marginalized farmers with limited access to markets, inorganic fertilizers, chemicals and pesticides. If domestic infrastructural, information and input access issues are properly addressed for the purposes of alleviating poverty and improve food security, there would be no point worrying about the farming system being organic or conventional. However, if the policy objective is to achieve these in a way that is less destructive to the environment, then the development of export markets for organic produce is vital. In the view of the fact that organic farming does not improve market access for domestic selling farmers; governments, non-governmental organizations and development agents promoting organic farming may wish to focus on improvement of markets access domestically because linking all smallholder farmers to export organic markets may be an unrealistic option.

CHAPTER SEVEN: CONTRIBUTION OF ORGANIC FARMING TO SMALLHOLDER FARMERS' HEALTH IN TANZANIA

Abstract

Poor health caused by poverty is a common phenomenon for rural agricultural communities in SSA. Since relationship between income and health is such that, health improves as the income increases but after some point it does so at a diminishing marginal rate of return. Improvements in income for smallholder farmers whose earnings are very little would thus be expected to generate equivalent linear improvements in health. A survey on 488 smallholder farming households in three sites in Tanzania was conducted to assess the impact of organic farming on their health; roughly half organic and half conventional from each site. The sites represented organic farmers with active contracts, exporting their produce (Karagwe); selling locally with no contracts (Bagamoyo); and finally with an opportunistic exporter, no contracts (Njombe). The results generally indicated no significant differences between organic and conventional farmers self reported health. Exporting organic farmers however had higher health scores than conventional and were significantly better in Physical Functioning scale. Since the trend (better health scores) reported by exporting organic farmers were not observed on partly exporting organic farmers or domestic selling organic farmers, the findings seem to suggest that the export rather than organic farming is responsible for health improvements. Whilst much of the effort and promotion of organic farming in tropical Africa focuses on its ability to improve poor farmers' livelihoods, these livelihoods can potentially only be improved when organic farming is coupled with export. Currently only a very few organic farmers have access to export markets and are nonetheless constrained by the exporters limited capacity to purchase all the available produce. As a result organic farmers lose out as their surplus produce tends to go to the domestic conventional markets where they lose their premium prices whilst still incurring the costs of conforming to organic export standards. If policy makers wish to promote organic farming for poverty alleviation purposes, they need to focus on securing access to the export markets.

Key words: *Farmer health, organic farming, export horticulture, Tanzania.*

7.1 Introduction

Population health is known to be influenced by both society and environment. Social and environmental determinants of health include income, employment, access to food and social capital, and exposure to agents in air, water and soil (Marmot 2005; Lebel 2003). Agriculture which is one aspect of environment and society, presents both an opportunities and risks to health (Hawkes and Ruel, 2006). Agriculture

produces food, fibre, material for shelter, medicinal plants and it is an important source of livelihood for majority of the population in developing countries. Conversely, agriculture can produce negative health impacts through detrimental working conditions, chronic diseases and pesticide effects (Hawkes and Ruel, 2006). Agriculture therefore has bilateral linkages with health in the sense that, whilst agriculture can shape both positive and negative human health outcomes, it in turn can be shaped by farm worker health. Ill health leads to a reduction or loss of labour that in turn leads to decreased agricultural production and vice versa (van der Hoek, 2004, Cross *et al*., 2009a). The links between agriculture and health have however been reported to received less policy attention (Hounsome *et al*., 2006; Hawkes and Ruel, 2006) and both researchers and policy makers in agriculture and health are urged to work more closely to achieve common growth (Hawkes and Ruel, 2006; Lipton and de Kadt, 1988; von Braun, 1991).

The majority of the Sub-Saharan Africa (SSA) population (about 65-75%) are employed or dependent upon agriculture for their survival and livelihoods (World Bank, 2000; 2007; Sciallaba, 2007; Chen and Ravillion, 2007) most of which are smallholder farmers (Temu and Temu, 2005, Zhang *et al*., 2007). Due to the inter-linkages between agriculture, development and vulnerability in SSA, the poor performance of the agricultural sector over the years has notably threatened the survival and livelihoods of the majority of SSA inhabitants (Diao *et al*., 2006; Zhang *et al*., 2007; Ellis, 2006). On the other hand, in recent decades there has been a growing demand for tropical horticultural products in Europe and some farmers in African countries such as Kenya, the Ivory Coast and Zimbabwe have enjoyed the benefits of this growing trade (MCulloh and Ota, 2002; Minot and Ngingi, 2004). Due to this demand, export horticulture has been promoted by governments and development agencies as a means to improve the agricultural incomes for smallholder farmers in most other tropical African countries in the hope of alleviating some of their income-poverty related problems (Simmons, 2002; Bakewell-Stone, 2006; APO, 2010; Bolwig *et al,* 2009). Since income is known to have a positive influence on health particularly in developing countries (Stronks *et al*., 1997, Lynch *et al*., 2000; Ruger, 2003; Marmot, 2005; and Mackenbach *et al*., 2005), similar improvements in income for smallholder farmers in SSA would be expected to positively influence health status.

The traditional African agricultural share of export trade in cotton, sisal, coffee, cocoa etc. have declined over a number of years, due in part to increasingly stiff competition from other emerging economies from Latin America and Asia, but also due to low investment in agriculture and its supporting sectors (FAO, 2003, UNCTAD, 2004; URT, 2008a). Organic horticulture has thus been purported as an affordable option for the poor African smallholder farmers to access European markets (EPOPA, 2008; UNEP-UNCTAD, 2008). This is because smallholder farmers are thought to have a competitive edge in terms of their abundant labour sources, small farm sizes and the use of little or no chemical inputs and mechanization in production (USAID, 2007). The tropical nature of their produce also means the produce cannot be easily produced in temperate regions (Edwards-Jones *et al*., 2009). If smallholder farmers in SSA can access markets in the developed world they may, not only alleviate income poverty but also improve their food security and access to other basic needs through the earned income whilst simultaneously conserving the environment (Setboonsarng, 2006; UNEP-UNCTAD, 2008; EPOPA, 2008, Birech, 2009; UNEP-UNCTAD, 2010).

The growth of organic markets particularly air freighting organic produce to the western world has not been without criticisms (Morgan 2010). The debate on food miles, air freighted foods and local vs. imported food consumption in developed countries has unveiled some unforeseen positive as well as negative prospects of the organic market and tropical fruits and vegetables as a whole (e.g. Chang and Lusk, 2009; Sim *et al*., 2007; Gibbon and Bolwig, 2007b; Edwards-Jones *et al*., 2008; 2009; Lusk and Briggeman 2009). Sim *et al*. (2007) found transport (or distance between production and consumption) to be an important factor in determining the environmental sustainability of food supply chains though for long distance haulage, the distinction between airfreight and shipping was significant. Such findings may have considerable implications on buying decisions for environmentally concerned consumers and consequently influence the terms of trade. However, a study by Edwards-Jones *et al*. (2008) testing whether 'local food was the best' concluded that "*food miles are a poor indicator of the environmental and ethical impacts of food production and only through combining spatially explicit life cycle assessment with analysis of social issues can the benefits of local food be assessed*". Similar

conclusions have been reached by the UK's Department of Environment, Food and Rural Affairs (DEFRA) (DEFRA, 2005). In another study on efficiency of different chains supplying to the UK in terms of their carbon emission, Edwards-Jones *et al*. (2009) suggested there was no simple relationship between the characteristics of an exporting country and its vulnerability to the introduction of a carbon label. Their study suggested it was unlikely that consumer responses to carbon labels would have a major impact on the horticultural sector in the short-term. Furthermore, consumer choice is driven by a number of factors other than just the production method and environmental concerns. Consequently, the tradeoffs that consumers are willing to make between prices, substitute produce, environmental, ethical concerns and justice have remained an important area of interest for research (e.g. Novotorova and Mazzocco, 2008; Newholm and Shaw, 2007; Caruana, 2007. Auger and Devinney, 2007. Chatzidakis *et al*., 2007; Dobson, 2007; Hughner *et al*., 2007). The existing literature provides scant evidence about the extent to which people's preferences for organic food are driven by concerns for fairness and distribution of outcomes versus for instance, environmental and food safety concerns (Chang and Lusk, 2009).

Concern about air-freighted goods' contribution to carbon emissions has caused legislative and certifying bodies across Europe to review their standing on imported air-freighted produce (Soil Association, 2011; 2008; 2007; Gibbon and Bolwig, 2007b; Hayes, 2008). Using case studies from Kenya and Ghana, Gibbon and Bolwig, (2007b) suggested that the ban of air-freighted organic produce from Africa would have a significant negative impact on the livelihoods of many smallholders involved in the sector. After consultative studies in 2007, the Soil Association, the leading organic certification body in the UK provisionally consented to certify air-freighted organic produce as long as the producers met the Soil Association's own ethical standards. Two of the principles of organic agriculture that guide the policy framework are the principles of health and fairness, which stipulate that, "Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible" and "Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities*"* (IFOAM, 2010). If organic agriculture objectives are to be realised, these principles have to be fulfilled.

Meeting the environmental, ethical and fairness demands of the organic movement and export is a challenging task that may require tradeoffs between the very principles that organic farming sets itself. A study by Lusk and Briggeman (2009) found that consumers' willingness-to-pay for organic produce was positively correlated with the extent to which people believe fairness was important in purchasing food. Preferences for distribution of benefits and measured beliefs about the relative distribution of benefits accruing to producers of organic foods have also been found to be significant factors explaining consumer willingness-to-pay a premium for organic food (Chang and Lusk, 2009). This suggests that consumers accord significant value to considerations of fairness and ethics which is reflected in their purchasing decisions. Findings from a study by Cross *et al*. (2009a) suggested UK consumers' choice to buy imported tropical fruits and vegetable from Kenya and Uganda could improve poor farm workers' health and that choosing the locally produced alternatives does not necessarily have positive health impact on farm workers in the UK. Based on such findings it can be assumed that, at least in the near future organic exports from SSA can still find their way to Europe and other developed country markets though the debates on carbon emissions, ethical concerns and fairness are far from over.

There are very few domestic organic markets in most SSA countries (IFOAM, 2007; Envirocare, 2006). Consequently, if organic farmers are not linked to an exporter who can guarantee the purchase of their produce then they tend to sell their produce in domestic conventional markets (Mbote, 2009; Mhana, 2009; Boon and Semakula, 2010; Akyoo and Lazaro, 2007Akyoo and Lazaro, 2008). These markets tend to offer similar and even lower prices for the organic produce because organic fruits are smaller in size than the conventional grown fruit that use fertilizer and hence fetch lower prices as size is among the major pricing criteria (Akyoo and Lazaro, 2008; Mbote, 2009; Mhana, 2009; Boon and Semakula, 2010). Organic farmers are however still believed to be better-off due to cost savings from the purchase of expensive conventional inputs (Setboonsarng, 2006; EPOPA, 2007; UNNEP-UNCTAD, 2008; Birech, 2009). In SSA smallholder farming where the use of conventional inputs is negligible (World Bank, 2006; Groot, 2009), it is unclear if, how and to what extent organic farming helps to save costs compared to their conventional counterparts. Assuming that through organic farming costs savings can

be made, food production and availability increased, and corresponding improvements in income through the sale of the excess organic produce realized (Setboonsarng, 2006; EPOPA, 2007; UNEP-UNCTAD, 2008; Birech, 2009) then farmers' health improvements can be achieved. Organic farmers would be expected to be healthier than their conventional counterparts as they would have more and a greater variety of more nutritious food and additional income to access other needs including social and health services.

The relationship between income and health is understood to be curvilinear meaning there are diminishing marginal returns on health as the income levels increase (Mackenbach, 2005; Fritzell *et al*., 2004; Stronks *et al*., 1997). This means health status improves as the income increases but it does so at diminishing marginal rate for the higher income categories. For developing countries such as Tanzania where smallholder farmers earn very little it is reasonable to expect that improvements in income would generate equivalent linear improvements in health status. Since organic farming and export agriculture is claimed to improve smallholder farmers' incomes, it is expected that farmers' health status will demonstrate an equivalent improvement. Furthermore there are very few studies in tropical Africa exploring the relationship between income, participation in the export market and farmer health and calls have been made for further work to fully consider these relationships (Cross, 2008, Hawkes and Ruel, 2006). This study aimed to examine the impact of organic horticulture (both domestic and export orientated) on smallholder farmer's health status (as a measure of wellbeing) in Tanzania.

The study aimed to address the following questions:-

- Is there any significant difference between organic and conventional farmers health?
- Does organic farming significantly improve smallholder farmers' health?
- Are the health benefits of organic farming realized by exporting as well as domestic selling farmers?
- Is it organic farming or export farming or both that improves health?

7.2 Methods

7.2.1 Sampling and data collection methods

7.2.1.1 Study sites

The study population comprised smallholder fruit and vegetable farmers in Tanzania. Pineapple production in Tanzania is done mainly by smallholders and it is among the few crops where organic farming has relatively been more widely adopted by many farmers. The crop can be cultivated in most regions of Tanzania (Nyange *et al*., 1994) offering wide geographical distribution; a range of infrastructures; market access; and different social and cultural settings that facilitate the generalization of the study findings across the country. There are also reasonable numbers of smallholder conventional pineapple farmers working alongside organic farmers permitting direct comparison of the two production systems.

Three study sites were selected where organic and conventional pineapple farmers co-existed. These were Bagamoyo in the coastal region (eastern Tanzania), Njombe in the Iringa region (central-southern Tanzania) and Karagwe in the Kagera region (northern Tanzania). A detailed description of the sites locations, weather and economic activities is presented in the general methodology chapter – Chapter three.

In all three sites, organic farmers were organized in some form of farmer's association for ease of access to training support, market information and access. The level of institutional support for organic farming however varied among the sites. Karagwe organic farmers were linked to an active privately owned organic processing and export scheme. The firm/scheme provided training on organic practices to all pineapple farmers (organic and conventional), organic certification and monitoring, and buying pineapples from organic farms for processing and export. In Bagamoyo area, organic farmers were organized in organic farmers' association but did not have any linkage to organic exporting scheme/firm/buyer. Farmers were not certified and they received little organic agriculture training from government extension officer and in some occasions from NGO's promoting organic farming. Most of the organic farming knowledge they had was from their peers; while monitoring, motivation and control of adherence to organic practices was left to peer farmers and occasionally the NGO's. Njombe organic farmers had certified

their farms organically, received organic agricultural training from the Export Promotion of Organic Products from Africa (EPOPA) project and continued to get assistance from domestic government agricultural extension officers when the project phased out in 2007/08. Their link to the exporting firm that was created with the help from EPOPA had deteriorated as they could not secure further contracts after the project phased out, from then on the buyer only made occasional purchases of their pineapples for export.

7.2.1.2 Sampling

Farmers in the three selected sites were first stratified into organic and conventional groups, and then lists of organic and conventional farmers were obtained from organic schemes/farmer associations and village leaders respectively. Representative samples were randomly drawn from each strata with replacements made for the farmers who were not available for interviews or refused to participate. A total of 478 pineapple farmers comprising 123, 233 and 122 farmers in Njombe, Karagwe and Bagamoyo respectively were interviewed; roughly half of them were organic and half conventional from each site.

7.2.1.3 Data collection instruments

Instruments

Three standardised measures of health status were used for data collection. These were the Short Form 36 (SF-36), EuroQol 5D (EQ-5D), and EuroQol Visual Analogue Scale (EQ VAS). A description of each instrument is given below.

Short Form 36 (SF-36)

The SF-36 is a standardised health status measure which is a multi-purpose, short-form health survey that has proven useful in surveys of general and specific populations, comparing the relative burden of diseases, and in differentiating the health benefits produced by a wide range of different medical interventions. It is a generic measure, as opposed to one that targets a specific age, disease, or treatment and has been translated and tested in more than 50 countries in the world. It has also been judged as the most widely evaluated of all generic health instruments (Ware and Gandek, 1998). It consists of 36 questions divided into 8 sections measuring attributes of both physical and mental health:- these are vitality (VT), physical

functioning (PF), bodily pain (BP), general health (GH), perceptions of physical role functioning (RP) emotional role functioning (RE) social role functioning (SF), and mental health (MH). According to respondents' answers, each health attribute is allocated weighted score. Each scale (section) score is transformed into a 0 -100 scale on the assumption that each section carries equal weight. Scores of 0 and 100 indicate either complete limitation or no limitation for that particular health attribute (http://www.sf-36.org/tools/sf36.shtml, Ware *et al*., 2000; Ware *et al*., 2005).

Two scales (Physical Component Summary (PCS) and Mental Component Summary (MCS) summarise the aggregate scores of the eight scales. As a standard procedure the aggregated scores for physical and mental components are calculated based on standardised z-values for the eight scales that are then multiplied by a physical and mental factor score coefficient from 1990 and 1998 general US population. The two aggregate components are then transformed to a norm based score; the transformed PCS summarises Physical Functioning (PF), Role Physical (RP), Bodily Pain (BP) and General Health GH) whilst the transformed MCS summarizes scores for Vitality (VT), Social Functioning (SF), Role Emotional (RE) and Mental Health (MH)(Ware *et al*., 2002). Published national norms exist for comparison purposes and for this reason it's important to transform and normalize the scores (Ware and Kosinski, 2001; Ware and Gandek, 1998; Ware *et al*., 2000). US national norms were used for comparison purposes as the same is not available for Tanzania.

EuroQol 5D (EQ-5D)

The EQ-5D is a standardised health status instrument developed by the EuroQol group. The instrument has been validated and proven to be sensitive, reliable and internally consistent when used to measure population and group health (Brooks and EuroQol Group, 1996; Dorman *et al*., 1997; Hurst *et al*., 1994; Nowels *et al*., 2005; Schrag *et al*., 2000; EuroQoL Group, 2011). The EQ-5D measures five distinct aspects of an individual's health status in the dimensions of mobility, self-care, usual activities, pain/discomfort and anxiety/depression (Fig. 7.1).

Respondents' responses to each dimension comprise three possible levels indicating the individual has no problems, has some problems and has severe problems in each dimension (EuroQoL Group, 2011; www.euroqol.org). The responses are scored

such that, three levels of the severity of the problems combined with five dimensions of health status gives 243 possible unique combinations i.e. three levels of response for each of five dimensions, $3^5 = 243$. The combination 11111 for example will indicate no problem in any of the five dimensions whereas 11223 indicates no problems with mobility and self care, some problems with performing usual activities, moderate pain or discomfort and extreme anxiety or depression (EuroQoL Group, 2011).

Figure 7.1 Dimensions of EuroQol 5D

Source: EuroQoL Group, 2011

EuroQol Visual Analogue Scale (EQ VAS)

The EQ VAS records the respondent's self-rated health on a vertical, visual analogue scale (much like a thermometer) of 0-100 where the endpoints are labelled 'Worst imaginable health state' and 'Best imaginable health state'. The instrument is relatively simple and quick to use as the respondent is only asked to place a mark on the visual scale of his/her health status at the day of the interview. This information can thus be used as a quantitative measure of health outcome as judged by the individual respondents. The scale was included in the study to complement the other

measurements as it both reflects physical and mental health status of an individual at the time of interview (Hounsome *et al*., 2006).

7.2.1.4 Data collection and analysis

The SF-36 version one was used because the Kiswahili translation of it was available and already pretested in Tanzania (Wagner *et al*., 1999; Wyss *et al*., 1999). Both the EQ-5D and VAS have previously been used in Kenya in a Kiswahili version (Cross *et al*., 2009a; 2009b) and the same were used in this study. The questionnaires were administered by the researcher and assistants to the selected farmers in the study areas. Replacements were made where farmers couldn't be found after three visits in order to reach the target number of participants for each particular location. The questionnaires were then coded and analyzed using SPSS 14, Excel and STATA 10.

Whenever appropriate Mann-Whitney U test, students' t-test and analysis of variance were used to explore the differences between groups. Multivariate analysis of variance (MANOVA) was performed to investigate farming practice, age groups and sex differences in self-reported health. Since organic farmers in the three locations differed by where they sold their organic produce (domestic market, export, opportunistic export), and access to social services including health care, prevalence of diseases e.g. malaria; the comparison between organic and conventional farmers was only done within each study location. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices and multicollinearity. Extreme outliers were removed and violations noted for normality and homogeneity of variance-covariance matrices were corrected for through the use of Pillai's trace rather than Wilks' Lambda and setting a more robust alpha level for determining significance for the affected variables in the F-test (Tabachnick and Fidel, 2007).

7.3 Results

7.3.1 Demographic profiles

A total of 478 smallholder farmers were interviewed in the three study areas, of which 74% were men and 26% women, roughly half of the respondents were organic farmers (52.09%) and half were conventional (47.91%) (Table 7.1). Ages ranged

from 17 to 77 years with the mean value around 40 years (SD 12.68). Approximately 32% of the respondents in Njombe had no formal education, only 6% and 18% of the interviewed farmers in Karagwe and Bagamoyo respectively reported having no formal education. Overall, approximately 16% of respondents had no formal education which is slightly lower than UNICEF's estimate of adult literacy rate for Tanzania over 2005-2008 period[7]. Only 12% of the farmers smoked or had smoked in the past across the three areas. More than 98% of the farmers reported being in farming for more than a year; and 81% of all the respondents had no other job than farming whereas around 19% reported having another part-time employment ranging from petty-trading and small businesses to professional work like building, carpentry, teaching, sewing, etc. Around 93% of the respondents reported having children, only 6.5% had no children. None of the respondents were registered with a doctor. Only 18.8% of the respondents reported visiting a doctor in the past three months of which 7.5% gave malaria illness as the reason for the visit and the remaining 11.5% had other reasons including backache and headaches, accidents and kids' clinic visits (Table 7.1).

7.3.2 Correlations between the health measurement scales.

All scales of SF-36 and the component summaries were significantly and positively correlated with each other. The scales were also significantly and positively correlated to the VAS (Table 7.2). Significant negative correlations were found between SF-36 scales and the five scales of the EuroQol. This is to be expected because of the way the scales are scored i.e. high scores in the EuroQol indicate poor health in a particular scale whereas the opposite is the case for SF-36 scales and the VAS.

[7] According to UNICEF data, 2011 – adult literacy rate in Tanzania in the period 2005-2008 was 73%, these farmers had 84% literacy rate in 2009 meaning they were slightly above average.

Table 7.1 Summary of demographic and other health related variables

Location		**Njombe**		**Karagwe**		**Bagamoyo**		**All**	
Variable	**Categories**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Farming practice	Organic	72	41.5	117	50.2	60	49.2	249	52.1
	Conventional	51	58.5	116	49.8	62	50.8	229	47.9
Sex	Male	80	65.0	164	70.4	108	88.5	352	73.6
	Female	43	35.0	69	29.6	14	11.5	126	26.4
Level of	No education	39	31.7	14	6.0	22	18.0	75	15.7
educ.	Primary education	82	66.7	203	87.1	96	78.7	381	79.7
	Secondary education	2	1.6	16	6.8	4	3.3	22	4.6
Smoking	Smoke now	3	2.4	20	8.6	25	20.5	48	10.0
	Smoked in the past	0	0.0	4	1.7	7	5.7	11	2.3
	Never smoked	120	97.6	209	89.7	90	73.8	419	87.7
Duration in farmi.	Six months-one year	3	2.4	3	1.3	0	0.0	6	1.3
	Over one year	120	97.6	230	98.7	122	100.0	472	98.7
Other job	Yes	24	19.5	20	8.6	45	36.9	89	18.6
	No	99	80.5	213	91.4	77	63.1	389	81.4
Have kids	Yes	123	100.0	211	90.5	112	91.8	446	93.3
	No	0	0.0	21	9.5	10	8.2	31	6.5
Reg. with a doctor	Yes	0	0.0	0	0	0	0.0	0	0.0
	No	123	100.0	233	100.0	122	100.0	478	100.0
Doctor visit	Yes	35	28.5	31	13.3	24	19.7	90	18.8
	No	88	71.5	202	86.7	98	80.3	388	81.2
Doc. vst. Reason	Malaria	13	38.2	15	45.5	8	33.3	36	7.5
	Other reasons	21	61.8	18	54.5	16	66.7	55	11.5
Total		123	100.0	233	100.0	122	100.0	478	100.0

Table 7.2 Correlations between SF-36 and EuroQol health measurement scales

	Mobility	**Self -Care**	**Usual activities**	**Pain / Discomfort**	**Anxiety/ Depression**	**(VAS) Visual analogy scale**	**(PF) Physical Functioning**	**(RP) Role physical**	**(RE) Role Emotional**	**(BP) Bodily Pain**	**(MH) Mental Health**	**(VT) Vitality**	**(SF) Social Functioning**	**(GH)General Health**	**(PCS)Physical Compo. Summary**
Mobility	1.000														
Self care	0.680*	1.000													
Usu. activt.	0.605*	0.780*	1.000												
Pain/Disco.	0.172*	0.176*	0.226*	1.000											
Anxi./Dep.	0.192*	0.271*	0.275*	0.254*	1.000										
VAS	-0.245*	-0.206*	-0.263*	-0.644*	-0.218*	1.000									
PF	-0.238*	-0.202*	-0.266*	-0.652*	-0.242*	0.735*	1.000								
RP	-0.229*	-0.191*	-0.245*	-0.523*	-0.186*	0.597*	0.693*	1.000							
RE	-0.276*	-0.224*	-0.298*	-0.419*	-0.201*	0.499*	0.550*	0.671*	1.000						
BP	-0.209*	-0.183*	-0.235*	-0.599*	-0.216*	0.642*	0.750*	0.604*	0.490*	1.000					
MH	-0.179*	-0.184*	-0.169*	-0.385*	-0.369*	0.492*	0.408*	0.362*	0.450*	0.414*	1.000				
VT	-0.209*	-0.182*	-0.172*	-0.485*	-0.347*	0.587*	0.589*	0.527*	0.499*	0.606*	0.599*	1.000			
SF	-0.216*	-0.186*	-0.248*	-0.598*	-0.272*	0.690*	0.750*	0.576*	0.546*	0.764*	0.541*	0.642*	1.000		
GH	-0.221*	-0.191*	-0.172*	-0.532*	-0.362*	0.671*	0.603*	0.494*	0.449*	0.596*	0.577*	0.670*	0.650*	1.000	
PCS	-0.223*	-0.190*	-0.243*	-0.626*	-0.212*	0.697*	0.868*	0.760*	0.464*	0.865*	0.279*	0.595*	0.725*	0.664*	1.000
MCS	-0.195*	-0.177*	-0.192*	-0.371*	-0.341*	0.499*	0.397*	0.368*	0.664*	0.385*	0.868*	0.660*	0.645*	0.573*	0.252*

Spearman rank correlations displayed

* Correlation is significant at 0.05 level (2-tailed).

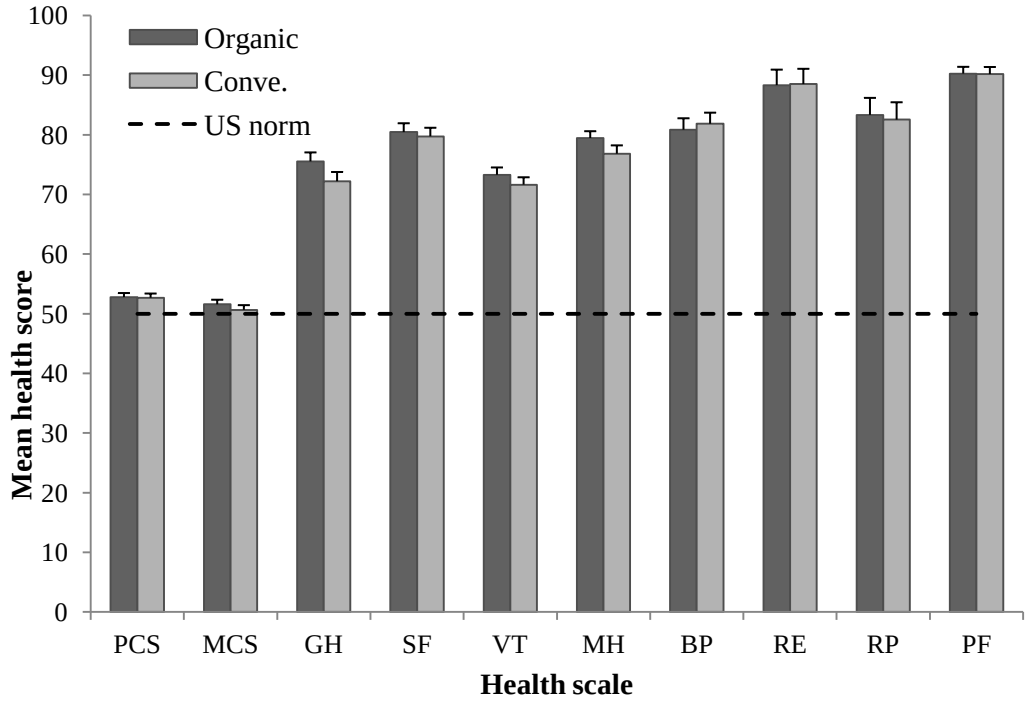
7.3.3 Farming practice and perceived health

Karagwe

In Karagwe, organic farmers exported most of their produce. The MANOVA results indicated no statistically significant difference in self-reported health between organic and conventional farmers across all the SF-36 scales including the two summary scales. However, when the dependent variables were considered separately, there was a statistically significant difference between organic and conventional farmers' self reported health for Physical Functioning (PF), $F(1, 232) = 7.629$; $p \leq 0.01$. Organic farmers reported slightly higher health status (Mean = 90.26, SD = 12.22) compared to conventional farmers (Mean 90.17, SD = 12.78).

Considering the general results without segregation into age groups or gender (Fig. 7.2), the export organic farmers scored higher than conventional farmers in PCS, MCS, GH, SF, VT, MH, RP and PF. Conventional farmers only scored higher in BP and RE. The differences were however not statistically significant in any of the SF-36 health scales (Table 7.3). All the reported mean scores for both organic and conventional farmers across the SF-36 scales were significantly higher than the US norms ($p \leq 0.001$) except for MCS where the difference was not significant for conventional farmers but significant at 5% for organic farmers.

Although there were no significant differences between the two farming systems in most scales, when age groups were considered, exporting organic farmers reported higher scores for the PCS across the age groups except for the 25-34 group (Fig. 7.3). Similarly, exporting organic farmers MCS scores (Fig. 7.3b) were higher in all but one age group, 18-24. In both mental and physical component summaries, comparison with US norms indicated that, regardless of farming practice, farmers in Karagwe scored higher than the US norm only up to their mid 50's, afterwards US norms were higher than each groups' scores in the two component summaries (Fig. 7.3 and 7.4).



Key: PCS = Physical Component Summary; PF = Physical Functioning; RP = Role Physical; BP = Bodily Pain; GH = General Health; MCS = Mental Component Summary; VT = Vitality; SF = Social Functioning; RE = Role Emotional; and MH = Mental Health

Figure 7.2 SF-36 Health scales disaggregated by farming method for the general sample in Karagwe location - conventional vs. exporting organic farmers. US norm - means for general population are plotted on the dotted line.

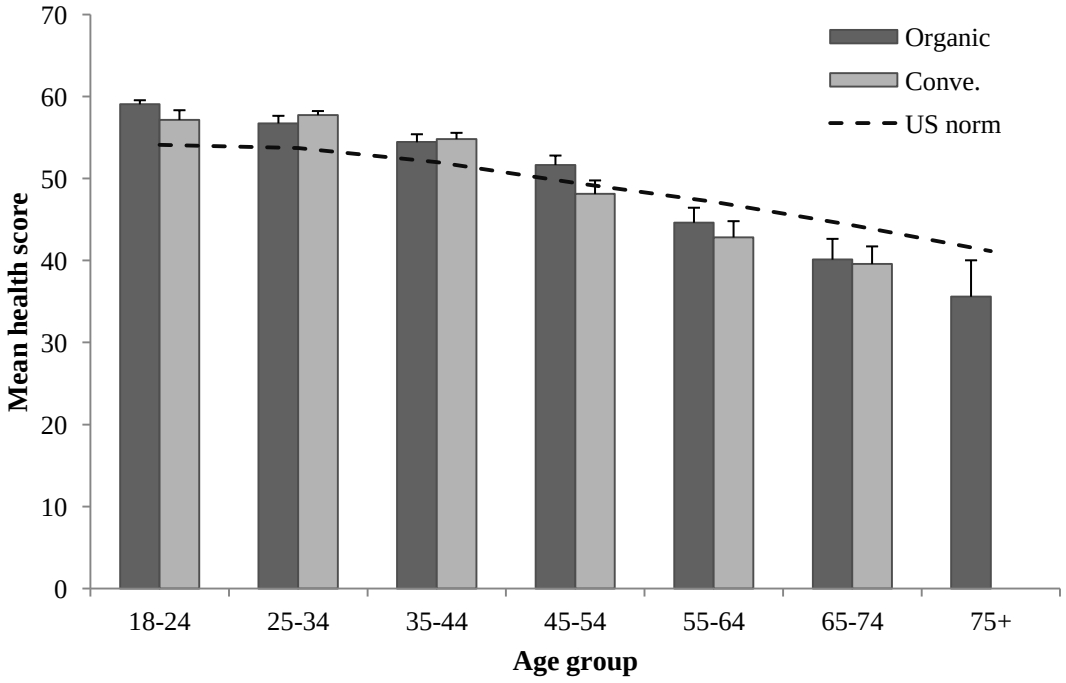


Figure 7.3 Physical Component Summary (PCS) disaggregated by age groups for conventional and exporting organic farmers (Karagwe location). US norm (means for each age group) are plotted on the dotted line.

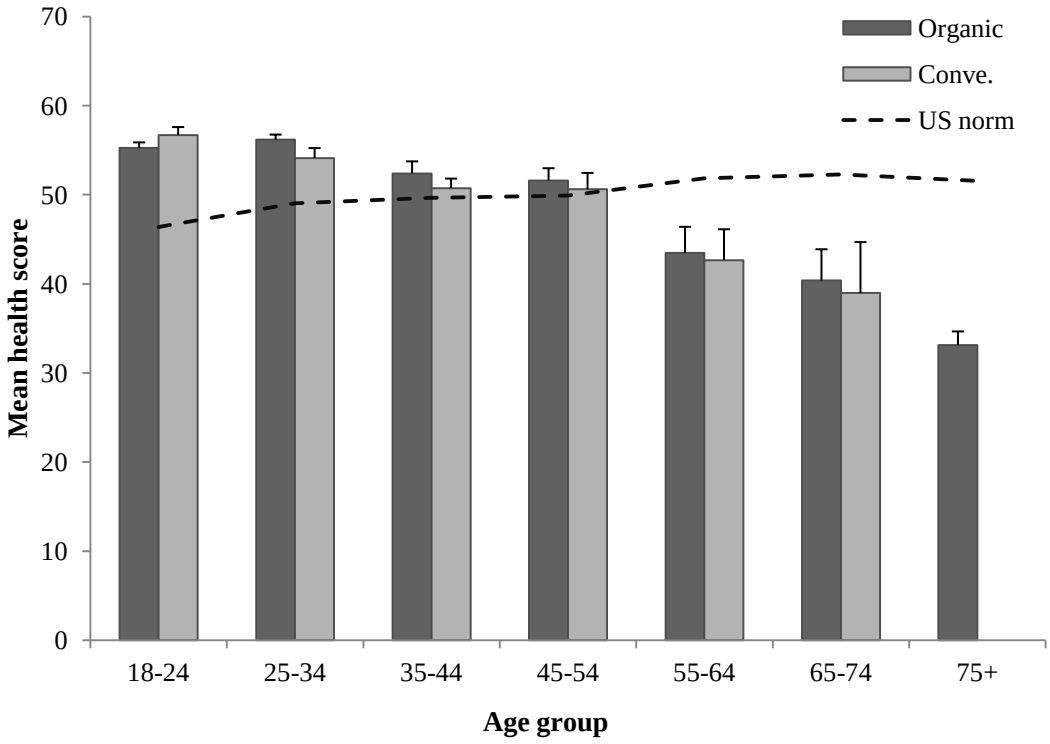
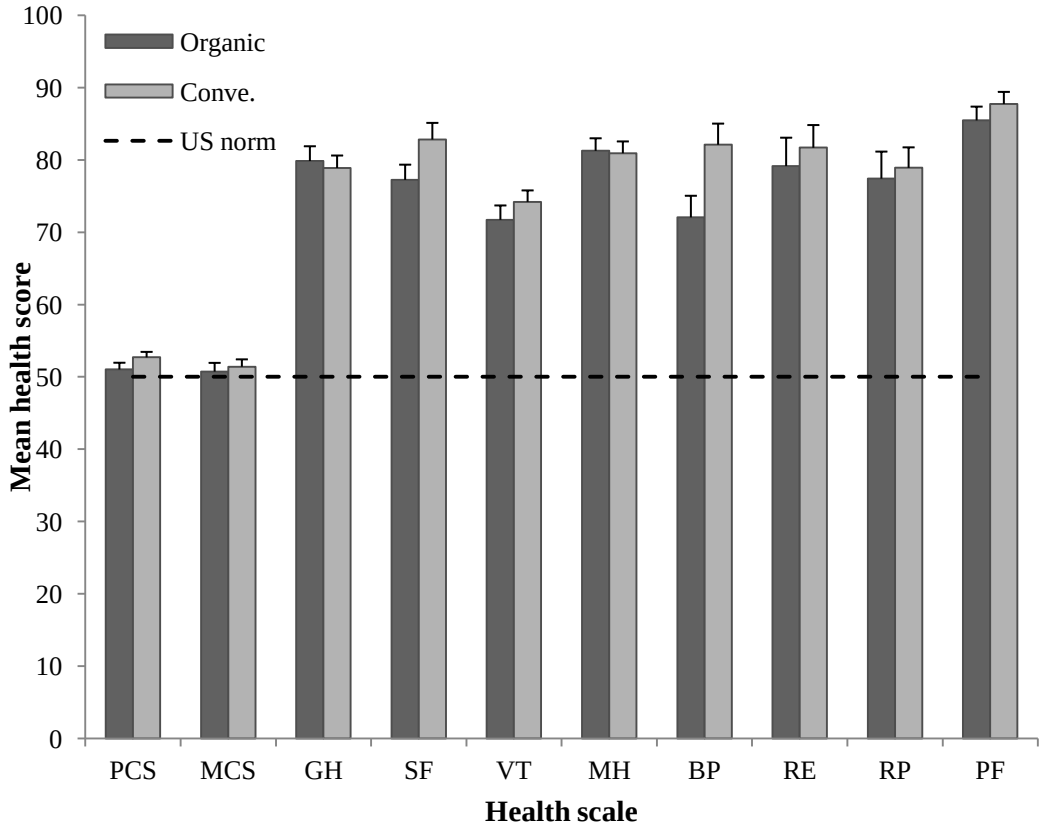


Figure 7.4 Mental Component Summary (MCS) disaggregated by age groups for conventional and exporting organic farmers (Karagwe location). US norm (means for each age group) are plotted on the dotted line.

Njombe

Organic farmers in Njombe sold produce to occasional exporter demands but they predominantly relied on the domestic market. The MANOVA results indicated no statistically significant difference between organic and conventional farmers' self-reported health across all the scales of SF-36 (including the two component summary scores) on combined dependent variables or on considering the dependent variables separately. Considering the general results without segregation into age groups or gender (Fig. 7.5), conventional farmers scored slightly higher than the partially exporting organic farmers in PF, RP, RE, BP, VT, SF, PCS and MCS. Only in GH and MH did the organic farmers score higher than conventional farmers. There were statistically significant differences only on BP mean scores ($p \leq 0.05$; df = 121) (Table 7.3). The mean scores for both organic and conventional farmers across SF-36 scales in this study area were significantly higher than the US norm ($p \leq 0.001$) except for the component summaries. There were no significant differences on MCS between the two farmers groups and the US norms. The PCS score for conventional

farmers in this area was significantly higher than US norms but the difference was not significant for the partly exporting organic farmers.



Key: PCS = Physical Component Summary; PF = Physical Functioning; RP = Role Physical; BP = Bodily Pain; GH = General Health; MCS = Mental Component Summary; VT = Vitality; SF = Social Functioning; RE = Role Emotional; and MH = Mental Health

Figure 7.5 SF-36 Health scales disaggregated by farming method for the general sample in Njombe location - conventional vs. partly exporting organic farmers. US norm means for general population are plotted on the dotted line.

In all but one age group (45-54), conventional farmers' scores for the PCS were slightly higher than organic farmers though the difference was not significant (Fig. 7.6). Examination of the MCS scores indicated mixed results with organic farmers scoring higher in some age groups and conventional farmers scoring higher than organic in other age groups (Fig. 7.7). Comparisons of the PCS and MCS with the US norms indicated that for younger age-groups, Njombe conventional farmers scored higher than the US norms but scored lower than the US norm at older ages. Organic farmers however scored lower than US norms in PCS at all age groups but the 18-24, on the MCS like conventional farmers, they scored higher than the US norms for the younger age groups and lower than the US norms for older age-groups (Fig. 7.6 and 7.7).

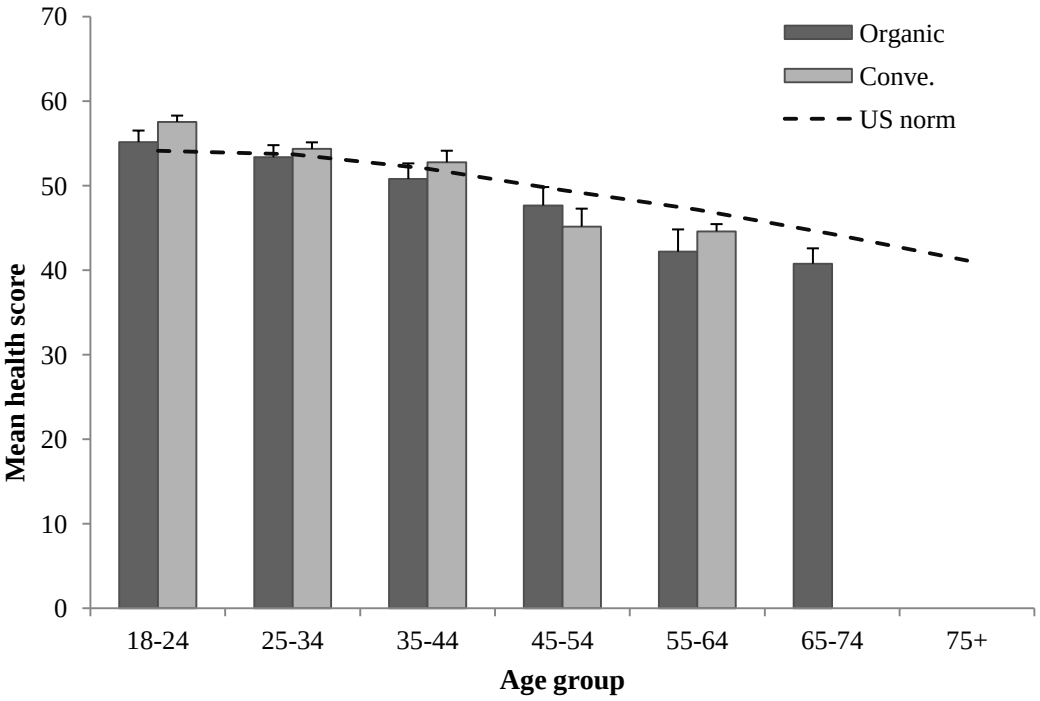


Figure 7.6 Physical Component Summary (PCS) disaggregated by age groups for conventional vs. opportunistic exporting organic farmers (Njombe location). US norm (means for each age group) are plotted on the dotted line.

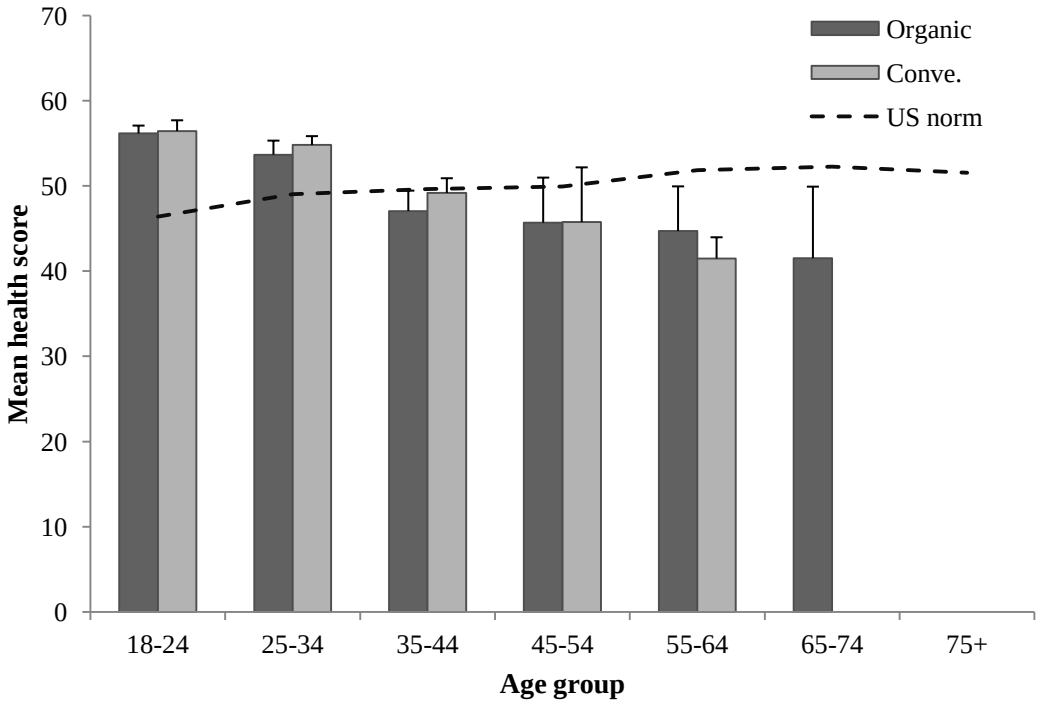
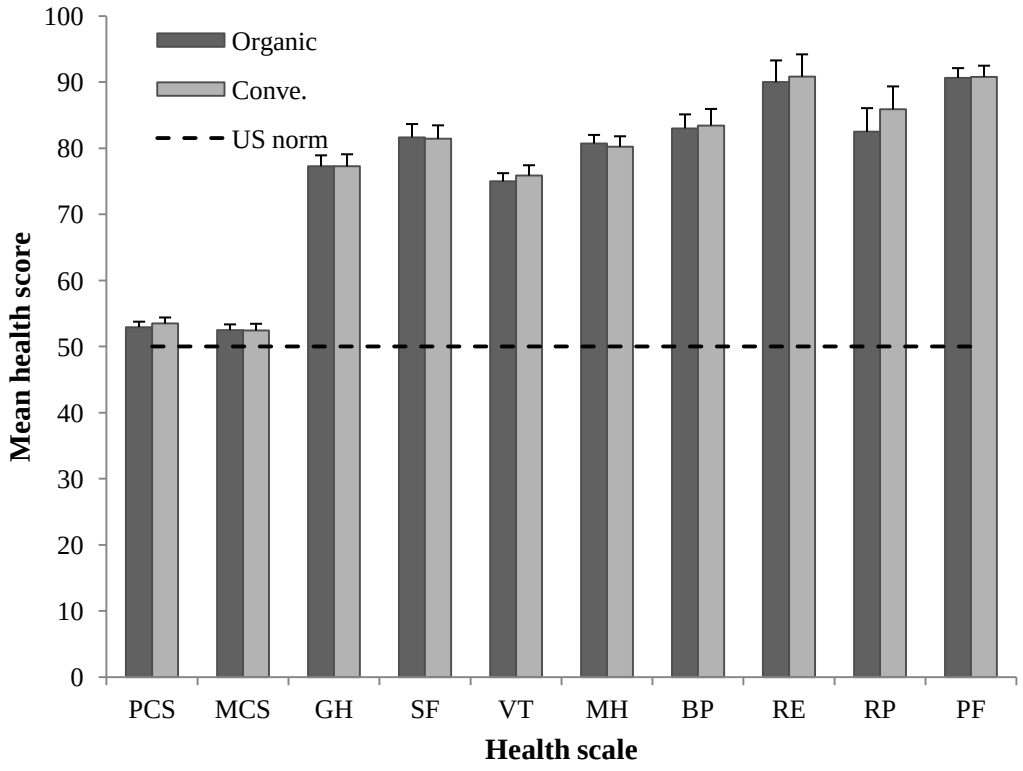


Figure 7.7 Mental Component Summary (MCS) disaggregated by age groups for conventional vs. opportunistic exporting organic farmers (Njombe location). US norm (means for each age group) are plotted on the dotted line.

Bagamoyo

The investigation on domestic selling organic farmers vs. conventional farmers in Bagamoyo area using multivariate analysis of variance revealed neither statistically significant differences between self-reported health across all the scales of SF-36 on combined dependent variables nor on considering the dependent variables separately. Considering the general results i.e. without segregation into age-groups or gender (Fig. 7.8), conventional farmers scored slightly higher than the domestic selling organic farmers in PF, RP, RE, BP, VT and PCS. In SF, MH and the MCS organic farmers scored higher than conventional farmers although the two groups had similar scores for GH. The differences were not significant for any of the scales (Table 7.3). All the reported mean scores across the SF-36 health scales for both organic and conventional farmers in this study area were significantly higher than the US norms (Fig. 7.8).



Key: PCS = Physical Component Summary; PF = Physical Functioning; RP = Role Physical; BP = Bodily Pain; GH = General Health; MCS = Mental Component Summary; VT = Vitality; SF = Social Functioning; RE = Role Emotional; and MH = Mental Health

Figure 7.8 SF-36 Health scales disaggregated by farming method for the general sample in Bagamoyo location - conventional vs. domestic selling organic farmers. US norm - means for general population are plotted on the dotted line.

Examination of the PCS and MCS scores indicated mixed results with organic farmers scoring higher in some age groups, similar scores as conventional farmers in some age groups, and conventional farmers scoring higher than organic farmers in other age groups, with no significant differences (Fig. 7.9 and 7.10). In comparison to the US norms, regardless of farming practice, the Bagamoyo farmers' PCS scores were higher than US norms except for the 75+ age group where the US norm was higher. Bagamoyo farmers' MCS scores were higher than US norms for younger age-groups and lower than the US norms for older age-groups (after their mid 50's) (Fig. 7.9 and 7.10).

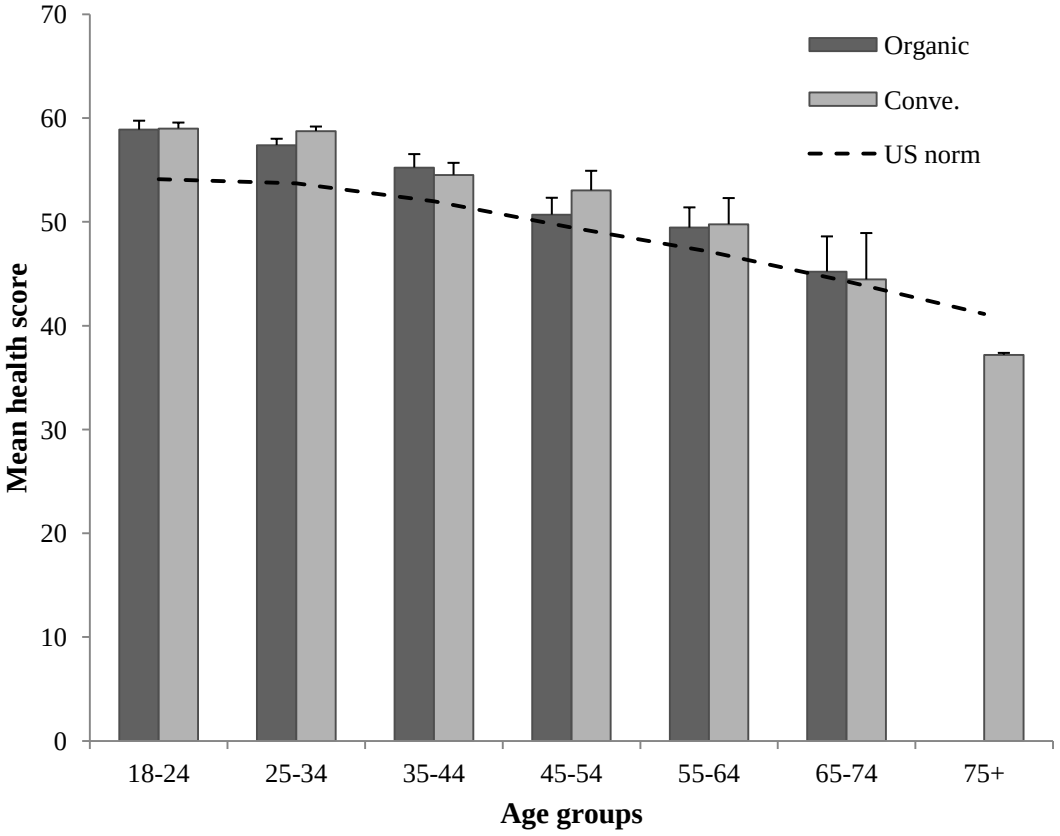


Figure 7.9 Physical Component Summary (PCS) disaggregated by age groups for conventional vs. domestic selling organic farmers (Bagamoyo location). US norm (means for each age group) are plotted on the dotted line.

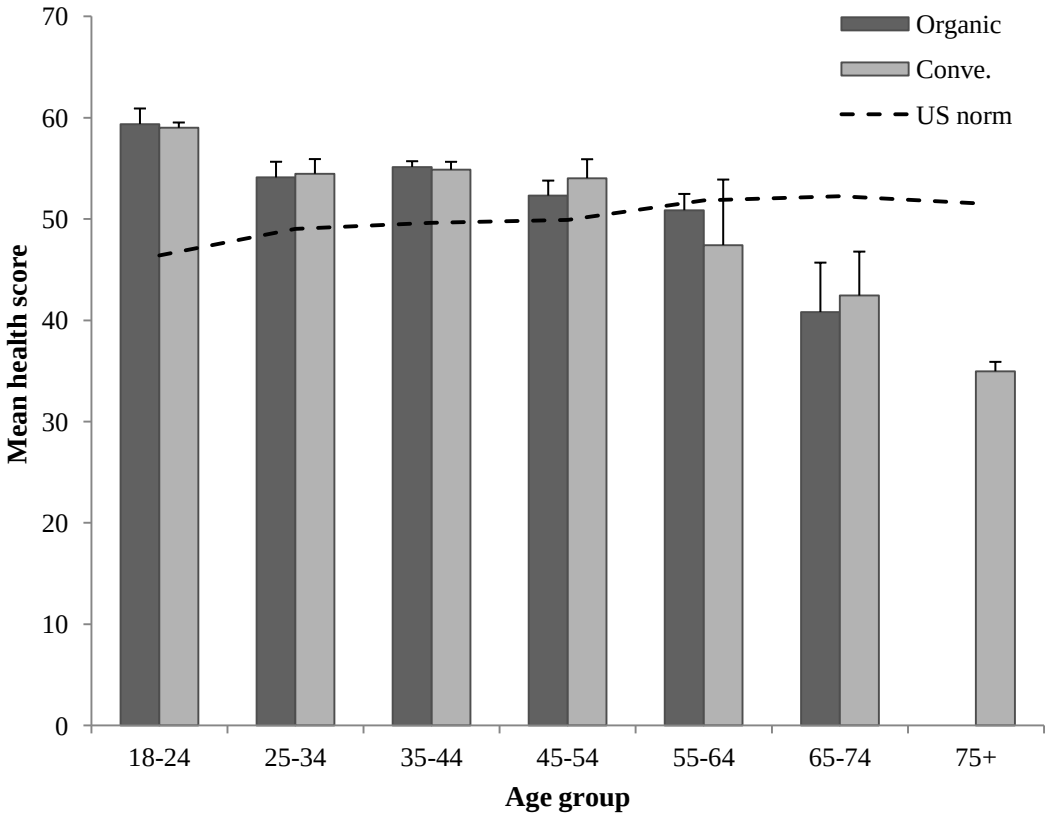


Figure 7.10 Mental Component Summary (MCS) disaggregated by age groups for conventional vs. domestic selling organic farmers (Bagamoyo location). US norm (means for each age group) are plotted on the dotted line.

7.3.4 Farming sector, gender, age and perceived health

Statistically significant differences were found in self reported health between age groups on combined dependent variables as well as when the dependent variables were considered separately in all the three study locations. Although in many scales males scored slightly higher than females (combining all age groups together), there was no statistically significant differences between sex across the health scales in all the three locations. The only exception was for the mental health scale (MH) in Njombe location where females scored higher (Mean = 84.65) than males (Mean 79.250, df. 121, $p \leq 0.05$) (Table 7.3).

Table 7.3 Comparisons of mean health scores by gender and farming sector across the scales of SF-36 including component summaries

		PCS	MCS	GH	SF	VT	MH	BP	RE	RP	PF
Njombe	Male	51.860	50.465	79.475	79.062	72.375	79.250	75.588	80.417	78.125	86.375
	Female	51.491	52.050	79.442	80.523	73.488	84.651	77.442	79.845	77.907	86.512
	df.	121	121	121	121	121	121	121	121	121	121
	p	0.781 [c]	0.360 [c]	0.991 [c]	0.659 [c]	0.692 [c]	0.033 [a]	0.685 [c]	0.918 [c]	0.967 [c]	0.961 [c]
Karagwe	Male	52.794	51.195	73.967	79.878	73.171	79.073	81.896	87.398	82.622	90.396
	Female	52.595	50.924	73.681	80.616	70.797	75.942	80.044	90.821	83.696	89.783
	df.	231	231	167	231	231	231	231	231	231	231
	p	0.853 [c]	0.823 [c]	0.892 [c]	0.744 [c]	0.214 [c]	0.113 [c]	0.526 [c]	0.391 [c]	0.810 [c]	0.733 [c]
Bagamoyo	Male	53.369	52.543	77.759	81.944	75.648	81.074	83.824	89.815	84.491	90.648
	Female	52.124	51.935	73.500	78.571	73.929	76.000	78.714	95.238	82.143	91.429
	df.	120	120	120	120	120	120	120	120	120	120
	p	0.522 [c]	0.772 [c]	0.273 [c]	0.451 [c]	0.584 [c]	0.111 [c]	0.323 [c]	0.463 [c]	0.765 [c]	0.825 [c]
Exporting Organic farmers	Organic	52.784	51.576	75.539	80.449	73.291	79.453	80.855	88.319	83.333	90.256
vs.	Conventional	52.686	50.649	72.216	79.741	71.638	76.828	81.845	88.506	82.543	90.172
Conventional farmers	df	231	231	231	231	231	222	231	231	231	231
	p	0.920 [c]	0.400 [c]	0.124 [c]	0.732 [c]	0.344 [c]	0.147 [c]	0.711 [c]	0.959 [c]	0.846 [c]	0.959 [c]
Partly Exporting Organic farmers	Organic	51.037	50.741	79.861	77.257	71.736	81.278	72.069	79.167	77.431	85.486
vs.	Conventional	52.711	51.412	78.902	82.843	74.216	80.941	82.118	81.699	78.923	87.745
Conventional farmers	df	120	120	120	121	120	121	121	120	119	120
	p	0.165 [c]	0.673 [c]	0.721 [c]	0.079 [c]	0.331 [c]	0.892 [c]	0.022 [b]	0.615 [c]	0.751 [c]	0.376 [c]
Domestic Selling Organic farmers	Organic	52.949	52.509	77.267	81.667	75.000	80.733	83.017	90.000	82.500	90.667
vs.	Conventional	53.495	52.437	77.274	81.452	75.887	80.258	83.452	90.860	85.887	90.807
Conventional farmers	df	120	120	120	120	120	120	120	120	120	120
	p	0.660 [c]	0.957 [c]	0.998 [c]	0.940 [c]	0.658 [c]	0.816 [c]	0.895 [c]	0.855 [c]	0.499 [c]	0.951 [c]

[a] Female mean scores were significantly higher than for males. [b] Conventional farmer mean scores were significantly higher than for organic producing farmers. [c] No statistically significant difference between the two groups.

7.3.4 Contribution of variables in the self reported health

Multiple regressions with physical component summary (PCS) and mental component summary (MCS) as dependent variables were run to assess the contribution of different variables in self-reported health. The independent variables were age, sex, farming system, farming sector, level of education, smoking, farming duration, income, children, having other employment and house ownership. A significant model was found for the PCS ($F_{,11,465} = 29.56$, $p \leq 0.001$, $r^2 = 0.412$). Significant variables were age ($\beta = -0.604$, $p \leq 0.001$), sex ($\beta = -0.074$, $p \leq 0.050$), farming sector ($\beta = 0.74$, $p \leq 0.05$), education ($\beta = 0.116$, $p \leq 0.01$) and having children ($\beta = -0.116$, $p = 0.002$). A significant model was also found for the MCS ($F_{,11,465} = 16.848$, $p \leq 0.001$, $r^2 = 0.534$). Significant variables were age ($\beta = -0.478$, $p \leq 0.001$), education ($\beta = 0.092$, $p \leq 0.05$) having other job ($\beta = -0.74$, $p \leq 0.05$), income ($\beta = 0.117$, $p \leq 0.01$), and having children ($\beta = -0.141$, $p \leq 0.001$).

7.4 Discussion

Multiple analysis of variances indicated a statistically significant difference only in Physical Functioning (PF) where exporting organic farmers had better mean health scores than for their conventional counterparts. There were no significant differences between conventional farmers and their partly exporting or domestic selling organic counterparts. Generally the results revealed that export organic farmers scored higher than conventional farmers in eight out of the ten scales, and only scored lower on the remaining two scales. Partly exporting organic farmers reported lower health status for eight out of the ten health scales, though the difference was only statistically significant for Bodily Pain (BP). Similarly, the domestic selling organic farmers scored lower than conventional farmers in seven out of the ten scales. It would appear from these trends that, there are some positive influences on smallholder farmers' health if they farm organically and export their produce. Only the smallholder farmers that were organic and exporting had higher scores than conventional farmers in most scales and a significant difference in their Physical Functioning.

Since the trend (better health scores) reported by exporting organic farmers were not observed on partly exporting organic farmers or domestic selling organic farmers, the findings also seem to suggest that export horticulture rather than organic farming is

responsible for the health differences. The partly exporting organic and domestic selling organic farmers reported health scores that were no higher than conventional farmers and in many cases were worse. The regression results support this finding in as much that the farming sector but not the farming system was a significant predictor of mental health (Mental Component Summary-MCS) with exporting farmers more likely to report better health than non-exporting farmers. It then appears that export horticulture rather than organic farming contributes to improvement of farmers' health. Abundant labour; small farm size advantages for organic production plus the tropical nature of the produce from SSA have been considered the major competitive edge that smallholder farmers hold over their competitors for developed countries markets (Johansen *et al*., 2005; USAID, 2007; UNEP-UNCTAD, 2008; 2010; Edwards-Jones *et al*., 2009). It would be reasonable to suggest that, although organic farming on its own does not seem to influence smallholder farmers livelihoods (which translates to better health), it does offer a competitive advantage to access export markets that have shown to improve farmers' incomes, household food security and consequently health (See chapter 5 and 6; Bolwig *et al*., 2009; UNEP-UNCTAD, 2008).

It can therefore be argued that for organic farming to benefit smallholder farmers in tropical Africa, it should be linked to export markets that pay premium prices, otherwise there will be no improvements to smallholder farmers' livelihoods relative to their conventional counterparts. Although developing local organic markets could be an alternative to make organic farming beneficial to domestic selling smallholder farmers, convincing the mainly poor SSA inhabitants to pay a premium for organic produce may be difficult. Among the organic farming challenges noted by IFOAM, (2007) in developing countries is the inability of farmers and consumers to tell the difference between organic and traditional produce. Consumers fail to appreciate the difference between the two because of the very small differences between organic farming systems and traditional SSA faming systems that uses very low off-farm inputs.

There is little or no direct health benefits to partly exporting and domestic selling producers of growing organic produce when compared to the benefits that might accrue

if they were given access to export markets. With the benefits of smallholder organic farming tied to export prospects, the debates on whether or not to ban air-freighted organic produce and buying local vs. imported may thus wish to consider the wider implications of cutting these markets for organic smallholders in least developed countries (LDCs). The risk of these smallholder farmers converting back to conventional farming could possibly lead to increased environmental damage and increasingly impoverished communities as they lose their competitive market-edge. The burdens from increased impoverishment and environmental degradation should thus be weighed against the benefits of buying local and banning air freighted produce.

An important observation on the findings could be the way the questionnaires were administered. Most of the mean scores were significantly higher than the US norms. The higher than US norm scores in this study underpin similar findings in previous studies in Kenya, Uganda and Tanzania (Cross *et al*., 2009 a and b; Wyss *et al*., 1999; Wagner *et al*., 1999). These were partly attributed to social desirability bias caused by face to face interviews where respondents underreport ill-health as they consider it socially undesirable. Overcoming this bias in SSA is problematic as many of the respondents possess weak literacy skills making the face to face interviews a necessity.

7.5 Conclusion

Whilst much of the effort and promotion of organic farming in tropical Africa focuses on its ability to improve poor farmers' livelihoods, these livelihoods can potentially only be improved when organic farming is coupled with export. Currently only a very few organic farmers have access to export markets. They are nonetheless constrained by the exporters' limited capacity to purchase all the available produce. As a result organic farmers tends to lose out as their surplus produce tends to go to the domestic conventional markets where they lose their premium prices whilst still incurring the costs of conforming to organic export standards. If policy makers wish to promote organic farming for poverty alleviation purposes, they need to focus on securing access to the export markets.

CHAPTER EIGHT: CONSUMERS' PREFERENCES FOR IMPORTED FRUITS: DO FOOD MILES OR ECOLOGICAL DRIVES MATTER IN ABSENCE OF THE LOCAL ALTERNATIVE?

Abstract

Influences of consumers' fresh and canned pineapple choices were studied in the United Kingdom (UK). Choice Based Conjoint – stated preferences was used to investigate the preferences of 317 respondents. Three product attributes with three choice levels each were involved in the choice tasks; these were producer country, production method and price. Approximately 40% of the respondents were unaware as to which of the three countries was furthest from the UK and respectively 45% and 60% did not have the knowledge of the means of transport used to transport canned and fresh pineapples into the UK. Two segments of consumers emerged from the latent class segmentation; the price sensitive group (about 60% of the respondents) and the less-price sensitive group (about 40% of the respondents). Price was a little more than three times as important as the production method or produce origin for the price sensitive segment of respondents. The production method on the other hand was more than twice as important as price or produce origin in the stated preferences for pineapples for the less-price sensitive segment of the respondents. Although about 60% of the respondents were aware of which of the producer countries was furthest from the UK, and 35% stated environmental concerns were quiet important in their buying decision; producer country had less than 20% relative importance compared to other attributes in the stated preferences across the two products. Overall fair-trade pineapples yielded the highest utilities for the respondents followed by organic, and lower prices were preferred to higher. The findings suggest that, when there is no local alternative, the distances between production and a consumption country no longer plays a role in shaping the buying decision. Instead, other product attributes like production methods and price become the priority. The findings also give a strong indication that a combination of fair trade and organic certification may prove beneficial in targeting the less-price sensitive consumer segments as the attributes were preferred in that order.

Key words: *Organic, Fair trade, Country of origin, Choice-Based Conjoint.*

8.1 Introduction

Tropical fruit and vegetable exports from Sub Saharan Africa (SSA) increasingly penetrated European markets in recent decades benefiting many smallholder producers from the region (MCulloh and Ota, 2002; Minot and Ngingi, 2004; Bolwig *et al*., 2007; Bolwig *et al*., 2009). Likewise, organic markets in Europe and elsewhere in the

developed world have grown rapidly in recent decades (The World of Organic Agriculture, 2008). Subsequently, governments and development agencies in developing countries have consciously promoted smallholder organic farming to access high value niche exports markets so as to improve their incomes (Simmons, 2002; Bakewell-Stone, 2006; Bolwig *et al*., 2009; APO, 2010). Bolwig *et al*., (2009) and UNEP-UNCTAD, (2008) suggested organic farming substantially improves smallholders incomes and livelihoods in SSA.

However in recent years, the growth of the share of imported foods in European consumers' food basket has raised some questions over their commitments to environmental conservation and support to local economy (DEFRA, 2003; DEFRA, 2005; Chamber *et al*., 2007; Morgan, 2010). The food that has travelled more miles from the production to consumption point is generally considered more ecologically destructive as it is believed to contribute significantly more CO_2 emissions from the transport process (DEFRA, 2006; Coley *et al*., 2009; Kemp *et al*., 2010). Food miles, a concept taken to loosely mean the distance the food travels from the point of production to the end consumer (Edwards-Jones *et al*., 2008; DEFRA, 2006) have since become a powerful tool in policy discourses built around sustainable agriculture and alternative food systems(Coley *et al*., 2009). Stacey (2008), reports that approximately 50% of vegetables and 95% of fruits consumed in the UK are imported; it is thus not surprising that the food miles topic has gained such importance in the UK news media, research and policy (Kemp *et al*., 2010).

Mode of transport has been found to be as important as distance in determining the carbon emissions from transport of foods (Coley *et al*., 2011). Food transport, particularly air-freighting has been suggested to be among the highest contributors of carbon emission in the product chain (Mason *et al*. 2002; DEFRA, 2005; Sim *et al*., 2007; MacGregor and Vorley, 2006; Kemp *et al*., 2010). The 'local food' movement in the UK is aimed at encouraging consumers to buy local food to support their local economies and to reduce the fruits and vegetables carbon footprint (Marsden *et al*., 2000; Hinrichs, 2000; CPRE, 2002; Weatherell *et al*., 2003; DEFRA, 2005; Chambers

et al., 2007). Economic models have predicted food miles-induced preference changes in Europe are likely to induce large welfare losses for New Zealand and several SSA nations (Ballingall and Winchester, 2008) without necessarily improving environmental outcomes (Pretty *et al*., 2005; Schlich *et al*., 2006; Ballingall and Winchester, 2008). However the local food and food miles movements have become an appealing idea to consumers and is supported by import-competing producers (Sirieix *et al*., 2007; Ballingall and Winchester, 2008). The current developments in carbon foot-printing and carbon labels presents yet another obstacle to exporting countries who rely on airfreight to transport their produce.

Understanding consumers' knowledge, awareness of the product and trade-offs they make between product attributes is important for new product development, marketing and consumer research (Brown *et al*., 2009; Dransfield *et al*., 2005; Yeh *et al*., 2010; Scarpa and Thiene, 2011; Harmon *et al*., 2006; Arnoult *et al*., 2007; Kemp *et al*., 2010; Nie and Zepeda, 2011). The stated preferences techniques, although sometimes criticized for not translating directly to revealed product purchases (Cummings *et al*., 1997; Blumenschein *et al*., 1998; Johannesson *et al*., 1998; Kemp *et al*., 2010), has been widely used in market studies and economic value estimations (Alfnes, 2004; Romeo *et al*., 2004; List *et al*., 2004; Contento *et al*., 2004; Danielis *et al*., 2005; Kelly *et al*., 2007). Understanding how UK consumers' knowledge and awareness affects their choice of imported fruits is important in envisaging the future of tropical fruit exports from SSA.

Economic development in SSA is strongly tied to agricultural production being the primary source of livelihood for 64% of the total population. Agriculture contributes to 34% of the continent's GDP and accounts for 40% of its export earnings (World Bank, 2008; Oyejide, 2008; Gayi and Cherel-Robson, 2009). The SSA share of world agricultural exports has declined from 8% in 1960s to 2% in early 2000s (FAO, 2006; Oyejide, 2008). This persistent decline of the share of world agricultural exports, mainly traditional cash crops like coffee, tobacco and sisal has left many smallholder farmers without a substantial part of their income (World bank, 2005; Amani; 2005; Gayi and

Cherel-Robson, 2009). The decline is commonly attributed to macroeconomic reforms of the 1980s - structural adjustment policies (SAPs), limited public investment in agriculture, research, basic transport, telecommunications and energy infrastructure (World Bank, 2008; Oyejide, 2008). In comparison to performance of cash crops in Asia and Africa, Gayi and Cherel-Robson, (2009) suggests that Africa does not have any intrinsic reason for being trapped in poor performance for other agricultural exports.

Organic farming has recently been highlighted as a potential route out of smallholders' income poverty and poverty alleviation (UNEP-UNCTAD, 2008; 2010). Current trends in organic and tropical food export markets however drives the debate on the future prospects of this new income source for SSA smallholder farmers. The small scale capacity of SSA farmers and the needs to adapt to the increasingly changing consumer requirements in order to maintain competitive advantage on these high value niche markets has left smallholder farmers more vulnerable to future changes (Vagneron *et al*., 2009).

To contribute in understanding the impacts of the changing consumers' perceptions on imported foods, this study investigated the UK consumers' tropical fruit choices and preferences (i.e. consumers' choice and preferences in absence of local alternative). Pineapple was selected as imported fruit case study. Specifically the study investigated:-

- Consumers' knowledge on the country of origin of pineapples
- Consumers' knowledge of the means of transport of pineapples into the UK, and,
- Importance of attributes such as distance travelled, means of transport, price and production method in consumer's buying decision in absence of the local alternative.

8.2 Methods

In this study, a stated preference - choice experiment (CE) was used to investigate consumers' choices and preferences relating to the production methods, and country of origin at different price levels of canned and fresh pineapples. The CE data were collected using self-administered paper questionnaires (Appendix 5.0 and 6.0).

Consumer preferences for pineapples were ascertained through the estimation of a latent class choice experiment model.

8.2.1 Study area

The study focused on the UK market potentials of SSA pineapples – both canned and fresh. Respondents were recruited from North Wales, Liverpool, Manchester, London and Birmingham in the UK.

8.2.2 Study and questionnaire design

Any choice experiment (CE) usually begins with the definition of the good to be valued in terms of its attributes and levels. The initial survey revealed pineapples sold on the UK comprise two forms, canned and fresh pineapple. The two product categories are priced differently in the market and it was therefore necessary to investigate canned and fresh pineapples differently although all other questions apart from 'price' were the same.

The attributes used in the canned pineapple study were production method, country of origin and price. Each attribute had three levels as follows: (i) Production method – Organic, Conventional and Fair trade; (ii) Country of origin – Tanzania, Ivory Coast and Philippines; and (iii) Price - £0.69, £0.99 and £1.29. The same attributes and levels were used for the fresh pineapple study but the levels used for price were - £1.69, £1.99 and £2.29 (Table 8.1).

Table 8.1 Attributes and levels chosen for the choice experiment

Attribute	Price		Country of origin	Production method
	Canned pineapple	Fresh pineapple		
Levels	£0.69	£1.69	Tanzania	Organic
	£0.99	£1.99	Ivory Coast	Fair trade
	£1.29	£2.29	Philippines	Conventional

In marketing research, country of origin is known to have an effect on the image the consumer has of the quality of specific products (Verlegh *et al*., 2005). Consumers use country of origin as a proxy for product quality, either alone or in conjunction with other product information (Balestrini and Gamble, 2006; De Cicco, Loseby and van der Lans, 2001; Ha¨ubl and Elrod, 1999). In this study, apart from produce quality or image, country of origin was also used as a cue for distance travelled by the produce. To define the different levels of country of origin for the CE, the target exporting country in this study – Tanzania was used as the first level, located approximately 7500 km from the UK. Ivory Coast and Philippines being among the largest pineapple producers and exporters to the European market were included as levels as they are considered market rivals to Tanzanians. Ivory Coast and the Philippines are located approximately 5000 km and 11000 km from the UK respectively, providing a good gauging scale for consumers' awareness and subsequently influence of distance travelled by the fruits on their stated preferences.

The initial surveys also revealed that canned and fresh pineapples sold in the UK were from conventional farming, organic and/or fair-trade certified producers. The three forms were used as the three levels of the production method attribute. The levels for the third attribute – price that is required to estimate welfare changes of respondents; were determined using the average market price as the mid level, and plus or minus 30 pence for the upper and lower levels respectively.

In addition to the CE tasks, information was also sought on consumers buying frequencies, their knowledge of distance between the producing country and the UK, and the transportation method (into the UK). Consumers were also asked to rate the importance of other aspects such as the produce keeping quality, product presentation, ethical, environmental and political drivers of the buying decisions. Demographic data were collected for consumer profiling and also to assess the representativeness of the sample. The average questionnaire completion time was 5 minutes.

8.2.3 Experimental design

Sawtooth software (Sawtooth Inc.) was used to generate a fractional factorial experimental design. With three product attributes and three levels for each attribute, each respondent would be required to rate 27 choice tasks in a full profile experiment. However, it has been suggested that, presentation of too many tasks risks the respondents becoming confused or overloaded and may resort to problematic simplification methods such as consistently selecting the first product (Green and Srinivasan, 1990; Orme, 2009). A partial profile[8] design was adopted to enable respondents to make meaningful trade-offs during the CEs, each respondent was given 9 choice tasks. To increase the reliability of the CE, it is advised that, the number of random tasks multiplied by the questionnaire versions should be ≥ 80 (Sawtooth inc. 2008). For that reason, ten versions of the choice experiments were produced for canned and fresh pineapples. Each version contained a different combination of nine CE tasks and each choice task consisted of three alternatives (Table 8.2). Some CBC experiments include the 'none' option because in a real market choice a consumer would have an option not to buy any of the produce. The 'none' option was not included in the current study to avoid possible respondents' simplification by choosing the 'none' option each time.

Table 8.2 Example of one choice task for fresh pineapple CE

If these were your only options which pineapple would you be most likely to buy? ***Choose one by ticking in one of the boxes below.***			
Country of origin	Tanzania	Philippines	Ivory Coast
Production method	Organic	Conventional	Fair trade
Price	£2.29	£1.69	£1.99
	☐	☐	☐

[8] In partial-profile CBC, each choice question includes a subset of the total number of attributes being studied; the attributes are randomly rotated into the tasks such that, across all tasks in the survey each respondent typically considers all attributes and levels (Orme, 2003).

8.2.4 Data collection

Data was collected between July-September 2011 using self-administered questionnaires. A pilot study was conducted with 29 respondents prior to the final administration of the survey. Minor corrections to the questionnaires were done after the pilots. The questionnaires were administered to consenting respondents in restaurants, cafés, trains, parks, work places, laundrettes and high streets. Some questionnaires were posted to consenting respondents at work places and homes. The response rate for the postal questionnaires was 64%; i.e. out of the 120 posted questionnaires, 77 were filled and returned.

Some studies suggest using the ratio of the number of parameters to the number of respondents to determine the sample size (Xu and Yuan, 2001). The rule of thumb for the ratio is between five and ten (Xu and Yuan, 2001, Novotorova and Mazzocco, 2008); with three attributes each having three levels, we would have a total of 7 parameters (the total number of levels minus the total number of attributes plus one). In this case at least 49 respondents (7 parameters x 7) are required to gain useful information. The target sample size for this study was 160 respondents for each product.

8.2.5 Analytical methods

Conjoint analysis is a multivariate technique used to estimate how respondents develop preferences for products and services (Hair *et al*., 1992). It has been used in marketing studies since early 1970's (Green, P. E. and Srinivasan 1978; 1990; Sawtooth, 2008; Orme, 2009). The conceptual basis for conjoint analysis models is Lancaster's theory of consumer demand (Lancaster, 1971) and random utility theory (McFadden, 1974 cited by Green., 2002). Lancaster's theory of consumer demand is based on the proposition that consumers value products because of the products' characteristics. According to Lancaster, (1966; 1971), the utility of a good is derived from the utilities of the attributes of that good and thus consumers' decisions can be determined by the utility of the attributes rather than by the good itself. Random utility theory (RUT) explains consumers' choices as utility maximization behaviours.

According to RUT, the probability of selecting a finite choice set will be higher if the utility provided by such choice option is the highest among the different choices (Green, 2002). The i^{th} consumer's utility of choosing option *j* is signified as,

$$U_{ij} = V_{ij}(X_{ij}) + \varepsilon_{ij}$$

where V_{ij} is the deterministic component, which is a function of a vector X_{ij}, consisting of choice specific attributes, and ε_{ij} is a random component$(0, \sigma^2)$,which is assumed to be independent of X_{ij} and follows some predetermined distribution. Depending on the different specifications of the density of unobserved factors $f(\varepsilon_{ij})$ as well as the functional form of the deterministic utility function, different choice models can be derived. The selection of this function will depend on the assumptions underlying the consumer's preferences. If we assume that εjs are Independent and Identically-Distributed (IID) random variables with the type-I extreme value distribution (Gumbel), a multinomial logit model (MNL) is specified (Green, 2002). The probability that consumer *i* chooses alternative *j* out of a total of *J* alternatives is given by:-

$$P_{ij} = \frac{e^{\mu(\beta x_j)}}{\sum_{j \epsilon c} e^{\mu(\beta x_n)}}$$

where β is a vector of parameters to be estimated and μ is a scale parameter that is usually normalized to 1 so that the βs can be identified (McFadden 1974; Green, 2002; Train, 2009).

Marginal utilities for each attribute level commonly referred to as part-worths were calculated from CE data. The relationship between the attributes and attribute levels determine the appropriate model specification. No assumptions were made regarding the relationship between attribute levels and consumer utility and therefore the 'part-worth relationship' was assumed for attribute levels (Ness and Gerhardy, 1994). It was also assumed that respondents implicitly add the part-worths of the attribute levels for each

product profile to form an overall preference of the product (Lancaster, 1966; 1971; Ness and Gerhardy, 1994).

Based on the utility attached to the product's attribute's single performance levels, the global utility (relative importance compared to other attributes) of every attribute can be calculated as the ratio of particular attribute's utility to the sum of all the attributes' utility (Smith, 2005; Sawtooth Inc., 2008). CE data can be analysed through:-

- Simple counts,
- The Multinomial Logit model (MNL),
- Latent Class segmentation (LC),
- Individual Choice Estimation (ICE) or
- Hierarchical Bayes model (HB).

MNL was widely used until the 1990's, more recently LC, ICE and HB models which are basically generalizations of the MNL have been more frequently used to overcome MNL limitations. MNL limitations are caused by the assumptions of homogeneous preferences in the sample, independence of irrelevant alternatives and independence of errors over time (Hausman & Mcfadden 1984; Green, P. E. and Srinivasan, 1990; Phanikumar and Maitra, 2007; Sawtooth Inc., 2008; Train, 2009). In real life situations, preferences are heterogeneous among consumers and the ability to account for this variation allows the estimation of unbiased models that provide a less idealised representation of reality. LC logit models relax the limitations of standard logit by allowing random taste variation and unrestricted substitution patterns in their estimation (Green, P. E. and Srinivasan, 1990; Green., 2002).

In this study, the LC model was used to investigate the relative importance of different canned and fresh pineapple attributes driving UK consumers buying decisions. The LC assumes that there are homogeneous classes among consumers and the individual resides in a "latent" class which is not revealed to the analyst (Hensher *et al*., 2007). The model segments the respondents into these latent classes and estimates utilities based on the classes and individual data rather than aggregate utilities. For LC model details see Train

(2009). Counts were used for the initial investigation; MNL was estimated to establish which model fitted best, the Sawtooth software platform was used to run both models. Only the results for the best-fit model are presented in this study. On the choice of the model-fit and number of segments that best-fitted the data, information criterion measures, Consistent Akaike Information Criterion (CAIC), relative chi-square, log likelihood and percent certainty were used (Sawtooth Inc. 2004). A close examination of respective log likelihoods, CAIC, relative chi-square and percent certainty of the models revealed the 'two groups' categorization of the respondents in the LC model provided the best-fit to the data in both canned and fresh pineapples.

Means, frequencies, percentages and cross tabulations were used to summarise and investigate demographic information, consumers' knowledge of the produce and general consumer preferences using SPSS 14.

8.3 Results

8.3.1 Demographic profiles

A total of 443 people were approached to take part in the study of which 63 declined to participate. Of the 380 questionnaires handed out 43 did not return the postal questionnaires and 20 questionnaires were incompletely answered; the completed questionnaires were thus 317. Each version of the CE questionnaire was allocated roughly the same times. Of the 317 completed questionnaires, 158 responded to the canned pineapple survey and 159 the fresh pineapple survey (Table 8.3). The target sample size was 320 respondents in total i.e. 160 respondents for each survey – canned and fresh pineapples. The youngest respondent was 18 years old whilst the oldest was 68 years old with the mean age of 38 years across the two surveys. The average household size of the sample was 2.77 and of all the respondents, 65.5% had children under the age of 16. More than 85% of the respondents reported to have bought pineapples in the previous 12 months. About 85.5% of the respondents were English or Welsh; 9.5% were from other European nations while only 5% were non-Europeans. The median income for the respondents fell in the £20,000 - £29,000 category.

Table 8.3 Respondents profiles

	Response	N	Percent
Bought pineapple in the past 12 months	Yes	262	82.6
	No	55	17.4
Buying frequency	Occasionally	138	43.5
	Once a month	99	31.2
	Regularly	25	7.9
	Never	55	17.4
Level of education	Secondary school	55	17.4
	A-levels	85	26.8
	Professional	67	21.1
	University first degree	84	26.5
	University higher degree	26	8.2
Nationality	British/Welsh	271	85.5
	Other European	30	9.5
	Non-European	16	5.0
Annual income (before tax)	less than £10,000	50	15.8
	£10,000-£19,000	102	32.2
	£20,000-£29,000	87	27.4
	£30,000-£39,000	50	15.8
	£40,000-£49,000	19	6.0
	£50,000-£59,000	6	1.9
	£60,000-£69,000	3	0.9

8.3.2 Consumers knowledge and general preferences

About 37% of the respondents were unaware of which country among the survey pineapple producers i.e. Tanzania, Ivory Coast and Philippines was the furthest from the UK (Table 8.4). Additionally, more than 81% of the respondents revealed the country of origin was not particularly important in their pineapple buying decisions. Furthermore, 18% of the respondents indicated they never check the produce label for country of origin while another 30% reported they rarely look for country of origin information. Only 25% reported regularly looking for country of origin information on their canned and fresh pineapples. Price was reported to be quite important in the buying decision for more than 74% of the respondents, only 5% revealed price was not at all important. More than 46% of the respondents indicated their buying decisions were influenced by what was on the special offer. Half of the respondents also reported that, their buying decisions were influenced by the product presentation (Table 8.4).

Table 8.4 Attribute importance in pineapple buying decisions

Attribute	Importance	N	Percent
Price	Not at all important	13	5.0
	Not particularly important	53	20.2
	Quite important	114	43.5
	Very important	82	31.3
Special offer	Not at all important	35	13.4
	Not particularly important	106	40.5
	Quite important	83	31.7
	Very important	38	14.5
Country of origin	Not at all important	73	27.9
	Not particularly important	140	53.4
	Quite important	41	15.6
	Very important	8	3.1
Ethical concerns	Not at all important	31	11.8
	Not particularly important	118	45.0
	Quite important	82	31.3
	Very important	31	11.8
Product presentation	Not at all important	38	14.5
	Not particularly important	91	34.7
	Quite important	104	39.7
	Very important	29	11.1
Production method	Not at all important	48	18.3
	Not particularly important	133	50.8
	Quite important	64	24.4
	Very important	17	6.5
Environmental concerns	Not at all important	46	17.6
	Not particularly important	125	47.7
	Quite important	71	27.1
	Very important	20	7.6
Effect of political status of producing country on buying decision	Yes	92	35.1
	No	63	24.0
	Indifferent	107	40.8
Furthest country from the UK	Tanzania	53	16.7
	Ivory Coast	64	20.2
	Philippines	200	63.1
Frequency of checking for country of origin label	Never	57	17.9
	Rarely	95	29.7
	Occasionally	51	16.1
	Regularly	79	24.9
	The produce don't show	35	11.0

Half of the respondents revealed 'production method' was not particularly important in their buying decision, while another 18% stated the 'production method' was not at all important. About 65% of the respondents reported environmental concerns were not particularly important in their buying decision. While ethical concerns were not particularly important in the buying decisions for 56.8% of the respondents, about 43%

indicated ethical drives influenced their buying decisions. However, around three-quarters of the respondents indicated their pineapple buying decisions were not influenced or they were indifferent about the political or human rights status of the producing country (Table 8.4).

The pre-survey investigations revealed that, with very few exceptions, canned pineapples are shipped into the UK while fresh pineapples are air freighted due to the perishable nature of the fruit. In the actual survey, the investigation of consumer awareness of means of transport of pineapples into the UK revealed that, around 25% of the respondents were unaware of the means of transport of the canned while 19%, 15.8% and 22.8% thought canned pineapples were air-freighted into the UK from Tanzania, Ivory Coast and Philippines respectively. While around 20% of the respondents were unaware of the means of transport of fresh pineapples into the UK, 45.3% thought they were shipped from Tanzania and Ivory Coast and around 30% also thought fresh pineapples were shipped from Philippines (Table 8.5). Therefore almost half of the respondents are unaware or have a wrong knowledge of the means of transport of the pineapples into the UK.

Table 8.5 Consumer awareness of the means of transport for pineapples

	Country of origin	Unit	Airfreight	Shipped	Unaware
Transport of canned pineapple from	Tanzania	N	30	90	38
		%	19.0	57.0	24.1
	Ivory Coast	N	25	92	41
		%	15.8	58.2	25.9
	Philippines	N	36	83	39
		%	22.8	52.5	24.7
Transport of fresh pineapple from	Tanzania	N	57	72	30
		%	35.8	45.3	18.9
	Ivory Coast	N	54	72	33
		%	34.0	45.3	20.8
	Philippines	N	77	48	34
		%	48.4	30.2	21.4

8.3.3 Attribute utilities for fresh and canned pineapples

The count analysis indicated no significant differences on the products' country of origin preferences between Tanzania, Philippines and Ivory Coast for both canned and fresh pineapples. Consumers preferences for the method of production were however significantly different for both canned (df = 2; chi square 113.38; $p \leq 0.01$) and fresh (chi square 101.94; df = 2; $p \leq 0.01$). Fair trade pineapples, both canned and fresh, were the most preferred followed by organic and lastly conventional produced pineapples. Lower prices were significantly preferred to higher prices for both canned and fresh pineapples (Appendix 7.0).

Table 8.6 presents part-worth utility estimates for fresh pineapple attributes calculated from stated preferences from the respondents. Although price preference followed the same order i.e. lower prices were preferred to higher; the first segment of the respondents (accounting for 60% of the respondents), appear to be more price-sensitive deriving three times more utility from the lower price level compared to the second segment (in which 40% of the respondents fell). The results also indicated that, the less price-sensitive group of consumers (segment 2) derived 21 times more utility from fair-trade pineapples compared to the price-sensitive group. There was no similar preference order for the 'production method' levels between the two segments although conventionally produced pineapples offered the least utility to both segments of the respondents. The less price-sensitive consumer segment preferred fair-trade to organic and conventional in that order, while the price-sensitive consumers preferred organic, fair trade and conventional in that order. Price-sensitive respondents (segment 1) appeared to prefer Tanzania as the country of origin for their canned pineapples while the less price-sensitive segment preferred Philippines (Table 8.6).

Table 8.6 Part-worth utility estimates for fresh pineapples (*n=159)*

Attribute	Level	Part-worths	
		Segment 1 (size 59.4%)	Segment 2 (size 40.6%)
Production method	Organic	16.55	0.84
	Conventional	-20.85	-91.24
	Fair trade	4.30	90.40
Country of origin	Tanzania	19.32	7.36
	Ivory coast	7.51	-32.10
	Philippines	-26.83	24.74
Price	£1.69	107.05	29.76
	£1.99	2.35	2.01
	£2.29	-109.41	-31.77
Chi-square	1088.49		
Percent certainty	38.95		
CAIC	2007.87		
Relative chi-square	29.42		
Avg. membership probability	0.98		

Note: Reported are the re-scaled part-worth utilities for comparability

Part-worth utility estimates for canned pineapple attributes calculated from stated respondents' preferences are presented in Table 8.7. Like the fresh pineapple consumers, the utilities revealed lower prices were preferred to higher. The first segment of the respondents (accounting for 54% of the respondents), were more price-sensitive, deriving more than twice the utility as the second segment (in which 46% of the respondents fell) from the lower price level. The two consumer segments' preferences for production method appeared to be similar as they both derived the highest utility from fair trade canned pineapples. The price-sensitive consumers derived the least utility on the 'production method' levels from organic pineapples while the less price-sensitive segment derived the least utility from conventional pineapples. Like the fresh pineapple results, price-sensitive respondents (segment 1) appeared to prefer Tanzania as the country of origin for their canned pineapples while the less price-sensitive respondents preferred Philippines (Table 8.7).

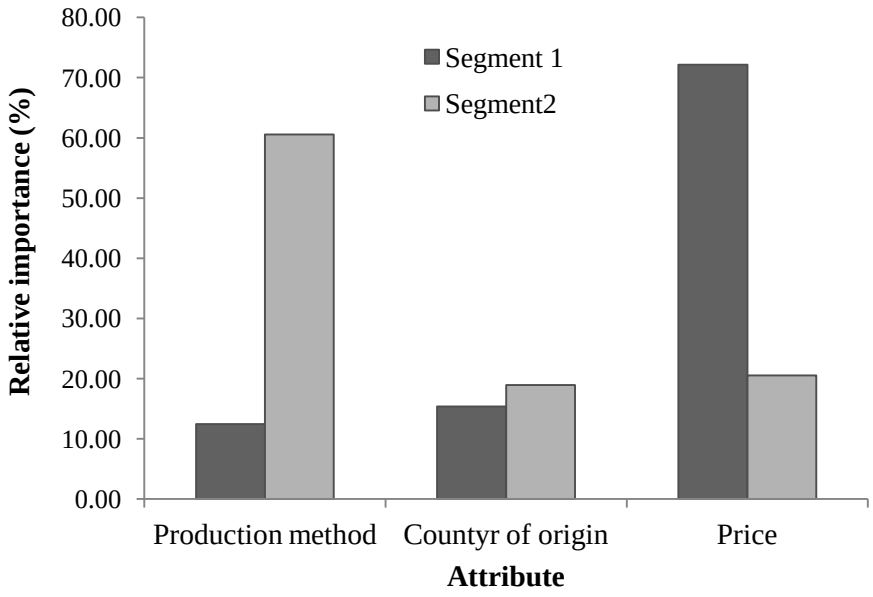
Table 8.7 Part-worth utility estimates for canned pineapples (*n=158)*

Attribute	Level	Part-worths	
		Segment 1 (size 53.7%)	Segment 2 (size 46.3%)
Production method	Organic	-17.49	30.83
	Conventional	1.26	-112.77
	Fair trade	16.22	81.94
Country of origin	Tanzania	27.08	9.55
	Ivory coast	17.75	-20.32
	Philippines	-44.83	10.76
Price	£0.69	84.14	34.27
	£0.99	26.09	5.66
	£1.29	-110.23	-39.93
Chi-square	1277.52		
Percent certainty	45.99		
CAIC	1801.03		
Relative chi-square	34.53		
Avg. membership probability	0.98		

Note: Reported are the re-scaled part-worth utilities for comparability

8.3.4 Relative importance of the attributes for pineapple buying decisions

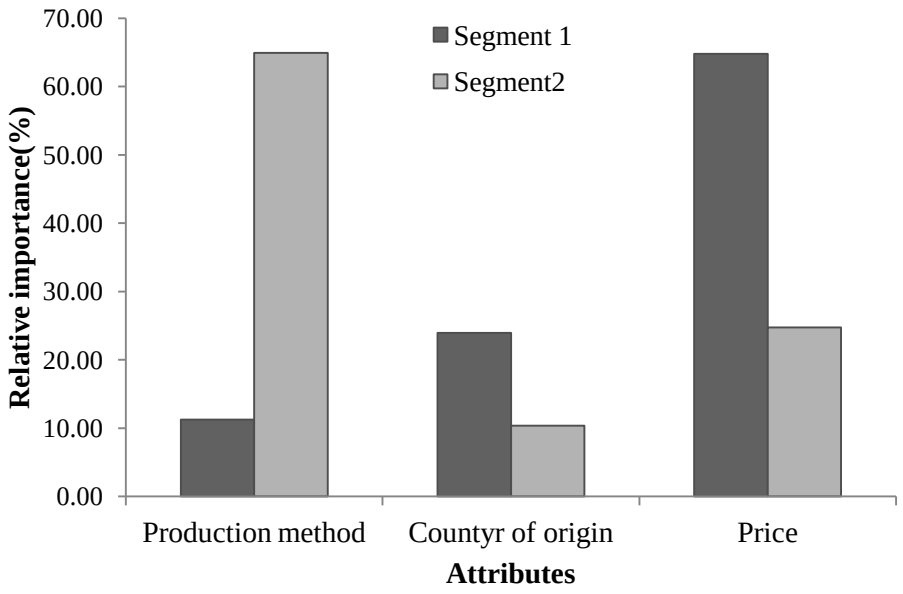
Dividing the part-worth range of an attribute by the sum of all range values provides a measure of the implicit relative importance that respondents assign to each attribute (Sawtooth inc. 2008). The computed relative importance for each attribute across the segments in the two surveys is presented in Figures 8.1 and 8.2 for fresh and canned pineapples respectively. Of the three attributes, price was relatively the most important influence on stated preferences for fresh pineapple for 60% of the respondents (segment 1), while production method was the most important attribute for the remaining 40% of the respondents (segment 2) (Figure 8.1). Price was more than four times as important as the country of origin or production method for the price sensitive segment, while production method was three times as important as the country of origin or price for the less price-sensitive segment of the consumers (Figure 8.1).



***Note*:** About 60% and 40% of respondents fall in segments 1 and 2 respectively.

Figure 8.1 Relative importances of attributes on fresh pineapple choices

Like fresh pineapples, price was the most important criteria for 54% of the respondents (segment 1) on their stated preferences for canned pineapples; it was almost three times as important as the country of origin and more than five times as important as the production method. Production method was the most important criteria for the remaining 46% of the respondents (segment 2) in the canned pineapple survey; it was six times as important as the country of origin and more than twice as important as the price (Figure 8.2).



***Note*:** About 54% and 46% of respondents fall in segments 1 and 2 respectively.

Figure 8.2 Relative importance of attributes on canned pineapple choices

8.4 Discussion

8.4.1 Country of origin and means of transport

The results indicated a fairly good knowledge of the location of the producer countries since 63% of the respondents could tell which of the three countries was furthest from the UK. However, 81% of the respondents indicated the country of origin was not particularly important in their pineapple buying decisions while only 25% reported regularly looking for country of origin information in their produce. Furthermore, the 'country of origin' appeared to have a relatively low importance on the stated preferences for pineapples as it carried the relative importance of less than 24% in both surveys and respondent segments. These results suggest that, although consumers may have fairly good knowledge of the producing country location relative to the consumption country, their buying preferences are not necessarily influenced by this knowledge of distance. This underpins the findings by Kemp *et al*., (2010) in the UK that "food miles" or the "long distance travelled by food" would stop only 21.5% of the respondents from buying that produce.

The ‘local food system’ description remains vague because the issues of the definition of local food systems are spatial, moral and functional and by no means inclusive in their manifestation (Anderson and Cook, 1999; Feagan, 2007, Martinez, 2010). A study by Darby *et al*., (2008) reported state boundaries in the USA appeared to coincide with respondent visions of “local” production. According to Jensen (2010), a local food system generally comprises the actors and process of growing and processing food near its end market, the consumer. The geographic proximity though might mean food is consumed within 100 or within 400 miles or within the state where it was produced (Jensen, 2010). In the current study, the three producer countries were neither from the same region nor continent as the UK and the country of origin preferences appeared to be insignificant in influencing the buying decision. These findings proposes that, when the geographic proximity goes beyond a certain point i.e. when consumers can no longer identify themselves with the producing country in terms of region, country or continent – the distance travelled by food no longer plays a role in shaping the buying decision.

Means of food transport have been identified as a substantial contributor of carbon emissions (Garnett, 2003; 2011); with air-freight being reported to contribute significantly higher emissions than other means of transport (Mason *et al*. 2002; DEFRA, 2005; Sim *et al*., 2007; MacGregor and Vorley, 2006; Kemp *et al*., 2010). Coley *et al*. (2011) suggests mode of transport is as important as distance in determining the carbon emissions from produce transport. This means for ecologically conscious consumers to take the decision to shift to the purported more sustainable chains, they would need a general understanding or indication of the distance travelled and the means of transportation of the food. Respondents in this study revealed only 55% and 40% were aware of the means of transport for canned and fresh pineapples respectively into the UK. This suggests that about half the consumers would not be able to make the ecological conscious decisions even if they wanted to due to a lack of sufficient awareness. If sustainable consumption is to be achieved through shifting purchasing patterns to food chains with lower carbon emissions, efforts may needed to build awareness of the produce transport means as well as distance travelled. However, product life cycle assessment studies point to the fact that, transport makes on average

relatively minor contribution to overall food chain emissions (DEFRA, 2008; Edwards-Jones *et al*., 2008; Garnet, 2010). The decision on produce choice should thus consider the whole value chain rather than only selecting parts of the chain.

8.4.2 Respondents' segmentation

Latent class segmentation revealed two homogenous groups, price-sensitive segment (60%) and the less price-sensitive segment (40%) of the respondents. Price was more than four times as important as the country of origin or production method for the price-sensitive segment of the respondents for fresh pineapple stated preferences. Similar results were observed for canned pineapple respondents. This class segmentation suggests that price is the major barrier preventing consumers from buying either organic or fair-trade pineapples. Since more than half of the respondents fall in the price-sensitive category, current or new entrants into the fresh pineapple market may wish to focus on keeping the price affordable to this group of consumers. As noted by Vagneron *et al*., (2009), the large players in the fresh pineapple sector such as Dole, Del Monte and Fyffe might afford to keep the prices affordable through economies of scale and other supply chain flexibilities. The bigger question would be on how the smaller players like a group of SSA smallholders through a small exporter can manage to make their produce appeal to the price sensitive 60% of the consumers.

Production method was three times as important as the country of origin or price in the stated preferences for the less price-sensitive segment of the respondents. Fair trade pineapples were the most preferred followed by organic. The segment derived 21 times more utility from fair trade pineapples compared to the price-sensitive group. This suggests that there is a group of consumers (40%), to whom price is not a limitation as such, and would prefer fair trade pineapples over organic or conventional. Similar results were observed from canned pineapple stated preferences. The indication here is that, this consumer segment is more concerned about welfare of the upstream actors of the supply chain than the purported ecological benefits that might accrue from organic production. Organic farming in SSA is geared towards improving farmers' welfare (livelihoods) (Johannsen *et al*., 2005; Bakewell-Stone *et al*., 2008; APO, 2010), while

ecological benefits if any are viewed as by-products. Combining fair trade and organic certification in SSA might allow more effective targeting of those consumers who derive maximum utility from the produce with the welfare improvement potential.

8.4.3 Implications for the future prospects for SSA organic pineapples

The segmentation analysis indicated the existence of two consumer segments one most likely to choose produce based on price (price sensitive) and the other most likely to choose produce base on the production method (less- price sensitive). The less price sensitive segments of consumers (40% of the respondents) derived the most utility from fair trade produce for the two products, followed by organic. This was the segment that was most likely to buy fair-trade and organic fresh and canned pineapples. Promoters of smallholder organic farming and export from SSA may wish to focus their effort in fair trade certification as it may offer competitive advantage on their organic pineapples. Targeting the price sensitive segment of consumers may be difficult for small producers that cannot employ economies of scale to lower prices.

The findings also suggested that, when consumers can no longer identify themselves with the geographic proximity of the producer country, distance no longer plays a role in shaping consumer buying decision. Ivory Coast was geographically more proximate to the UK and the Philippines the furthest – three times further from the UK than the Ivory Coast. However, 'producer country' preferences had the least relative importance of the three attributes and did not reveal any consistent order of liking between the consumer segments or between the two products. This suggests that, distance is not an issue when there is no local or near local competition. SSA pineapple producers can, for the time being, focus on other aspects of the supply chain that may make their produce affordable in order to target some of the price sensitive consumers or else add a competitive edge through fair trade certification.

8.5 Conclusion

Raised awareness of the location of the producer countries relative to the UK and perceived importance of the environmental concerns does not necessarily reflect

consumers stated preferences for fresh and canned pineapples. A lack of any preference order for the three countries across the two products and consumer segments suggests that, when there is no local alternative, the distances between producing and consumption countries are no longer important in the buying decision. Instead, other product attributes like production method and price become the priority. Overall fair-trade pineapples yielded the highest utilities for the respondents followed by organically produced pineapples, while lower pineapple prices were preferred to higher. Lowering pineapple prices may be an appropriate strategy to appeal to the price-sensitive category of the consumers. However this may prove difficult to smallholder farmers that cannot employ economies of scale and other supply chain flexibilities to lower their costs. A combination of fair trade and organic certification may prove beneficial in targeting the less price-sensitive consumer segment as they appear to prefer the pineapples in that order.

CHAPTER 9: GENERAL DISCUSSION, CONCLUSION AND RECOMMENDATIONS

9.1 Introduction

The growth of organic fruit and vegetable (F&V) markets in Europe and elsewhere in the developed world is increasingly seen as an opportunity for producers in developing countries to access the high value export niche markets (USAID, 2007; APO, 2010; UNEP-UNCTAD, 2008; EPOPA, 2008) and subsequently improve their incomes and livelihoods (Bolwig *et al*., 2009; UNEP_UNCTAD, 2008; 2010). Many smallholder export oriented initiatives in SSA, including organic farming, are organized into contract schemes. The structural organization of the schemes is such that, the exporter/firm takes responsibility for farmer training programmes, communicates and enforces standards (Mnenwa *et al*., 2007; Bakewell-Stone, 2007; Bolwig *et al*., 2009). This arrangement helps smallholders gain access to high value markets demanding prices that are in most cases higher than existing local market prices (Kirsten *et al*., 2005, Mnenwa *et al*., 2007; Bakewell-Stone, 2007). Since the whole structural organization, contract farming and organic farming co-occur; it is important to disaggregate the impacts of organic farming from the impacts of contract farming or export production arrangements.

Export organic farming has been highly promoted in SSA from the early 2000's by governments and development agents notably the Export Promotion of Organic Products from Africa (EPOPA) and UNEP-UNCTAD Capacity Building Task Force on Trade, Environment and Development (UNEP-UNCTAD CBTF). Domestic organic markets paying premium prices in SSA are scarce (Kilcher *et al*., 2008; Kazimoto, 2009; Boon and Semakula, 2010; Mhana, 2010). Due to small capacity of F&V organic export firms in SSA, a substantial part of organic produce is being sold to domestic markets through conventional channels and often at a lower price than conventional produce (Kazimoto, 2009; Boon and Semakula, 2010; Mhana, 2010). Nonetheless, studies assessing the impact of organic farming in Africa tend to focus on export-orientated farmers. Little research has assessed the contribution of organic farming systems to domestic selling organic farmers in SSA. This study assessed the contribution of domestic and export-orientated organic farming to smallholder livelihoods in Tanzania. The broader aim of

the study was to understand the wider impacts of organic farming in the region on smallholder farmers' livelihoods.

The study specifically investigated the income differences between organic and conventional systems disaggregated by those farmers in contract schemes and those with no contact, selling domestically and those involved in export. The adoption of organic farming in developed countries has been attributed to farmer concerns for environmental issues (Burton, 2003; Best, 2008). Its adoption in SSA is thought to be driven by the need to generate income through improvement of farmers' access to high value markets which are mainly export markets (e.g. Johannsen *et al*., 2005; Bakewell-Stone *et al*., 2008; APO, 2010). Organic farming is relatively a new concept in SSA and little has been done to understand the adoption of organic farming practices. No study has assessed the factors influencing the adoption of organic farming practices among smallholder farmers in Tanzania. If the purported benefits of organic farming are to be realised, there is a need to investigate factors that influence adoption of these practices in order to use this knowledge to formulate policies that encourage adoption. To generate this knowledge, an assessment of the factors influencing the adoption of organic farming among smallholder farmers was undertaken.

Organic farming is also thought to improve food security as measured through increased production and improved income proxies (UNEP-UNCTAD, 2008; 2010). While some studies in SSA have reported improvement of incomes for organic farmers (Bolwig *et al*., 2009), other studies have reported no observed income differences between organic and conventional farmers (Akyoo and Lazaro, 2008). With studies reporting improved farm productivity associated with organic farming (Bradgley *et al*., 2007) and other studies reporting reduced productivity (Waggoner, 1994; Smil, 2001; 2004; Connor, 2008); there appears to be a lack of agreement as to whether organic farming increases productivity or not. Furthermore, other indirect benefits of organic farming which impact food security, such as health benefits accrued from non-use of synthetic fertilizers and pesticides are not reflected in the 'income' and 'productivity' proxies. The use of the 'production improvement' and 'income improvement' proxies to assess

the food security impact of organic farming thus appear to be inadequate. No study has assessed the food security impact of organic farming on domestic and export-orientated farmers in Tanzania by directly assessing their food security status. It was therefore important to comparatively assess the household food security status between the farming systems and sectors using the coping strategy index (CSI) in order to generate more realistic data about the impacts of organic farming on food security.

It has been argued that, organic farming improve farmer's health through pesticide use reductions (Faria *et al*., 2009; Scialabba, 2007) or improvement of income through premium prices (Stronks *et al*., 1997, Lynch *et al*., 2000; Ruger, 2003; Mackenbach *et al*., 2005; Marmot, 2005). However in SSA smallholder farming, the use of synthetic pesticides and fertilizers is very low even in conventional systems (Groot, 2009; World Bank, 2006), and thus no significant health benefits are expected from organic farming. But the income and health of farmers is thought to have be positively correlated, especially for the lower earning categories (Stronks *et al*., 1997, Lynch *et al*., 2000; Ruger, 2003; Marmot, 2005; and Mackenbach *et al*., 2005). Organic farming is therefore assumed to improve smallholder farmers' health in SSA because of the potential to improve incomes relative to conventional farmer incomes. No study has assessed the contribution of organic farming to farmers' health in SSA. The current study assessed the impact of organic farming on farmer health in domestic and export sectors in Tanzania.

In addition, the future of organic exports does not seem so certain with unresolved debates relating to air-freighting of organic produce, food miles and the growth of the local food movements. Studies have assessed consumer preferences, choices and trends on imported products/foods with local alternative (e.g. Chambers *et al*., 2007; Feenstra, 1997; Juric and Worsley, 1998; Garber *et al*., 2003; Lopez *et al*., 2006). For fruits such as pineapple, no locally grown alternative is available to European consumers and the purchase decision is made in the absence of local alternatives. Aspect of the product such as distance travelled and environmental concerns or welfare of the up-stream actors in the supply chain may be of importance to consumers. However, it is not understood if

these aspects are equally important when there is no local alternative to the produce in question. Currently, no studies have assessed the importance of these aspects and subsequently their role in influencing the purchase decision in absence of local alternative. In order to assess the future prospects of tropical organic exports, UK consumers' purchase decisions for imported fruit (in absence of local alternative) were investigated.

9.2 General discussion

9.2.1 Adoption of 'organic farming practices' among smallholder farmers in Tanzania

Socio-economic factors were used to assess the characteristics of the household or farmers that made them more likely to adopt 'organic farming practices'. The survey of 488 smallholder farmers revealed that organic farming practices that required more land and/or substantial financial investments such as fallowing and terracing were the least adopted. Those requiring minor adjustments were the most adopted even by conventional farmers. Farmers with smaller plots were more likely to adopt organic practices than those with larger farms. Households led by older heads were more likely to adopt more organic practices than those led by younger household heads. The characteristics here, which were found to influence the adoption of organic farming practices appear to describe a 'vulnerable' farmer i.e. older farmer, who cannot afford substantial financial investment on new organic practices and can only run a small plot. It is important to note that 'substantial' is a relative term. The cost of terracing one hectare of land varied from 30,000Tshs ($20) to 90,000 Tshs ($60) in 2009, presenting 'substantial' costs to a farmer who lives on less than $1 per day.

Unlike the developed world where environmental benefits of organic farming are the main driver for adoption (e.g. Best, 2008; Burton, 2003), such was not the case in this study. Economic or monetary related reasons were the prime driver for smallholder adoption of organic farming practices. Approximately two-thirds of adopters mentioned economic or monetary reasons as the main motivation for their adoption. It would therefore appear that, adoption of organic farming in poor countries is subject to its ability to provide the sought monetary or economic benefits. Similar findings have been

reported from other developing parts of the world such as Latin America and the Caribbean where perceived economic benefits were the overriding motivation for adoption (IFAD, 2003).

Lack of organic farming knowledge appears to be a limiting factor in the adoption of most practices. This suggests that more training and provision of organic farming information and support to smallholder farmers might lead to wider adoption of this farming system. An interesting finding was that, farmers with access to conventional markets and synthetic inputs showed low adoption rates to organic practices. The higher earning farmers by household income in these areas were less likely to adopt most of the practices whilst visits by extension workers had a negative influence on the adoption intensities of such farmers. Farmers mentioned that they only chose organic farming due to a lack of money to buy synthetic inputs, suggesting that they were not organic farmers by choice but rather owing to restricted circumstances. It appears from these findings that organic farming is an appealing option for the vulnerable poor and that if access to markets (albeit domestic markets) was improved, many farmers would not opt to farm organically. It can then be reasonably suggested that organic farming be targeted to smallholder farmers with limited access to markets and synthetic inputs because they are more likely to adopt this farming system. Otherwise, if the aim is to bring about economic development through agriculture, the best alternative might be to focus on improving basic transport, telecommunications and energy infrastructure in order to develop better and accessible domestic markets while the export markets initiatives can still co-exist for the farmers that are willing to take that route.

It is still unclear as to why the visit by government extension worker had a negative influence on the adoption of organic practices. It can only be speculated that the extension worker aimed to encourage the use of external inputs (which is a common agenda of governments) so as to improve productivity contrary to the direction of private organic schemes agenda (IFOAM, 2007).

9.2.2 Organic farming and smallholder farmers' incomes

Organic farming was found to be a predictor of household revenues when farmers were contractually linked to active exporting schemes. Under such conditions, organic farmers had significantly higher household revenues compared to their conventional counterparts. The findings agree with other studies on contractual organic export schemes where the smallholder farmers' incomes were reported to improve in SSA (Bolwig *et al.*, 2009; UNEP-UNCTAD, 2008). However, this improvement in incomes was found to be limited to the contractually linked exporting organic farmers only. Smallholder organic farmers who were not contractually linked to an active buyer/exporter were significantly worse-off in household incomes compared to their conventional counterparts. Domestic selling farmer participation in organic farming had no influence on farmer incomes.

The combination of organic certification, contracts and export appear to be responsible for the observed improved incomes. With organic certification alone, the farmers that were not contractually linked to an exporter and subsequently sold most of their produce in the domestic markets, were significantly worse-off in incomes than their conventional counter parts. The increased costs for certification and adherence to export standards whilst they end up selling their fruits in domestic markets appear to be the reason for their lower incomes compared to the conventional farmers.

The study demonstrated that organic farming has no tangible influence on revenues for domestic targeted fruit production. This raises an important question about the 'by and large' capacity of organic farming to improve incomes for smallholder farmers in Africa (UNEP-UNCTAD, 2008; 2010). It is not cheaper to produce certified organic fruits in poor countries such as Tanzania; compared to conventional as the extra certification and standard adherence costs make it more costly. It is neither more profitable when the fruits are sold in the domestic markets where premium prices are absent. Even for uncertified and/or locally certified organic farmers who have reduced certification and export quality requirements, it is still unprofitable compared to conventional production. This is due to domestic consumers and processors paying more for larger and heavier

fruits whilst organic fruits were reported to be by far smaller in size and weight (Mhana, 2010; Kishor, 2009) probably due to non-use of agro-inputs.

Care should thus be taken to avoid generalizations regarding organic farming's potential to improve smallholder farmer's income. Organic farming may have a role to play in generating income but must be tied to export contracts. Governments, NGOs, international agencies and policy makers promoting organic farming may wish to consider investing in developing stronger export market links for smallholder organic farmers if poverty alleviation and environmental conservation objectives are to be achieved simultaneously.

9.2.3 Organic farming and food security

The potential for organic farming to contribute to food security have been documented in a few studies (Bakewell-Stone, 2006; Bolwig *et al*., 2007; Bakewell-Stone *et al*., 2008; UNEP-UNCTAD, 2008; 2010). The present study has demonstrated that organic farming can only improve household food security for contractually linked, exporting organic farmers. The household food security status for domestic selling or partly exporting (the non-contractually linked organic farmers) was no different than their conventional counterparts. Many organic farming studies in Africa have focused on export-oriented farmers and the benefits accrued from export organic farming are perceptionally generalized across the sectors. The present study has demonstrated otherwise, i.e. without export markets the food security improvement potential of organic farming cannot be realized.

Like the income implications of organic farming on smallholders, food security improvement from organic farming is brought about by the organization of the export schemes, the selling assurance due to contracts and additional incomes from the premium prices. Organic farming on its own does not appear to improve the household food security, although it may have a role in adding a competitive edge for export fruit targeted at environmentally conscious consumers. More efforts may be needed to secure

and maintain export markets if organic farming is to contribute to household food security in SSA.

9.2.4 Organic horticulture, export and farmer's health

The 'reduction in the pesticide use' and 'improvement of income' potentials of organic farming are thought to improve farmer health (Crissman *et al*., 1994; Knutson, 1999; Fritzell *et al*., 2004; Mackenbach, 2005). This is the first study to assess the impacts of organic farming on health in SSA. No significant differences were observed between organic and conventional farmer's health in the exporting or domestic selling sectors.

The relationship between income and health is understood to be curvilinear i.e. as the income increase, the health becomes better but at diminishing marginal return (Stronks *et al*., 1997; Fritzell *et al*., 2004; Mackenbach, 2005). In Tanzania, where smallholder farmers earn very little, it was reasonable to expect that improvements in income would generate equivalent linear improvements in health status. Such results were not observed in this study. One possible suggestion from the findings is that income improvements or increased food variety and availability linked with organic farming are not sufficiently substantial to have significant influence on farmer health.

This does not rule out the possibility of health improvement through export agriculture. Only the exporting organic farmer had consistently better health scores than their conventional counterparts although this difference did not reach statistical significance. A wider comparative study, as part of the Rural Economy and Land Use Programme (RELU), investigated the sustainability of national and international fresh vegetable produce supply chains in the UK, Spain, Kenya and Uganda. One of the assessment criteria was farm-worker health. The study revealed that export horticulture generated health benefits for farm workers employed in the export sectors in Kenya and Uganda (Cross, 2008; Cross *et al*., 2009a; b). The consistent better health trend observed in the exporting organic farmer category in the present study supports RELU study findings in Kenya and Uganda.

9.2.5 The future of organic exports from SSA

More than 40% of UK consumers were unaware of the distances between the producing countries and the UK, whilst more than half of the consumers were unaware of the means of transport of the pineapples into the UK. Although a fairly average knowledge of the distances and means of transport of the tropical produce into the UK was observed among consumers, overall the distance travelled or means of transport had very little role to play on their purchase decisions. Some studies have shown local to be preferred over imported produce due to issues related to food miles or carbon emissions (Arnout *et al*., 2007; Chamber *et al*., 2007). In the present study where the 'local' option was not available it appears that distance travelled and the possible carbon emissions from the means of transport are not as important in the purchase decision. It then appears that food miles, carbon foot-printing developments and local food movements are only a threat to imported products that have perfect or very close local substitutes. The sale of tropical organic products such as pineapples may still thrive in the European markets in the near future unless some new and probably less energy consuming system is devised to produce the same in the temperate climates.

Approximately 60% of consumers were price-sensitive, underscoring the importance of keeping the production costs low if these consumers are the target. Smallholder farmers may be disadvantaged here due to limited production capacities and othe economies of scale disadvantages. Working in groups or farmers co-operatives may help. The less price-sensitive consumer segment that comprised approximately 40% of the surveyed consumers preferred fair trade fruits over organic and conventional in that order. Overall in both categories, fair-trade fruits were the most preferred followed by organic and last conventional. This suggests that, if the prices can be kept affordable, shopping decisions might be shaped by the producer welfare - fair miles (MacGregor and Vorley, 2006) rather than the food miles.

The preference of fair-trade followed by organically produced food might also be an alternative for smallholder farmers to target the less-price sensitive niche. Due to intensive manual labour requirements, running small organic farms is considered

cheaper and economical than larger farms (MacRae, *et al*., 1990; Lampkin and Padel, 1994; Egri, 1999; Bakewell-Stone *et al*., 2008; Naegeli and Torrico, 2009). While large companies can enjoy the economies of scale and other supply chain flexibilities, smallholder farmers can take advantage by combining organic production and fair trade certification to win over the less price-sensitive – welfare concerned consumers. Generally, organic and fair trade products continue to be niche market products rather than mainstream products.

9.3 Limitations of the study

Possible limitation to this study are methodological and/or design related and mainly due to time and resource constraints. Some of the limitations have been raised in their respective chapter's four to eight. There are a number of issues that could have been addressed differently and potentially improve the outcome to enable more rigorous conclusions and generalizations of the findings.

- The nature of quantification of the costs, incomes and farm sizes is a possible limitation. The farm sizes and harvest quantities reported relied largely on farmers' memory recall and records for those who kept records. Reliance was also on the interviewers' experience on farm size estimation through observation (at least to establish if the farmer was hugely over or under-reporting). No attempt was made to do actual counting or measurement of farm sizes. Although the key informant interviews were used to establish ranges for transport costs and other farm activity costs, market prices and yield per hectare; acquiring this information also largely relied on farmer's memory and records.

- The comparison of organic and conventional farmers in the study gave a good indication of the possible benefits that can be accrued from the farming system. However comparing exporting organic farmers and conventional farmers that are selling domestically tends to overestimate the benefits of organic farming due to the inclusion of the export effect and subsequently underestimate the conventional farming system. In an ideal environment, one would like to compare organic and conventional farmers both from the same geographical

locations and exporting to the same markets. This could not be achieved in this study as the conventional pineapple farmers were selling their produce into the domestic markets.

- An observation, not necessarily a limitation in this study, could be the influence of the 'social desirability bias' in the food security status and self reported health studies. In face to face interviews, respondents are known to under-report the perceived socially undesirable aspects and over-report the socially desired aspects (Nunnally, 1978. Lautenschlager and Flaherty, 1990; Randall and Fernandes, 1991; Fisher, 1993). Overcoming this bias in SSA is problematic as many of the respondents possess weak literacy skills making the face to face interviews a necessity. However, since the nature of this study was a comparative assessment and the respondents were chosen from the same societies – it can be presumed the social desirability bias, if present, would affect both organic and conventional farmers in similar ways. In this way the comparative results of this study can yield valid conclusions. This does not rule out the possibility that the findings might be misleading if they were to be used in non-comparative studies e.g. to reflect the food security status or health of the Tanzanian farmers.

- Like other studies in SSA (e.g. Bolwig *et al*., 2009; Lazaro and Akyoo, 2008), family labour inputs were not quantified in the present study. This was due to the difficulties in obtaining the proper records or memories of number of times family members were involved in the farm work. Lack of standardised measure of women, men, child labour per hour or day basis was another impediment. Since organic farming is known to be labour intensive, the quantification of family labour in both systems could have offered another dimension to the present findings.

9.4 Conclusions

Major problems commonly pointed out in African agriculture relates to poor transport infrastructure which limits access to markets; insufficient access to consultation and information; low political lobby; and low economic investment and support of the

sector. This study revealed organic farming is more appealing/more adopted by the poorer group of smallholder farmers with limited access to synthetic inputs and markets. The study further revealed organic farming can improve smallholder farmers' incomes through improved market access only when they are contractually linked to exporting scheme/buyer. Food security as well as health benefits of organic farming to smallholder farmers were also found to be a result of the contracts and export aspects of the organic farming. Whilst much of the effort and promotion of organic farming in tropical Africa focuses on its ability to improve poor farmers' livelihoods, these livelihoods can potentially only be improved when organic farming is coupled with export. Currently only a very few organic farmers have access to export markets and are nonetheless constrained by the exporters limited capacity to purchase all the available produce. As a result organic farmers lose out as their surplus produce tends to go to the domestic conventional markets where they lose their premium prices whilst still incurring the costs of conforming to organic export standards.

Developing domestic organic markets that can pay premium prices could be a long-term solution. However underlying agricultural sector support, information access, infrastructural and marketing problems facing smallholders in tropical Africa needs to be addressed in order realize the rewards of any farming system. The study indicated farmers with access to urban domestic markets and synthetic inputs were less likely to adopt organic farming. It then appears that, if domestic infrastructural, information and input access issues are properly addressed, the choices of farming systems might be very different. However, if the policy objective is to improve farmers' livelihoods in a way that is less destructive to the environment, then the development of export markets for organic produce appears to be a vital solution. The study overall indicates that although organic farming may have a role to play, it cannot resolve the multitude of problems facing smallholder farmers in SSA, nor should it be viewed as a panacea for food security or poverty reduction in the region.

Raised awareness of the distance travelled by tropical fruits and means of transport does not necessarily reflect consumers stated preferences for fresh and canned pineapples.

The sale of tropical organic exports with no close local substitutes appear to have a brighter near future amid the food mile debates, local food movements and carbon foot-printing developments. Smallholder farmers from SSA can add a competitive edge over their produce if they choose to combine organic and fair trade certifications.

9.5 Recommendations

Specific recommendations have been given in chapters four through eight, generally the government and other organic farming stakeholders could focus on providing more organic farming information, training and support if the farming system is to be more widely adopted among smallholder farmers in SSA. There is also a need to harmonise the government and private sector objectives in agricultural/ agribusiness development. When the government objective is to improve the use of agro-chemical inputs for improved productivity whilst the private sector aims for organic farming in the same location, the conflicting objectives become hard to implement and confusing for farmers.

The government, policy makers and other organic farming stakeholders may also wish to invest in obtaining and maintaining export markets for organic produce if the purported benefits of organic farming are to be realized by farmers. Focus on building awareness and development of domestic organic markets equally important for the future of organic produce because in practice, not all organic farmers will have an opportunity of exporting their produce.

The government and policy makers may wish to use the knowledge that, the main problem for smallholder farmers regardless of the farming systems seems to be access to markets. Therefore, improvement of the basic transport, telecommunications and energy infrastructure in order to develop better and accessible domestic markets at par with the export market initiatives for farmers that are willing to take that route is vital if agricultural development and subsequent livelihood improvements are to be achieved.

9.6 Areas for further research

More comparative research of organic and conventional farming systems in SSA is needed to understand the benefits of the system. A study on the exporting organic

farmers vs. exporting conventional farmers from the same locations exporting to similar markets might clarify further the unique contribution of organic farming. Furthermore, quantification of family labour inputs in the organic vs. conventional studies could offer another dimension to the organic vs. conventional comparative studies in SSA. Such a study could involve fewer respondents but follow and quantify the family labour inputs in one or more production seasons to provide a more holistic assessment of production costs in comparing the two farming systems in developing countries.

There is a need to conduct domestic market studies on the consumer knowledge, awareness, and preferences of organic vs. conventional produce, their reasons, profiles and willingness to pay in order to develop organic and establish domestic organic market potentials. In line with assessment of domestic market potential and market development studies, it would also be informative to establish domestic consumers' perception of the local and international organic certification of the produce in order to establish potential costs and subsequently prices for the products.

During the field survey, a substantial number of dropouts from organic schemes were observed; some schemes did not exist at all after less than two years of donor support phasing out. It would be worth understanding the reasons behind these drop-outs and collapse of organic farming initiatives and subsequently provide information on the sustainability of donor supported organic farming initiatives.

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APPENDICES

Appendix 1.0: Smallholder farmers' questionnaire

Introduction

My name is…….. from Sokoine University of Agriculture. This interview is part of the study on **"The enhanced export of fruits and vegetable from Tanzania"**. With your permission, I would like to ask a few Questions related to your farming business. There is no correct answer, give the answer that best reflect your situation. The interview will take about 35 minutes. It is a study for postgraduate research degree and the responses given will not be used for any other purposes than scientific research. So please be assured we will honor your confidentiality.

A. General information

1. Questionnaire number …….
2. Date of the interview……..
3. Name of the interviewer……
4. District……
5. Village……
6. Name of the respondent …….
7. Gender of respondent;

   1= Male 2= Female
8. Relationship to household head

   1= spouse 2= son/daughter 3=Hh
9. Gender of the household head

   1= Male 2= Female
10. Age of the household head…….

    (in range of 10-15, 16-20,21-25etc)
11. Occupation of the farm business owner
    i. full time farmer
    ii. part time farmer(employed somewhere else)
12. Level of education of the person in control of the farm business

    1= not completed primary school 2= completed primary school

    3= secondary education 4= post secondary qualification

13. Household composition

0 – 17 yrs	18 – 60 yrs	Above 60 yrs	How many do work in a farm?

14. Number of people in the household with the following qualification

Not completed primary school	Completed primary school	Secondary education	Post secondary qualification

B. Household food security (Indices on household coping strategies)

15. ***To be answered by the person in the household responsible for food preparation.*** **There is no correct answer, please pick the one that best applies to your situation**

In the last seven days:

Question/Answer	Never	Rarely (one time/meal)	From time to time (2-3 times)	Often (5 or more times)
Has the household consumed less preferred foods? (input from the checklist)				
Have you reduced the quantity of food served to men in this household?				
Have you reduced your own consumption of food?				
Have you reduced the quantity of food served to children in this household in the last 7 days?				
Have members of this household missed meals because there was no enough for 3 meals in the last 7 days?				
Have members of your household missed meals for a whole day?				

C. Household resources and farm information

16. Total amount of land possessed(number of plots and their sizes)

a. Own

Plot			
Area			

b. Hired

Plot			
Area			

17. Which types of fruits and/or vegetables do you produce either for sale or your own use

Type				
Area				
Farming practice (1=Certified organic 2=organic not certified 3=Conventional)				
End use(sale, consumption, sale and consumption.)				

18. Besides the F&V what other crops do you produce

Crop	Certified Organic	Organic not certified	Conventional	Area

19. Which of the above crops are planted together(mixed)

……
……
……..

20. Which ones are rotated in the same area/plot

……
……
……..

21. Area under fallow land…….

22. Rank the Crops in order of their importance(includ. the F&V) to your household

Crop	Why important?		
	Income	Food security	Other reason

23. Number and types of livestock owned by the household

Type	Number

24. Number and types of vehicles owned in the household

Car…….
Motorbike……
Cart……
Bicycle……
Others……

25. Type of housing for the household

i. Mud with thatched/grass roof
ii. Blocks with grass roof
iii. Blocks with iron roofing
iv. Others (specify)…….

D. Land ownership status

26. Indicate if any land has been bought, rented, sold, or rented out, in the last 12 months

Bought land (acres)……..

Land purchase costs (Tshs)……..

Rented land (acres)…….

Land rental fees paid (Tshs)…….

Sold land (Acres)…….

Land sale income generated (Tshs)……

Rented out land (acres)……

Land rental income generated (Tshs)……..

E. Production costs in 2008 season

27. **Area used for pineapple production**

In 2007……(Acres)
In 2008……(Acres)
In 2009……(Acres)

28. **Labor costs**

a) No. of family members who worked on the plots last week (Number)…… (If not production season recall typical work week)
b) Is this typical of normal week? ..... If not, why not? And how is the typical week like?……
……
……
……

c) Family labour inputs (Typical week estimation)

	Men	Women	Children	Total
Number of family members working in farm				

Days spent(days)				
Labor hours/day(hrs)				
Total hours worked(hrs)				
Rate per labor hr (Tshs)				
Total family labor value (Tshs)				

d) How long is the typical production season (in weeks)……..

e) Does it involve the similar workload throughout (typical week as above?) ..…….

f) If not, give details

……
……
……
……
……

g) Payment for Hired labor (Tsh)…… (for season or typical week whichever is easier to remember)

Total labor cost (Tsh)……..

29. **Cost items(last production season) – for pineapple enterprise**

Land clearance	
Ploughing	
Planting	
Weeding	
Mulching	
Manure application	
Fertilizer application	
De-suckering	
Pesticide application	
Harvesting	
Post harvest handling	
Watchperson expenses (on-farm)	
Other costs	

30. **Material costs** (Seedlings / cuttings, Mulching material, Manure, Fertilizer, Pesticides, Input transport, Sprayers, Harvesting tools, Others…..) be specific eg. Peas seeds, carrot seed etc (for pineapple enterprise)

Type			
Units purchased (no., quantity)			
Purchase cost @ unit (Tsh)			
Total purchase cost (Tshs)			
Units hired (no., quantity)			
Hire cost @ unit (Tsh)			
Total hire cost (Tsh)			
Total			

Total materials cost…….

E. Crop selling during 2008 season

31. Sales of ……Pineapple…….

Crop	Eg. maize									
Total units produced	80kg									
Total units sold	50kg									
Farming system	Organic cert.									
Sold as	O	Conv.	O	C	O	C	O	C	O	C
Sold(units)	40kg	10kg								
Price/unit(Tshs)	200	150								
Total value (Tshs)	8000	1500								
Sales point										
Transport. Cost (Tshs)	1000	300								
Ushuru										
Net sales (Tshs)	7000	1200								

Options for sales point.....

1. On-farm (farm gate) 2. Village market 3. Urban market 4. Others (specify)…….

32. Other revenue (Sale of Cuttings / seedlings etc) –related to the enterprise in question(from pineapples)

Product					
Number of units sold(kg)					
Price per unit (Tsh)					
Total value (Tsh)					
Cost of transport (TSh)					
Net sales (Tsh)					

33. What other crops did you sell during 2008 season?

Crop name				
Quantity sold (unit)				
Price @ unit (Tsh)				
Total revenue (Tsh)				
Transport cost to point of sale				
Net revenue				

34. Other sources of Income during 2008 season?

Livestock sales - …….
Wages, Casual work - ……..
Salary, formal employment - ……
Pension - …….
Allowances - ……
Remittances - …….
Others, specify - ……
……
……

G. Farm equipments and implements purchased during last 12 months

35. Equipment costs (Sprayer(s), Plough, Wheelbarrow, Hoes, Spades, Slashers, Machettes, Knives, Other ……) – for the enterprise in question.

Type of equipment / implement				
Number of units				
Purchase cost @ unit (Tsh)				
Total cost (Tsh)				

H. Miscellaneous questions

Planting materials

36. What is your source of planting materials? 1= From own nursery/plantation 2= purchased from nursery farmers 3= Supplied by crop buyer 4=Others(specify)……

Farmer associations' information

37. Is anyone in the household a member of a SACCOS? 1= Yes 2= No If yes since when……
38. Does anyone in the household belong to association or farmers' cooperative? 1= Yes 2= No If yes, since when……Name of the association……
……
……
39. What was spent on fees / subscriptions to associations in 2008? (Tshs) ……..

Credit access information

40. Have you ever (or anyone in the household) received credit from a bank or any other source last 12 months? 1= Yes 2= No
41. If yes, since when?.....
42. If 'YES', indicate credit amount (Sh):…… was the credit used on the enterprise in question?.....
43. Source of credit:…….
44. Purpose of credit: 1= Farm development 2= Farm machinery, implements and tools 3= Post harvest processing 4= school fees, 5= marriage expenses, 6= funeral expenses, 7= buying food, 8= Other (specify)……
45. Interest paid in 2008(Tsh) …….
46. Have you received help in kind? …….If yes, what did you get?.....
47. If in kind what was the value of credit/help? (Sh) ……..
48. Was it used in pineapple enterprise ……..

Farmer training information

49. Has any member of the household received farm training during 2007/08 season? 1= yes 2= No
50. Who was this received from?
51. How long did the course last?.....days

52. What type of training did you get? 1= Pest and disease control 2= Post-harvest processing 3= General training 4= Organic farming practices 5= other (specify)……..

53. How often are you visited by an extension worker/scheme supervisor? 1= Once per week 2= Once per month 3= Every time I demand his /her services 4= Never visited 5=Others(specify)…….

Organic farming information

54. How long have you participated in Fruits/vegetable production business…….. (for organic farmers) how long have you been in the organic farming of pineapples …….(years)

55. How can you rank the market access situation in the past five years and now ……..(use a scale of 1-5 where 1=far much better 2= slightly better 3= the same 4=slightly worse 5= far much worse)

56. How often do you use the following farming practices in your vegetable production?

Recommended practice	Implementation frequency 1.Use of practice now 2. Used it in the past but not now 3.Never used it 4.Never used it but plan to 5. Not applicable 6. Not familiar with the practice
Practice contouring	
Use hedge crops	
Use leguminous plants	
Use green manure	
Use mulching	
Practice crop rotation	
Use natural pesticides	
Use chemical fertilizers	
Use chemical pesticides	
Practice fallowing	
Practice terracing	
Use animal manure	

57. What made you choose to or not to participate in organic farming

……

……
……

58. In your own opinion, what can you say about organic production of fruits/vegetables in terms of the following. Use a scale of 1-5 for parts a and b 1=far much better 2= slightly better 3= the same 4=slightly worse 5= far much worse
    a. Productivity……
    b. Profitability……
    c. Other organic farming benefits you can think of
       ……
       ……
       ……
    d. Organic farming Problems/barriers
       ……
       ……
       ……
       ……
       ……
59. Do you think/know if there is a premium price for organic produce?
    …….....
60. Would you still produce your fruits/vegetables organically if there are no premium prices?
    ……
    ……..
61. What do you think are the impacts of increased trade of F&V (probe on food security, Income, general livelihood status). Is it a good thing/a bad thing? Why?
    ……
    ……
    ……
    ……
    ……
    ……

Thank you for your time.

Appendix 2.0: Focus group/key informants' checklist

Organic Farming

Have you hear of organic farming? .....

What do you understand by organic farming?

……
……
……
……

Why do you think people choose to farm organically?

……
……
……
……
…

Why do you think people choose not to farm organically?

……
……
……
……

What do you perceive as benefits of organic farming? What is it good for?

……
……
……
……

What do you think are the problems of farming organically?

……
……
……

Is there anything you think should be done to encourage more people to farm organically? If yes, mention

……
……
……
……

Would you farm organically if the above conditions were met

……

If you had good access to fertilizer and other chemical pesticides for your pineapple, would you still choose to farm organically? .....

Why or why not……

What changes if any have you seen in your community as a result of people farming organically for export?

.....
.....

Food security

What is your understanding of food security/insecurity?

……
……
……
……

When do you consider a household to be food secure?.....
.....
.....
.....

What are less preferred foods in your area(food consumed in times of less food/hunger)……
……
……
……

What are the considered best foods in your area? (food you eat during harvest season).....
.....
.....
.....

Which months do you have more foods (harvest)

……
……
……

Which ones are the food scarce months?

……
……

What do people normally do at times of less food to cope with the situation? Mention as many strategies as possible used in your area

…….
…….
……
……

Which foods do you consider inferior i.e. consumed when there is food scarcity in your area?.....
.....
.....

Would you normally eat this food during the harvest season?

……..……. …….
.....

Appendix 3.0: Checklists

Organic outlets in Tanzania -checklist

- Their locations
- What products they sell
- Sources of the products –supply chain
- What are their main customers?
- Are their products certified?
- Are the customers concerned about the lack of certification in the products?
- Prices compared to conventional

Scheme organizers' /Exporters' checklist

- Selection of out-growers - criteria
- Participation fee?
- Training costs
- Certification costs
- Monitoring costs
- Recommended practises
- Price setting
- Support – govt? donor?
- Production and export quantities
- Problems

Appendix 4.0: Health questionnaire

1. Maelezo ya kibinafsi

Tafadhali tia alama visanduku vile vinavyotumika kwako

a. Umri ☐ **b.** jinsia Mwanaume ☐ Mwanamke ☐

c. Hadhi ya ndoa

Je! Wewe Uko peke yako ☐ Umeolewa/ umechumbiwa ☐ Umepewa talaka ☐ mjane ☐

d. Ni kwa kiwango kipi ulichokamilisha elimu yako?

Msingi ☐ Sekondari ☐ Chuo kikuu ☐ zingine ☐

e. Je! Unaweza kujifafanua kama

Mvutaji sigara sasa ☐ Aliyeacha kuvuta sigara ☐ Asiyevuta sigara ☐

2. Ajira

a. Je! Unaweza kutuambia cheo chako cha kazi yako ya sasa ni kipi? ☐

b. Je! Kwa sasa umeajiriwa kama ..... (tafadhali tia alama ya mviringo)

Mfanyikazi wa kudumu | Muda maalum | Kibarua cha muda wote | Mfanyikazi wa majira | Muda maalum wa majira

c. Umeajriiwa kwa muda upi kwa aina hii ya kazi?

Chini ya miezi 6 ☐ Miezi 6 – mwaka 1 ☐ Zaidi ya Mwaka 1 ☐ Zaidi ya msimu mmoja ☐ Ikiwa wewe ni wa muda maalum au wa majira, je! Wewe hurudi kila mwaka ☐

d. Ni siku ngapi kwa wiki unafanya kazi katika kazi yako ya sasa? 1 | 2 | 3 | 4 | 5 | 6 | 7

e. Je! Hii ndiyo kazi yako kuu kulingana na mapato ya kila mwaka? Ndiyo | Hapana

f. Je! Una kazi zingine zinazokuingizia kipato? Ndiyo | Hapana | Mwanafunzi

g. Kama ndiyo, kazi hizo zingine unazofanya ni gani? ☐

3. Ufafanuzi wa kazi

Katika siku ya kawaida ya kazi, Je! Kazi yako inahusisha mojawapo ya yafuatayo?
(Tafadhali kadiria idadi ya masaa kwa siku unayotumia kwa kila kazi):

Kuendesha tingatinga	Kutumia mashine ya kulima	Kutumia mashine ya bohari(warehouse)
Kupanda mimea kwa mkono	Kunyunyuzia mimea mwenyewe	Kupalilia kwa mikono
Kupunguza kwa mikono	Kuvuna mimea kwa mikono	Kutumia vyombo vya umwagiliaji
Kufungasha	Kusafisha, kubeba	Kazi ya ofisi
Kulima kwa mkono Zingine (tafadhali eleza)		

4. Vyombo vya kazi

Wakati wa siku ya kawaida ya kufanya kazi, Je! Wewe hutumia mojawapo ya zifuatazo?
(Tafadhali tia alama visanduku vinavyofaa)

Vifaa vya mkono	buti	kofia
Barakoa(mask)	Bwelasuti (overalls)	glavu

5. Vifaa

a. Je! Vifuatavyo/huduma zifuatazo zinapatikana kazini kwako? **(Tafadhali tia alama visanduku vinavyofaa)**

Banda la chakula	Chakula cha mchana cha bure	Vifaa vya kuoga kazini
Makazi ya bure	Maji/ Umeme wa bure	Malipo ya likizo
Marupurupu ya matibabu	Huduma ya watoto	Mafunzo yanayolingana na kazi

b. Je! Wewe husafiri kilomita ngapi kuja kazini kila siku? (Kwenda shamba)**(Tafadhali tia alama visanduku vinavyofaa)**

Chini ya km 1	Km 1-5	Km 5-10	Zaidi ya km 10

6. Hali ya kazi

Kwa kutumia mizani ambapo 1 ni mbaya sana na 5 ni nzuri sana; unawezaje kukadiria hali zifwatazo za kazi yako? **(Tafadhali tia alama ya mviringo kwa kila kipengele kinachotumika kwako)** **Je! Unapenda ....**

a.	Kufanya kazi nje	1	2	3	4	5	Haitumiki (not applicable)
b.	Mishahara yako	1	2	3	4	5	Haitumiki
c.	Kufanya kazi kwa pamoja	1	2	3	4	5	Haitumiki
d.	Uzito wa kazi yako	1	2	3	4	5	Haitumiki
e.	Kufanya kazi peke yako	1	2	3	4	5	Haitumiki
f.	Kufanya kazi ya kimwili(physical work)	1	2	3	4	5	Haitumiki
g.	Kupanda	1	2	3	4	5	Haitumiki
h.	Kuvuna	1	2	3	4	5	Haitumiki
i.	Kuvuna mazao yaliyonyunyiziwa	1	2	3	4	5	Haitumiki
j.	Kurudiarudia kazi (task repitition)	1	2	3	4	5	Haitumiki
k.	Kushughulikia matunda na mboga	1	2	3	4	5	Haitumiki

l. Je! Mambo/vitu gani unafikiri ni vizuri kabisa katika kazi yako? (best aspects of your work)

m. Je! Mambo/vitu gani unafikiri ni vibaya kabisa katika kazi yako? (worst aspects of your work)

7. Viwango vya malipo

a. Tafadhali tia alama ya **mviringo** ya masaa mangapi kwa siku uliyofanya kazi wiki iliyopita, pamoja na muda wa ziada

4	5	6	7	8	9	10+

b. Je! Ni pesa ngapi ulizopata mwezi uliyopita? _____

c. Je! Unadhania unapata pesa ngapi kila mwaka? _____

d. Je! Wewe hufanya kazi kwa muda wa ziada? Ndiyo / Hapana

e. Kama ndiyo, masaa mangapi wiki iliyopita? _____

f. Je! Kiwango cha muda wa ziada kwa kila saa ni ngapi?

Sawa na kiwango cha kawaida | Mara moja na nusu ya kiwango cha kawaida | Mara mbili ya kiwango cha kawaida | Zingine

8. Hali ya Maisha

Tafadhali unaweza kutia alama ya mvirongo ufafanuzi ambao unafafanua vizuri hali yako ya sasa ya maisha ikilinganishwa na miaka mitano iliyopita na mwaka uliyopita

	Nzuri sana kuliko sasa	Nzuri kuliko ya sasa	Sawa na sasa	Mbaya zaidi ya sasa	Mbaya sana zaidi ya sasa
a. Miaka mitano iliyopita (2004) hali yangu ya maisha ilikuwa	1	2	3	4	5
b. Mwaka uliyopita (2008) hali yangu ya maisha ilikuwa	1	2	3	4	5

c. Ikilinganishwa na mwaka uliyopita, una pesa zaidi au chache za kutumia? Zaidi | Chache | Hakuna mabadiliko

d. Ikiwa una pesa zaidi, ni sababu gani zifwatazo ambazo zinaweza kufafanua mabadiliko haya?

Usaidizi kutoka kwa jamaa ☐ Mapato kutoka kwa mwenza ☐ Mapato kutoka kwa kilimo cha bustani ☐ zingine ☐

e. Ikiwa huna pesa zaidi, ni sababu gani zifwatazo ambazo zinaweza kufafanua mabadiliko haya?

Talaka au kifo cha mwenza ☐ Mwenza alipoteza kazi ☐ Uliacha/ulipoteza kazi inayolipa vizuri ☐ zingine ☐

9. Huduma ya watoto **(Tafadhali tia alama kisanduku kinachofaa)**

a. Je! Una watoto wowote? Ndiyo | Hapana

b. Ni watoto wangapi unao katika vikundi vya umri vifwatavyo?

Chini ya miaka 5 ☐ 5-11 ☐ 12-16 ☐ 17-21 ☐

c. Je! Ni nani anaangalia watoto wakati unafanya kazi?

Wewe mwenyewe ☐ Mwenza ☐ Familia ☐ Marafiki ☐

Hao wenyewe ☐ Kituo cha huduma ya watoto (day care centre) ☐ zingine ☐

d. Je! Unalipia huduma ya watoto? Ndiyo | Hapana

e. Kama ndiyo, kiasi gani kwa wiki? ☐

10. Makazi

Tafadhali jibu yafuatayo kulingana na mahali pako pakuu pa kazi (k.v. unapoishi sana kwa mwaka) Tafadhali tia alama visanduku vile vinavyotumika kwako

a.	Kwa kawaida unaishi nyumbani kwa wazazi wako au na jamaa zako?	
b.	Kwa kawaida unaishi nyumbani na mwenza wako?	
c.	Je! Unaishi kwa makazi ya kukodisha?	
d.	Je! Unamiliki makazi yako?	
e.	Je! Unashiriki makazi yako na ikiwa ndiyo, ni watu wangapi unashirikiana nao?	
f.	Je! Unaishi kwa nyumba ya matope iliyofunikwa na nyasi?	
g.	Je! Unaishi kwa nyumba ya matope iliyofunikwa na mabati?	
h.	Je! Unaishi kwa muzigo?	N/A
i.	Je! Unaishi kwa nyumba ya matofali ya kudumu?	
j.	Zingine?	

11. Madaktari. Tafadhali tia alam ya mviringo

a.	Je! umesajiliwa na daktari?	**Ndiyo**	**Hapana**
b.	Je! mwajiri wako anahitaji uwe umesajiliwa na daktari?	**Ndiyo**	**Hapana**
c.	Je! Ni mara ngapi umemwona daktari/mwuguzi/ mtaalamu wa huduma ya afya kati ya miezi 3 iliyopita?		
d.	Kama jibu lako ni ndiyo kwa swali lililopita, unaweza kutoa sababu ya kumtembelea daktari?		

12. Umiliki. Tafadhali andika katika eneo lenye kivuli idadi ya vitu hivi unavyomiliki katika orodha iliyo hapa chini (vitu hivi unapaswa kuwa navyo mahali ambapo kwa kawaida unaishi)

Kitu	Ni ngapi kwa kila kitu unamiliki?	Mwaka ambao kitu cha mwisho kilinunuliwa (tarakimu mbili za mwisho)
a. Nyumba, fleti		
b. Shamba		
c. Gari		
d. Pikipiki		
e. Baisikeli		
f. Friji		
g. Runinga		
h. Runinga ya setileti		
i. Simu/ simu ya mkononi		
j. Redio		
k. Video/DVD		
l. Kompyuta ya kibinafsi		
m. Bima ya maisha		
n. Bima ya afya		
o. Wanyama (ngombe)		
p. Mbuzi		
q. Kuku		

13. Ajira nyingine

a. Ni kazi gani nyingine unayoweza kufanya ikiwa ungekuwa haufanyi kwa kilimo cha bustani?

b. Ni nchi gani unayoweza kufanya kazi?

c. Unadhania kazi hiyo nyingine inaweza kukulipa pesa ngapi kwa mwezi?

d. Je! Unaweza kuwashauri vijana kuingia katika ukulima wa mbogamboga na matunda? Ndiyo / Hapa na

e. Kama ndiyo, ni kazi gani haswa katika ukulima wa bustani unayoweza kupendekeza (k.v. kuvuna, kuchukua, kupanda, kunyunyuzia)?

14. Kwa kuweka alama katika kisanduku kimoja kwa kila kikundi hapa chini, tafadhali ashiria ni taarifa zipi zinazofafanua vizuri hali yako mwenyewe ya leo ya afya.

a. Urahisi

Sina shida ya kutembea ☐

Nina shida ya kutembea ☐

Nimezuiliwa kitandani ☐

b. Huduma binafsi(self care)

Sina shida ya kujihudumia ☐

Nina shida kidogo ya kuoga na kuvaa ☐

Siwezi kuoga na kuvaa mwenyewe ☐

c. Shughuli za kawaida (k.v. kazi, masomo, kazi za nyumbani, shughuli za familia au za mapumziko)

Sina shida ya kufanya shughuli zangu za kawaida ☐

Nina shida ya kufanya shughuli zangu za kawaida ☐

Siwezi kufanya shughuli zangu za kawaida ☐

d. Uchungu/Maumivu

Sina uchungu au maumivu ☐

Nina uchungu au maumivu kidogo ☐

Nina uchungu au maumivu mengi sana ☐

e. Wasiwasi/Huzuni

Sina wasiwasi au huzuni ☐

Nina wasiwasi au huzuni kidogo ☐

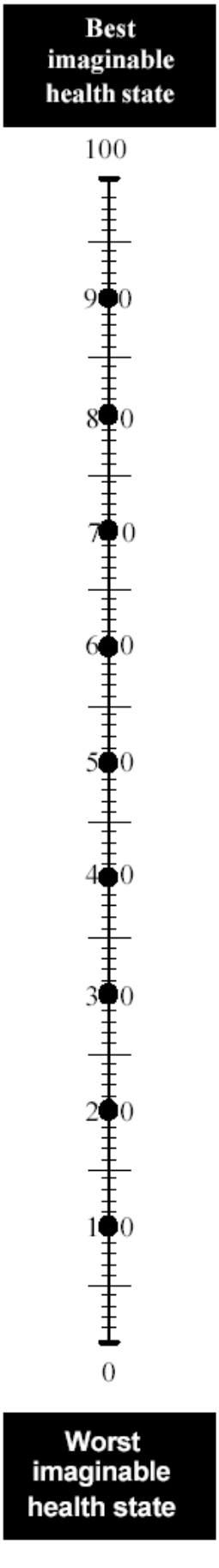
Nina wasiwasi au huzuni sana ☐

15.

Ili kuwasaidia watu kusema jinsi hali ya afya ni nzuri au mbaya, tumechora mizani (inayofanana na kipimajoto) ambayo hali nzuri kabisa unayoweza kudhania imewekwa 100 na hali mbaya kabisa unayoweza kudhania imewekwa 0.

Tungependa uashiria kwenye mizani hii jinsi afya yako mwenyewe ilivyo leo, kwa maoni yako. Tafadhali fanya hivi kwa kuchora laini kuanzia kisanduku hapa chini hadi sehemu yoyote kwenye mizani inayoashiria jinsi hali yako ya afya ilivyo leo.

Hali yako mwenyewe ya afya leo



MAELEKEZO: Uchunguzi huu unaomba maoni uliyonayo kuhusu afya yako. Habari hizi zitasaidia katika kufuatilia jinsi unavyojisikia na jinsi gani unaweza kufanya shughuli zako za kawaida. Jibu kila swali na zungushia jibu ulilotoa. Kama huna uhakika wa jinsi ya kujibu swali, tafadhali toa jibu unalofikiria kuwa ni zuri zaidi kwako.

16. Kwa ujumla, unaweza kusema afya yako ni: (Zungushia jibu moja)

Nzuri kupita kiasi	1
Nzuri sana	2
Nzuri	3
Ya wastani	4
Mbaya	5

17. Afya yako ikoje sasa ukilinganisha na mwaka mmoja uliopita?

Nzuri zaidi kuliko mwaka mmoja uliopita	1
Kiasi ni nzuri kuliko mwaka mmoja uliopita	2
Ni karibu sawa na ya mwaka mmoja uliopita	3
Kiasi ni mbaya kuliko mwaka mmoja uliopita	4
Mbaya sana kuliko mwaka mmoja uliopita	5

18. Shughuli zilizoorodheshwa hapa chini ni shughuli unazoweza kuzifanya kila siku. Je, afya yako hivi sasa inakuzuia kufanya shughuli hizi? Kama ndivyo, kwa kiasi gani?
(Zungushia namba moja katika kila mstari)

SHUGHULI	Inazuia sana	Inazuia kiasi	Haizuii kabisa
a. Kazi za nguvu kama kukimbia, kuinua vitu vizito, kushiriki kikamilifu katika michezo na kucheza ngoma	1	2	3
b. Kazi za kawaida kama kuchota maji, kufua nguo, kubeba mtoto	1	2	3
c. Kufagia, kuinua au kubeba kikapu chenye mahindi, au, viazi kiasi cha nusu debe	1	2	3
d. Kupanda mlima mkali	1	2	3
e. Kupanda mlima mfupi	1	2	3
f. Kuinama, kupiga magoti au kuchuchumaa	1	2	3
g. Kutembea mwendo wa nusu saa bila ya kupumzika	1	2	3
h. Kutembea mwendo wa robo saa bila ya kupumzika	1	2	3
i. Kutembea kutoka golf hadi golf la kiwanja cha mpira wa miguu bila kupumzika	1	2	3
j. Kuoga au kuvaa nguo mwenyewe	1	2	3

19. Katika kipindi cha rnwezi mmoja uliopita, je umewahi kupata moja ya matatizo yafuatayo katika utendaji wako wa kazi, ikiwa ni matokeo ya matatizo ya afya yako? (Zungushia namba moja katika kila mstari)

	Ndiyo	Hapana
a. Umepunguza muda wa kufanya kazi au shughuli zako	1	2
b. Umetekeleza machache kuliko ulivyotarajia	1	2
c. Umeshindwa kufanya baadhi ya kazi au shughuli	1	2
d. Ulipata matatizo katika kutekeleza kazi au shughuli zako (kwa mfano, nilijilazimisha kufanya kazi)	1	2

20. Katika kipindi cha mwezi mmoja uliopita umewahi kupata moja ya matatizo yafuatayo katika utendaji wako wa kazi ikiwa ni matokeo ya mawazo mengi?

		NDIYO	HAPANA
a.	Umepunguza muda wa kufanya kazi au shughuli zako	1	2
b.	Umetekeleza machache kuliko ulivyotarajia	1	2
c.	Hukufanya kazi au shughuli zako kwa uangalifu kama ilivyo kawaida	1	2

21. Katika kipindi cha mwezi mmoja uliopita, ni kwa kiasi gani matatizo' ya kiafya au za kifamilia, shughuli na marafiki, mawazo yameathiri shughuli zako za kijamii kama majirani au makundi ya watu unaoshirikiana nao?

	(Zungushia jibu moja)
Hayakuathiri kabisa	1
Yameathiri kidogo	2
Yameathiri kwa wastani	3
Yameathiri kwa kiasi kikubwa	4
Yameathiri kwa kiasi kikubwa sana	5

22. Ni kiasi gani cha maumivu va mwili uliyoyapata katika kipindi cha mwezi mmoja uliopita?

	(Zungushia jibu moja)
1. Hakuna maumivu	1
2. Maumivu kidogo sana	2
3. Maumivu kidogo	3
4. Maumivu ya wastani	4
5. Maumivu rnakali	5
6. Maumivu makali sana	6

23. Katika mwezi mmoja uliopita, maumivu yalikuzuia kwa kiasi gani kufanya kazi zako za kila siku (ndani na nje ya nyumbani kwako)?

	(Zungushia jibu moja)
1. Hayakunizuia kabisa	1
2. Yalinizuia kiasi kidogo	2
3. Yalinizuia kwa wastani	3
4. Yalinizuia kwa kiasi	4
5. Yalinizuia kwa kiasi kikubwa sana	5

24. Maswali yafuatayo yanahusu jinsi unavyojisikia kiafya, vile vile jinsi gani shughuli zako zilivyofanikiwa kwa kipindi cha mwezi mmoja uliopita. Kwa kila swali, tafadhali toa jibu lililo karibu na jinsi ulivyokuwa unajisikia. Je ni muda kiasi gani kwa kipindi cha mwezi mmoja uliopita umekuwa ukijisikia au kuwa na yafuatayo:

	Muda wote	Muda mwingi	Muda wa kutosha kidogo	Baadhi ya muda	Muda mchache	Hakuna muda wowote.
a. Je ulijisikia mzima kabisa?(full of life)?	1	2	3	4	5	6
b. Je umekuwa ni mtu mwenye wasiwasi sana?	1	2	3	4	5	6
c. Je ulikuwa huna raha kiasi cha kutofurahishwa na kitu chochote?	1	2	3	4	5	6
d. Je ulijisikia mtulivu na mwenye amani?	1	2	3	4	5	6
e. Je ulikuwa na nguvu nyingi?	1	2	3	4	5	6
f. Je ulijisikia kusononeka?	1	2	3	4	5	6
g. Je ulijisikia kuwa na uchovu? Did you feel worn-out)	1	2	3	4	5	6
h. Je ulikuwa ni mtu mwenye furaha?	1	2	3	4	5	6
I Je ulijisikia kuchoka?	1	2	3	4	5	6

25. Katika mwezi mmoja uliopita, ni kwa muda gani matatizo ya kiafya au kimawazo yameathiri shughuli zako za kijamii (kama kutembeleana na marafiki, ndugu na jamaa n.k.)?

	(Zungushia jibu moja)
Muda wote	1
Muda mwingi	2
Muda fulani	3
Kiasi kidogo cha muda fulani	4
Sikuwahi kuathirika kabisa	5

26. Kati ya maelezo yafuatayo, ni yapi yaliyo ya UKWELI au YASIYO YA UKWELI kwako? (Zungushia namba **moja** kila mstari)

	Ni kweli hasa	Ni kweli kwa kiasi	Sijui	Si kweli kwa kiasi	Si kweli kabisa
a. Ninaonekana kuugua kirahisi zaidi kuliko watu wengine	1	2	3	4	5
b. Nina afya ya kutosha kama mtu yeyote yule ninayemjua	1	2	3	4	5
c. Ninategemea afya yangu kuwa mbaya zaidi	1	2	3	4	5
d. Afya yangu ni nzuri kupita kiasi	1	2	3	4	5

Asante sana kwa muda wako na kwa kuzingatia

Appendix 5.0 Fresh Pineapple Questionnaire (version 1)

Thank you for your willingness to participate in this study

You are part of a group of UK fruit consumers we have selected to ask for feedback regarding fresh pineapples. There are three sections in this questionnaire and it will take **just 5 minutes to complete.** All answers will be kept strictly confidential and your anonymity will be protected. Your responses will only be used for the purposes of this research (academic).

Section A - Shopping for fresh pineapples

In this section we would like you to answer some general questions about shopping for fresh pineapples. ***Please circle one***

A1. Have you bought any pineapples within the past twelve months?

- **Yes**
- No (if no go to section B)

A2. Have you bought fresh pineapples within the past twelve months?

- **Yes**
- No

A3. How often do you buy fresh pineapples?

- Occasionally – (once or twice a year)
- Every now and then – (once a month)
- Regularly (once a week)

A3. How important are the following factors when you buy fresh pineapples? ***Please tick the appropriate box in each row***

	Not at all important	Not particularly important	Quite important	Very important
Price				
What is on special offer when you shop				
Where they were grown (place/country of origin)				
Method of production (e.g. organically or conventionally grown)				
How long they will keep at home				
Environmental concerns				
Ethical/ social concerns (e.g. employees and farmers welfare in the production)				
Packaging/overall presentation				

A4. Does the political status of a country affect your choice of produce e.g. Would you be less likely to buy pineapples knowing they came from a politically unstable country e.g. at war or violates human rights?

- Yes
- No
- Makes no difference

A5. How often do you look for the country of origin information in your produce label? (*Please circle one*)

- Never
- Rarely
- Occasionally
- Regularly
- Other

Section B - Preferences for fresh pineapples

In this section we would like to gain some insights into the choices you make when purchasing fresh pineapples. We would like you to imagine that you are shopping for fresh whole pineapples even if you never buy pineapples.

The pineapples can be from:-

- Tanzania
- Ivory Coast
- Philippines

Their production method may be:-

- Organic
- Conventional
- Fair trade

Their price levels may be:-

- £1.69
- £1.99
- £2.29

It is important that you answer in the way you would if you were actually buying fresh pineapples.

B1. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below its box*

Country of origin	**Tanzania**	**Philippines**	**Ivory Coast**
Production method	**Organic**	**Conventional**	**Fair trade**
Price	**£1.99**	**£2.29**	**£1.99**
	☐	☐	☐

B2. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below its box*

Country of origin	**Tanzania**	**Tanzania**	**Philippines**
Production method	**Conventional**	**Fair trade**	**Organic**
Price	**£2.29**	**£1.69**	**£1.69**
	☐	☐	☐

B3. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below its box*

Country of origin	**Ivory Coast**	**Philippines**	**Ivory Coast**
Production method	**Organic**	**Fair trade**	**Conventional**
Price	**£2.29**	**£1.99**	**£1.69**
	☐	☐	☐

B4. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below its box*

Country of origin	**Ivory Coast**	**Philippines**	**Tanzania**
Production method	**Fair trade**	**Conventional**	**Organic**
Price	**£1.99**	**£1.69**	**£2.29**
	☐	☐	☐

B5. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below its box*

Country of origin	**Philippines**	**Ivory Coast**	**Ivory Coast**
Production method	**Fair trade**	**Organic**	**Conventional**
Price	**£2.29**	**£1.69**	**£2.29**
	☐	☐	☐

B6. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below its box*

Country of origin	**Philippines**	**Tanzania**	**Philippines**
Production method	**Organic**	**Conventional**	**Fair trade**
Price	**£1.69**	**£1.99**	**£1.99**
	☐	☐	☐

B7. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below its box*

Country of origin	**Ivory Coast**	**Tanzania**	**Philippines**
Production method	**Conventional**	**Organic**	**Fair trade**
Price	**£1.69**	**£2.29**	**£1.99**
	☐	☐	☐

B8. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below its box*

Country of origin	**Tanzania**	**Tanzania**	**Philippines**
Production method	**Fair trade**	**Organic**	**Conventional**
Price	**£2.29**	**£1.69**	**£1.99**
	☐	☐	☐

B9. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below its box*

Country of origin	**Ivory Coast**	**Ivory Coast**	**Tanzania**
Production method	**Organic**	**Conventional**	**Fair trade**
Price	**£1.99**	**£2.29**	**£1.69**
	☐	☐	☐

B10. Which one of these countries do you think is furthest from UK? *Please tick one*

☐ Tanzania ☐ Philippines

☐ Ivory Coast

B11. How do you think pineapples are transported from these countries to UK?

	Air freighted	Shipped	Don't know
Tanzania			
Ivory Coast			
Phillipines			

Section C - About Yourself

Finally, could you please provide a few details about yourself? Some of these questions may seem rather personal. However, they are useful for our analysis. For example, from the income question we can determine if the preferences of lower and higher income groups differ. We would remind you that all answers will be treated as **confidential and anonymous** and that results of the survey will only be used in aggregate form for research purposes only.

C1. What is your age? ☐ yrs

C2. What is your nationality? ***Please tick one box***

☐ British/Welsh ☐ Other EU ☐ Other

C3. What is the highest level of education that you have completed? ***Please tick one box***

☐ Secondary school
☐ A - Levels
☐ Professional
☐ University First Degree
☐ University Higher Degree

C4. Which of these best describes your current occupation? ***Please tick one box***

☐ I am not employed (please give details e.g. home maker, retired, unemployed etc) ……
☐ Office based employee (e.g. clerical)
☐ Middle management
☐ Senior management
☐ Qualified professional (e.g. doctor, architect, lawyer)
☐ HM Forces / emergency services
☐ Non-office based employee (e.g. driver, factory worker, manual, catering)
☐ Self employed
☐ Educator (e.g. teacher, lecturer)
☐ Carer (e.g. nurse)
☐ Other, please specify .....

C5. How many people are currently living in your household (including yourself)? ☐

C6. Please indicate the number of children in each age category that are in your household. ***Please enter the appropriate number in each box, if no children are living with you, go to*** **C7**

☐ Less than 3 years old
☐ 3 to 10 years
☐ 11 to 16 years
☐ 17 to 18 years

C7. Please could you give an estimate of your gross (before tax) annual household income from all sources? *Please tick one box*

- ☐ Less than £10,000
- ☐ £10,000 - £19,999
- ☐ £20,000 - £29,999
- ☐ £30,000 - £39,999
- ☐ £40,000 - £49,999
- ☐ £50,000 - £59,000
- ☐ £60,000 - £69,999
- ☐ £70,000 - £79,999
- ☐ More than £80,000

C8. Which county/city or town of the UK would you say is your normal residence?----------

Thank you for taking the time to complete this questionnaire. Your help is very much appreciated.

Appendix 6.0: Canned pineapple Questionnaire (version 1)

Thank you for your willingness to participate in this study
You are part of a group of UK fruit consumers we've selected to ask for feedback regarding canned pineapples. There are three sections in this questionnaire and it will take **just 5 minutes to complete.** All answers will be kept strictly confidential and your anonymity will be protected. Your responses will only be used for the purposes of this research (academic).

Section A - Shopping for canned pineapples
In this section we would like you to answer some general questions about shopping for canned pineapples. ***Please circle one***

A1. Have you bought any pineapples within the past twelve months?

- **Yes**
- No (if no go to section B)

A2. Have you bought canned pineapples within the past twelve months?

- **Yes**
- No

A3. How often do you buy canned pineapples?

- Occasionally – (once or twice a year)
- Regularly (once a week)
- Every now and then – (once a month)

A3. How important are the following factors when you buy canned pineapples? ***Please tick the appropriate box in each row***

	Not at all important	Not particularly important	Quite important	Very important
Price				
What is on special offer when you shop				
Where they were grown (place/country of origin)				
Method of production (e.g. organically or conventionally grown)				
How long they will keep at home				
Environmental concerns				
Ethical/ social concerns (e.g. farmers and employees welfare in the production)				
Packaging/overall presentation				

A4. Does the political status of a country affect your choice of produce e.g. Would you be less likely to buy pineapples knowing they came from politically unstable country e.g. at war or violating human rights?

- Yes
- No
- Makes no difference

A5. How often do you look for the country of origin information in your produce label? (*Please circle one*)

- Never
- Rarely
- Occasionally
- Regularly
- Other

Section B - Preferences for canned pineapples

In this section we would like to gain some insights into the choices you make when purchasing canned pineapples. We would like you to imagine that you are shopping for canned pineapples even if you never buy pineapples.

Assume all pineapples are packed in a 400g can – sliced pineapples in juice.

The pineapples can be from:-

- Tanzania
- Ivory Coast
- Philippines

Their production method may be:-

- Organic
- Conventional
- Fair trade

Their price levels may be:-

- £0.69
- £0.99
- £1.29

It is important that you answer in the way you would if you were actually buying canned pineapples.

B1. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below in its box*

Country of origin	**Tanzania**	**Philippines**	**Ivory Coast**
Production method	**Organic**	**Conventional**	**Fair trade**
Price	**£0.99**	**£1.29**	**£0.99**
	☐	☐	☐

B2. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below in its box*

Country of origin	**Tanzania**	**Tanzania**	**Philippines**
Production method	**Conventional**	**Fair trade**	**Organic**
Price	**£1.29**	**£0.69**	**£0.69**
	☐	☐	☐

B3. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below in its box*

Country of origin	**Ivory Coast**	**Philippines**	**Ivory Coast**
Production method	**Organic**	**Fair trade**	**Conventional**
Price	**£1.29**	**£0.99**	**£0.69**
	☐	☐	☐

B4. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below in its box*

Country of origin	**Ivory Coast**	**Philippines**	**Tanzania**
Production method	**Fair trade**	**Conventional**	**Organic**
Price	**£0.99**	**£0.69**	**£1.29**
	☐	☐	☐

B5. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below in its box*

Country of origin	**Philippines**	**Ivory Coast**	**Ivory Coast**
Production method	**Fair trade**	**Organic**	**Conventional**
Price	**£1.29**	**£0.69**	**£1.29**
	☐	☐	☐

B6. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below in its box*

Country of origin	**Philippines**	**Tanzania**	**Philippines**
Production method	**Organic**	**Conventional**	**Fair trade**
Price	**£0.69**	**£0.99**	**£0.99**
	☐	☐	☐

B7. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below in its box*

Country of origin	**Ivory Coast**	**Tanzania**	**Philippines**
Production method	**Conventional**	**Organic**	**Fair trade**
Price	**£0.69**	**£1.29**	**£0.99**
	☐	☐	☐

B8. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below in its box*

Country of origin	**Tanzania**	**Tanzania**	**Philippines**
Production method	**Fair trade**	**Organic**	**Conventional**
Price	**£1.29**	**£0.69**	**£0.99**
	☐	☐	☐

B9. If these were your only options, which pineapple would you be most likely to buy? *Choose one by ticking below in its box*

Country of origin	**Ivory Coast**	**Ivory Coast**	**Tanzania**
Production method	**Organic**	**Conventional**	**Fair trade**
Price	**£0.99**	**£1.29**	**£0.69**
	☐	☐	☐

B10. Which one of these countries do you think is furthest from UK? *Please tick one*

☐ Tanzania ☐ Philippines

☐ Ivory Coast

B11. How do you think pineapples are transported from these countries to UK?

	Air freighted	Shipped	Don't know
Tanzania			
Ivory Coast			
Philippines			

Section C - About Yourself

Finally, could you please provide a few details about yourself? Some of these questions may seem rather personal. However, they are useful for our analysis. For example, from the income question we can determine if the preferences of lower and higher income groups differ. We would remind you that all answers will be treated as **confidential and anonymous** and that results of the survey will only be used in aggregate form for research purposes only.

C1. What is your age? ☐ yrs

C2. What is your nationality? ***Please tick one box***

☐ British/Welsh ☐ Other EU ☐ Other

C3. What is the highest level of education that you have completed? ***Please tick one box***

☐ Secondary school
☐ A - Levels
☐ Professional
☐ University First Degree
☐ University Higher Degree

C4. Which of these best describes your current occupation? ***Please tick one box***

☐ I am not employed (please give details e.g. home maker, retired, unemployed etc) ……
☐ Office based employee (e.g. clerical)
☐ Middle management
☐ Senior management
☐ Qualified professional (e.g. doctor, architect, lawyer)
☐ HM Forces / emergency services
☐ Non-office based employee (e.g. driver, factory worker, manual, catering)
☐ Self employed
☐ Educator (e.g. teacher, lecturer)
☐ Carer (e.g. nurse)
☐ Other, please specify .....

C5. How many people are currently living in your household (including yourself)? ☐

C6. Please indicate the number of children in each age category that are in your household. ***Please enter the appropriate number in each box, if no children are living with you, go to*** **C7**

☐ Less than 3 years old
☐ 3 to 10 years
☐ 11 to 16 years
☐ 17 to 18 years

C7. Please could you give an estimate of your gross (before tax) annual household income from all sources? ***Please tick one box***

- ☐ Less than £10,000
- ☐ £10,000 - £19,999
- ☐ £20,000 - £29,999
- ☐ £30,000 - £39,999
- ☐ £40,000 - £49,999
- ☐ £50,000 - £59,000
- ☐ £60,000 - £69,999
- ☐ £70,000 - £79,999
- ☐ More than £80,000

C8. Which county/city or town of the UK would you say is your normal residence? ----------

Thank you for taking the time to complete this questionnaire. Your help is very much appreciated.

Appendix 7.0 Summary results of the UK consumer survey (Conjoint Analysis)