ECONOMICS OF COMPLIANCE WITH INTERNATIONAL FOOD STANDARDS IN TANZANIA: THE CASE OF ORGANIC SPICES

BY

ADAM MESHACK AKYOO

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ABSTRACT

The fall in the agricultural sector's contribution to Tanzanian export earnings since the early 1990s has increased attention toward new crops with the potential of supplementing the country's traditional export crops. Particular attention has been focused upon identifying crops enjoying price stability, high demand elasticity and low substitutability. Spices fall into this category. However, access to high value export markets raises issues of supply chain dynamics and conformity with international standards. This study focuses upon the recent history of the spice industry in Tanzania with reference to these issues. It also explores existing standards conformity assessment capacity and quantifies the costs and benefits of complying with the certified organic standard for members of black pepper and chilli contract farming schemes in two districts in Tanzania. The latter is based on survey data from 2006-07 based on samples of scheme members and control groups. High value markets like the EU are concerned with food safety. In addition, organically-traded exports must be certified as such. For food safety the main tests demanded are for hazards like aflatoxins, pesticide residues, prohibited chemical dyes, heavy metals, as well as for Salmonella. Conformity assessment for these parameters entails investments in high performance liquid chromatograph, gas chromatograph, and atomic absorption spectrophotometer equipment, as well as other state-of –the-art laboratory facilities. Local conformity assessment in relation to these standards has been found to be deficient in many ways. The benefits of certified organic farming include guaranteed produce market, premium prices, higher net revenues and increased yield. Expected benefis were not realized by certified organic farmers. This is the result of absent price premiums, low level of adoption of recommended organic practices, and wider contract failure. The main conclusions are that Certified Organic standards are the only international standards complied with, and that a very loosely coordinated chain exists alongside a more coordinated one. Macro- and micro-institutional weaknesses need attention for tapping the full potential of the industry. Meeting challenges of international accreditation, improved coordination of existing laboratories, and formulation of a national food safety policy are recommended for improving local conformity assessment capacity. Learning from more successful organic schemes, recruitment of larger and better organized exporters and design of more effective contracts are recommended for realizing organic farming benefits.

DECLARATION

I Adam Meshack Akyoo, hereby declare to the Senate of Sokoine University of Agriculture, that this thesis is my original work and has not been submitted for a higher degree award in any other University.

Signature .... Date 21. 09. 2010

Adam Meshack Akyoo

This declaration is confirmed.

.... 21.09.2010

Dr. Evelyne Lazaro Date

Supervisor

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LIST OF ACRONYMS AND ABBREVIATIONS

AAS	Atomic Absorption spectrophotometer
ADBI	Asian Development Bank Institute
AMSDP	Agricultural Marketing Sector Development Programme
BET (Tanzania)	Board of External Trade
BRC	British retailers Consortium
BSc	Bachelor of Science Degree
CAC	Codex Alimentarius Commission
CEO	Chief Executive Officer
Cf.	Compare
DAIPESA	Development Alternative Initiative - Private Entreprises Support Activities
DFID (British)	Department of International Development
DR Congo	Democratic Republic of Congo
EAC	East African Community
EAOPS	East African Organic Products standard
EAS	East African Standard
EC	European Commission
EKO	Dutch Product Label for Organically produced products
EPOPA (Swedish)	Export Promotion of Organic Products from Africa
ESA	European Spice Association
ETI	Ethical Trading Initiative
ETO	Ethyl Oxide Sterilization
EU	European Union
EUREPGAP	European Retailer Produce Working Group Good Agricultural Practice

FAO	United nation's Food and Agriculture Organization
FDA (US)	Food and Drugs administration
FLO	Fairtrade Labelling Organizations International
GAP	Good agricultural Practice
GC	Gas Chromatograph
GCLA (Tanzania)	Government Chemical Laboratory Agency
GMO	Genetically Modified Organisms
GMP	Good Manufacturing Practice
GTZ (Germany)	Gesellschaft für Technische Zusammenarbeit
Ha	hectare
HACCP	Hazards and Critical Control Points
HPLC	High performance Liquid Chromatograph
ICM	Integrated crop Management
ICS	Internal Control System
IDS (UK)	Institute of Development Studies
IEC	International Electrochemical Commission
IFOAM	International Federation of Organic Agriculture Movements
IFS	International Food Standard
ILEIA	Centre for Information on Low External Input and Sustainable Agriculture
IMO	International Marketecology Organisation
IMR	Inverse Mill's Ratio
IOAS	International Organic Accreditation Service
IPM	Integrated Pest Management
IPPC	International Plant Protection Convention
IPQC	In-process Quality Control

ISO	International Standards Organization
ITC	International Trade Centre
JAS	Japanese National Organic Regulation
KOAN	Kenyan Organic Agriculture Network
LDC	Least Developed Country
LEISA	Low External input and Sustainable agriculture
LOD	Limit of Determination
MAFSC	Ministry of Agriculture, Food Security and Cooperatives
MIT	Ministry of Industry and Trade
MPRA	Munich Personal RePEc Archive
MRL	Maximum Residue Limits
MSc	Master of Science Degree
MSC	Marine Stewardship Council
MVIWATA	*Mtandao wa Vikundi vya Wakulima Wadogowadogo Tanzania* (The Network of Smallholder Farmer Groups in Tanzania)
NBS	National Bureau of Statistics
NFQCL	(Tanzania) National Fish Quality Control Laboratory
NGO	Non-governmental Organization
NIE	New Institutional Economics
NOGAMU	National Organic Agriculture Movement of Uganda
NOP (US)	National Organic Programme
ODA (British)	Overseas Development Agency (now DFID)
OECD	Organization of Economic Cooperation Development
OIE	Office Internationale des Epizooties (the World Organization for Animal Health)
OLS	Ordinary Least Squares

PCBs	Polychlorinated Biphenyls
PGS	Participatory Guarantee Systems
PhD	Doctor of Philosophy
PIC	Prior Informed Consent
PVS	Private Voluntary Standards
SANAS	South Africa National Accreditation Service
SIDA	Swedish International Development Cooperation Agency
SPS	Sanitary and Phytosanitary Measures
SQF	Safety Quality Food
SWOT	Strengths, Weaknesses, Opportunities and Threats
TANCERT	Tanzania Organic Certification Association
TBS	Tanzania Bureau of Standards
TFDA	Tanzania Food and Drugs Agency
TIRDO	Tanzania Industrial Research and Development Organization
TOAM	Tanzania Organic Agriculture Movement
TPRI (Tanzania)	Tropical Pesticide Research Institute
TRA	Tanzania Revenue Authority
TRIAS	A Belgian Non-Governmental Organization
Tsh	Tanzania shilling
TZS	Tanzania Standard
UK	United Kingdom
UKAS	United Kingdom Accreditation Service
UNCTAD	United Nations Confernce on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UR	Uruguay Round

URT	United Republic of Tanzania
US	United States
USA	United States of America
USAID	United States Agency for International Development
WHO	World Health Organization
WTO	World Trade Organization
ZCCFSP	Zanzibar Cash Crop Farming Systems Project
ZMALNR	Zanzibar Ministry of Agriculture, Livestock and Natural Resources
ZSTC	Zanzibar State Trading Company

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter introduces the study's subject matter. It presents the research problem statement, objectives and justification. The overall organization of the study is described at the end of the chapter.

1.2 Background Information

Tanzanian traditional exports have recorded a dwindling performance over the last two decades. Factors like commodity specialization, low price elasticity, variability in supply and demand, and geographical concentration have been advanced as potential causes of this performance (Murray, 1998; Koester *et al.*, 1999).

Export earnings influence country's national income, rate of saving, capital formation, price stability, and import capacity (Gyimah-Brempong, 1991; Love, 1992). Instability in export earnings has serious implications for the rate of inflation, tax revenue, and debt burden. Tanzania has thus been looking for alternative export crops to mitigate prevailing instability in earnings from traditional export crops.

Both the Structural Adjustment Programme (1983-85) and Economic Recovery Programme (1986-1989) had, amongst their main concerns, the need to stabilize foreign exchange earnings (Maliyamkono and Bagachwa, 1990). The fall in prices of traditional export crops is one of the factors that have caused the contribution to export earnings from the agricultural sector to fall from 50 % in the mid-1990s to just over 20% since 2000 (Amani, 2005).

A major recommendation to all Least Developed Countries (LDCs) in redressing their export earnings instability is the need to diversify their traditional exports towards high value agro-food products (ITC, 2001). The latter are said to be superior to the former in terms of their price stability, high demand elasticity, and low substitutability. In Tanzania, such high value agro-food products include fish, cut flowers, vegetables and spices and herbs. The scope of this study is confined to spices, although herbs also are discussed in passing.

The most important spice producing area in Tanzania is Zanzibar (the term here is used to cover both the island of Zanzibar - Unguja in Kiswahili - as well as Pemba). Zanzibar began its effort to look for alternative export crops to diversify its export earnings from cloves in the early 1990s. The efforts by the Zanzibar Ministry of Agriculture, Livestock and Natural Resources (ZMALNR) were conducted under the Zanzibar Cash Crop Farming Systems Project (ZCCFSP) which was financed by the British Overseas Development agency (now DfID). ZCCFSP identified four crops (chillies, hibiscus, turmeric, and mango) as priority crops (ZMALNR, 1993). The inclusion of two spice crops (chillies and turmeric) in plans to augment earnings from cloves (also a spice) reflects the traditional importance accorded to spices in Zanzibar. Unfortunately, research activities under ZCCFSP ceased in 1995 due to ODA withdrawing funding. This followed political unrest in relation to the 1995 general election in Zanzibar.

There was no similar effort on the mainland in respect of spices during the same period. More recently however, the trend seems to be changing with growing emphasis from government and donors on promoting spice production. There are now government policy directives that are aimed at introducing spices like vanilla and paprika (in addition to existing common spices being produced) in the more important producing areas of

Morogoro and Tanga regions[1]. The fact that the Board of External Trade (BET), which is under the Ministry of Industry and Trade (MIT), is nurturing the formation of Spices Exporters Association (Caigher, 2004) further indicates increased government interest. Donor programmes like the USAID's Private Enterprises Support Activities (DAI-Pesa) Project in Iringa region and the Belgian NGO (TRIAS Tanzania) in Bukoba region are also involved in promoting paprika and vanilla.

Alongside these efforts have been apparently increasing numbers of producers and levels of production, growing linkages between mainland spice producers and Zanzibar spice traders, external influences from spice importers/international spice promoters, and a growing awareness of international trade opportunities. Another important contribution has been a donor project promoting organic farming, Sida's Export Promotion of Organic Products from Africa (EPOPA). Historically, Zanzibar has been a world renowned source of spices, so its involvement in new spice products has been important in securing international recognition of a revival in the sector.

1.3 International Trade in Spices and Global Market Trends

Globally, annual imports of culinary herbs and spices are in excess of US$ 2.0 billion with an annual growth rate of 8.5%. However, import markets for spices are concentrated, with European Union (EU) and United States (US) purchasing more than half of the total world exports (Jaffee, 2004; ITC, 2001). Between 1995 and 1999, Tanzania ranked third among LDCs by exporting 5 percent of LDCs' total spice exports. Madagascar was the largest LDC exporter (72 percent) followed by Comoros (6 percent), but total LDC exports fulfilled only 5.5 per cent of global import demand (ITC, 2001).

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[1] Efforts to introduce vanilla in Morogoro and paprika in Muheza, Tanga were confirmed by the respective District Agricultural officers during surveys that were conducted during the third and fourth quarters of 2005.

World spice exports in recent years amount to $2.7 billion annually with one-third of the bulk trade consisting of re-exports. Total exports (combining bulk and value-added products), net of re-exports, are about $2.0 billion annually (Jaffee, 2004). Wide variations in world prices have occurred in recent years for vanilla, cloves, and several others. According to ITC (2001.), developing countries are responsible for the vast majority of spices consumed world-wide. About 95% of the world's spices are grown in the developing countries and the majority is consumed in-country. As disposable incomes rise in these countries, their populations are able to afford greater quantities and varieties of spices.

Spices are traded in dried bulk (whole) form; in ground or powder form; and as oil, oleoresins, natural colours, and extracts. They are used in foods, cosmetics, toiletries, aromatherapy, pharmaceuticals, and fragrances. It is estimated that 85 percent of global spices trade involves the sale of whole unprocessed raw materials. It is only for pepper, curry powder, paprika and spice mixtures that significant volumes of trade are in ground form (Jaffee, 2004). The survey results of this study revealed that over 68 percent of Tanzanian spice producers sell their produce to local buyers in dried whole form with the rest being traded in fresh whole form. However, all EU exports are in dried whole form.

For many of the low-volume, high-unit-value spices, the bulk of world production enters world trade. This applies to vanilla, saffron, nutmeg, cardamom and cinnamon. Two-thirds of world's black and white pepper production, less than a quarter of world production of ginger and cloves, and less than 15 percent of capsicum/chillies production, is traded on the world market. World trade in spice oils and oleoresins is small amounting only to $250 million annually (Jaffee, 2004).

There is very little trade in consumer-packed spice products (Jaffee, 2004). This trend is accounted for by the following reasons:

(i) Distinctive requirement of end users. These are food processors and caterers with very distinct requirements for quality, taste, colour etc. In EU and US, 60 percent of traded spice is used by processors.

(ii) Higher quality/safety standards for value-added products. Tolerance levels of impurities and presence of extraneous matter are substantially higher for whole, unground spice materials, enabling more suppliers to trade such products. This is based on the fact that it is more difficult to grade, clean, or decontaminate a tainted ground/powdered spice.

(iii) High concentration in the retail sale of branded products. These take a form of either national brands or those of leading multinational spice companies.

(iv) Tarrif escalation for value-added products. For instance, in EU, whole pepper and chillies are duty free whereas their ground (processed) forms face 4 and 5 percent duties respectively. In Japan, these ground forms attract duty at a rate of 3.5 - 4.2 percent.

Of most importance however is the fact that access to high value export markets raises issues of supply chain dynamics and conformity with international food safety standards (see chapter 2). Food safety requirements impose strict oversight on potential hazards associated with food that can cause ill- health in humans. These hazards include microbial pathogens, zoonotic diseases, parasites, and physical contaminants and adulterants. Others include naturally occurring toxicants, agrochemicals and veterinary drug residues, prions, persistent organic pollutants, heavy metals and genetically modified organisms (Henson, 2003). Advances in modern technology coupled with increased consumer incomes in developed economies are pushing demand for safe food from the market (Mitchell, 2003).

Developing and Least developed country exporters are thus constantly challenged to conform to these standads in order to access the markets.

1.4 Problem Statement

It is difficult to assess wider potentialities of spices in Tanzania (production levels, productivity, tradable volumes locally and internationally, price trends etc) in the absence of relevant data from local sources (e.g. the Ministry of agriculture, the National Bureau of Statistics (NBS), Tanzania Revenue Authority (TRA), Customs, regional and district agricultural offices). Whilst there are no reliable data for Tanzanian spice exports as a whole, data on imports of spices from Tanzania to the EU is available. The main exports that are not captured in the EU data is exports of cloves and chilli to Asia (Table 1 below), overwhelmingly by the publicly-owned Zanzibar State Trading Company (ZSTC)[2].

Table 1: EU spices imports from Tanzania, 2001 – 2005 (value in Euros)

Spice Type	2001	2002	2003	2004	2005
Cloves	358 734	354 687	39 047	72 506	49 386
Ginger	210 196	96 812	39 589	54 721	45 653
Paprika and chilli (dried, crushed or ground)	154 261	378 806	275 714	374 924	477 114
Black pepper	56 741	43 347	6 730	5 701	27 159
Other spices	40 980	3 004	2 675	0	0
Cardamom	45 802	0	0	0	0
Turmeric 'curcuma'	12 168	7 836	24 095	0	6 356
Vanilla	11 770	0	0	0	1 167
Cinnamon	0	1 506	5 996	3 985	2 216
Coriander seeds	4 885	0	944	0	0
Thyme	0	0	650	0	0
Various mixtures	0	515	0	103	0
Total	895 537	886 513	395 440	511 940	609 051

Source: http://fd.comext.eurostat.cec.eu.int/xtweb (Eurostat).

[2] ZSTC has monopoly on cloves in Zanzibar.

The main trend shown in Table 1 is the decline in exports of cloves to the EU following 2002. This partly reflects declining procurement by ZSTC and partly change of market destination for direct ZSTC clove exports in favour of Asian market (the largest buyer being Indonesia) in response to stringent standards being demanded by the EU market (Akyoo and Lazaro, 2007). In the first case, ZSTC always re-sold a proportion of its procurement locally to a private company exporting to the EU (M/s TAZOP, see below)[3]. As procurement fell, the proportion that was re-sold locally in this way fell to an even greater extent. A trend which, for the purposes of this study, is even more important but which is not clear from the statistics, is for paprika and chilli exports to the EU (easily the largest category in terms of value) to become dominated by certified organic exports. Thereby, Tanzanian spice exports generally to the EU have become dominated by certified organic exports.

Generally, Table 1 portrays a declining trend (though not a consistent one) of EU imports from Tanzania for almost all spices over the years. However, substantive research studies which can account for this trend, and further portray export potential and challenges facing the Tanzanian spice industry are lacking. The first diagnostic study on Tanzanian spice exports was carried out by MIT through BET in 2002 (URT, 2002). The most recent study is however a World Bank consultancy describing the industry's constraints and potential and analysing the support required for its future development (Caigher, 2004). This study also described the types of spices grown in Tanzania by location, estimated current production area, identified potential production areas and commented on the institutional environment and on marketing issues. On the basis of a SWOT analysis it then

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[3] ZSTC clove procurement fell from 5.90 thousand tons in 2002 to 3.35 thousand tons in 2005. Another contributory factor was increased smuggling of cloves to Kenya for export via Mombasa, in response to higher prices being available on the parallel market.

recommended a development plan for the sub-sector. The study singled out the sub-sector's fragmented supply chain as a major hurdle to its future development.

The two studies above fell short of giving comprehensive qualitative and quantitative information on the industry's export potential given the adopted consultancy approaches which allowed for very restricted field work. In addition, both studies did not address the issues of compliance with international food safety standards and their consequences to the industry, which is arguably the biggest challenge in export trade. For a sub-sector like spices which has not been researched much and thus deficient in secondary information, such consultancy approach was only likely to set a ground for a more down to earth research work on these fronts in future i.e. paving a way for a full fledged research study. Generally, quantitative studies in relation to standards conformity in primary production systems are particularly scarce globally. They have been mostly done in processing industries like meat and fish industries (Antle, 1998a; 1998b, 2000; Jensen and Unneverh, 1999; Cato and Santos, 1998). Consultancy studies in primary production systems seem to be more common as again attested by studies done in Thailand, Morocco and Ghana (Manarungsan *et al.*, 2004; Aloui and Kenny, 2004; Gogoe, 2003)[4]. These studies were based on specific codes of standards that are promoted by private UK Retailer groups- European Retailer Produce Working Group Good Agricultural Practice (EUREPGAP) and BRC (British Retailers Consortium). Fully-fledged research studies on quantification of compliance costs in primary agricultural production and in LDCs are literally scanty. A single research study, specific to spices, has been conducted in India (a developing country) but it was also plagued with data paucity (Jaffee, 2004).

[4] These studies are reviewed in Chapter 2

1.5 The Study Objectives

A thorough knowledge of the magnitude of compliance costs and *modus operandi* of ever-changing global trade governance structures is essential in attaining exports diversification in Tanzania. Furthermore, quantified studies on the economic effects of Sanitary and Phytosanitary (SPS) measures are important in informing government and/or industry of involved compliance costs in different global markets (Beghin and Bureau, 2001; OECD, 1997). Such knowledge is thus important for designing cost-effective ways of attaining regulatory/standards compliance in accessing respective global markets. The Tanzanian spice industry is no exception in this regard.

The general objective of this study[5] is therefore to examine the level and extent of compliance with international food standards and its implication for markets access in the Tanzanian spice industry. The study endeavoured to address the following specific objectives:

(i) To characterize the Tanzanian spice industry with a view to establishing the status of its stakeholder base, institutional set up, supply chain structure (vertical coordination) and its international food safety standards compliance prospects,

(ii) To examine existing conformity assessment capacity, within Tanzania, for verifying compliance with food safety standards of concern for spices destined for local and international markets; and,

(iii) To quantify and assess the costs and benefits of certified organic farming for members of chilli and black pepper contract farmers in Tanzania.

[5] DIIS working papers number 2007/8, 2008/10 and 2008/30 form part of this thesis. These are accessible at www.diis.dk and www.tralac.org

Implementation of the first objective involved interviews with various spice industry stakeholders including producers, traders, government agricultural officials in producing districts, spice-related institutions, exporters and non-governmental organizations on Mainland Tanzania and Zanzibar. The persuit of objective two involved interviewing key informants for some selected testing laboratories and certification bodies in Dar Es Salaam and Arusha. The third objective was implemented through case studies that involved in-depth semi-structured interviews with organic and conventional black pepper and chili farmers in Muheza and Unguja North 'A' districts respectively (see details in Chapter 3).

1.6 Study Justification[6]

This study focuses in detail on the spice industry's supply chain structure and its prospects of attaining conformity to international food safety standards. The specific issues of the research are essentially three. More specifically, it discusses the extent and type of vertical coordination mechanisms that exist in the industry. Secondly, it undertakes an in-depth analysis of existing local capacity to assess conformity to these international food standards. Thirdly, it identifies the extent of the industry's compliance with international food standards and undertakes an in-depth analysis and discussion of costs and benefits of compliance with certified organic standard.

These themes are of course related. The first reflects a growing recognition that international trade is now operated mainly through global chains and networks of formally independent agents, rather than taking place internally within vertically integrated transnational corporations (Kherala and Kirsten, 2001). Because of high levels of competition between suppliers in different locations, success in accessing markets depends on actor's ability to be part of a competitive chain. This in turn generally rests on the

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[6] Further specific justification for objectives (ii) and (iii) are given in chapter 4.

presence of some form of vertical coordination falling short of vertical integration. Study of vertical coordination in a sub-sector such as spices in Tanzania is thus crucial to understanding its prospects for international competitiveness.

The second theme is an important component in the complex realm of international food standards compliance. This realm entails a cycle of three things namely; identification of risks, introduction of procedures to address those risks, and finally creation of procedures to verify conformity with the risk control procedures (Humphrey, 2008). Local capacity for standards conformity assessment is an important component in accessing export markets. In theory, it leads to lowered compliance costs on the part of local exporters. Moreover, it may provide local exporters with the ability to contest unfavourable foreign test results and thus avoid unnecessary losses. This is even more important in cases where product contamination occurs outside their borders (Akyoo and Lazaro, 2008a).

The knowledge of a country's capacity to assess standards conformitys is thus an important aspect in understanding the relative easiness or difficulty of accessing international markets by local industries/firms as it gives an indication of the extent of compliance costs involved. It also informs the extent of those costs that are supposed to be incurred by each of the two main sectors; public and private sectors.

Attention to the third theme (cost-benefit analysis of compliance with certified organic standards) is inspired by the fact that food standards imposed by importing countries appear to be escalating, to the extent that they can constitute non-tariff barriers to trade (Antle, 1998a; Hoekman and Kostecki, 2001; Mitchell, 2003; Athukorala and Jayasuriya, 2003). At the same time, knowledge of costs and benefits of conformity with them is sparse. So too is knowledge of whether there are alternative markets to those demanding high standards, and of compliance costs in these markets. Knowledge of compliance costs is also important in designing efficient regulation for the industry (Beghin and Bureau, 2001).

In a wider perspective therefore, this study is expected to contribute to the body of knowledge on international food standards and their consequences for agricultural producers' costs and revenues which is currently deficient in Tanzania. It is also expected to give an indication of broader challenges facing Tanzania in its quest to diversify its agricultural exports into high value products like spices. Moreover, it is expected to be a compass for agricultural policy-makers on issues related to compliance with intenational food standards, now a global phenomenon which individual countries (including Tanzania) can hardly sideline from.

1.7 Organization of the Study

This study is organized in five chapters. The first introductory chapter is followed by the literature review chapter. Research methodology is covered in chapter three whereas results and their discussions are presented in chapter four. The study's conclusions and recommendations are presented in chapter five.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter reviews the pertinent literature on food standards. It focuses especially on the theoretical discussion of food standards, empirical studies on their implication for production costs, and studies discussing the methods that can be used for quantifying their economic effects.

2.2 Evolution of Food Standards

In discussing food standards, the literature typically makes a distinction between quality and safety attributes of food (Antle, 1998b, 2000; Henson, 2003; Jaffee, 2004; Nadvi and Waltring, 2002; and Manarungsan *et al.*, 2004). Manarungsan *et al.* (2004) refers to quality as including physical attributes of a food product such as freshness, sensory (organoleptic) qualities, and packaging, which enhances its marketability. On the other hand, Henson (2003) defines food safety as specifically referring to freedom from potential hazards (e.g. microbial pathogens and chemical contamination) that can cause ill-health in humans. Antle (2000) separates safety and non-safety food quality attributes referring in the former case to absence of pathogens in food thus concurring with the other two definitions above. A related issue is that both food safety and quality concerns have evolved hand in hand. In the case of food safety there has been a transition from concerns with basic hygiene to food safety considered more widely. Likewise, while quality has always been and remains a concern, dimensions of quality that are relevant today have changed (Nadvi and Waltring, 2002; Jaffee, 2004).

An example of these trends in relation to spices is given by Jaffee (2004). He contends that, prior to 1990s the governing standards in international trade for spices were related mainly to quality and cleanliness specifications set by particular manufacturers or food service companies. On the quality side, technological refinement in food processing and related industries gradually led to an increase in attention to actual chemical constituents of spices such as carotene content in paprika, piperine content in black pepper and capsaicin content of chillies. At the same time there was a gradual incorporation of health and hygiene specifications in commercial supply chains for spices and, to a lesser extent, these became subject to regulatory oversight in international trade. This development was inspired by an increased understanding of microbiological and chemical hazards in foods as well as consumers' concerns about these hazards. This then shifted the focus from cleanliness characteristics to issues of potential contamination with microbial pathogens, chemical/heavy metals, chemical pesticides, and exotic pest infestation (Jaffee, 2004).

Evolution in standards in general is captured in the literature both directly in single systematic studies on the matter or in studies whose main focus is elsewhere. Nadvi and Waltring (2002) study falls into first category as it describes the trends and patterns that quality management, environmental, and social standards have shown over the years. The study identifies different generations of standards under each of these headings, which also helps in understanding the changing global standard-setting pattern. According to this study, quality management standards have followed a 'thinning-out' (pyramid) trend as they have moved from generic to company/firm-specific standards, a reflection of their ever growing stringency over time. On the other hand, environmental and social standards have depicted an opposite 'inverse pyramid' trend as they have moved from firm-specific to generic standards reflecting increasing consumer awareness of these issues over time (Nadvi and Waltring, 2002). In the context of examining the agri-food industry, the multi-authored book by de Battisti *et al.* (2009) is a good example of work in the second category.

As de Battisti *et al.* (2009) argue, a notable trend in the agri-food industry has been the recent proliferation of private voluntary standards (pvs) in the food safety area (see also Wolff and Stanton, 2008; MacGregor, 2008; Homer, 2008). These are mushrooming in the wake of growing consumer concerns, which were initially a result of the 1990s scares over food-borne diseases (e.g. mad cow disease in meat-BSE and dioxin in animal feed)[7]. Private firms, especially brand owners, always respond swiftly to their customers' demand in a bid to maintain market share and to protect their investments in their brands. Regulatory requirements in the EU (under the General Food Law Regulation 178/2002 EC) are also among the major reasons for this trend as food sellers are legally responsible for compliance with European food safety legislation (MacGregor, 2008). Formulation and enforcement of private standards is thus a way to demonstrate 'due diligence' on the part of retailers/brand owners. In a further recent development, food safety has been woven into social, ethical, and climate change issues (MacGregor, 2008). The new generation of standards in the global agri-food supply chains therefore encompasses food quality/safety, social and environmental issues (Nadvi and Waltring, 2002). Given that the institutional/public standards-setting process has been slow (Swann, 2000; Nadvi and Waltring, 2002), this proliferation is seen by some authors as an initiative by the private sector to fill the gap between dynamic public opinion and food legislation (Homer, 2008).

[7] Avian and swine flu are the most recent food safety scares which are likely to affect standards in the poultry and pork industries respectively.

2.3 The Economics of Food Standards

2.3.1 Economic Theory and Standards

Swann's (2000) paper provides a comprehensive literature review on the economics of standards up to its date of publication. The economics literature on standards is shown to have first emerged in the mid 1970s. The main contributions are referred to by Swann as including Hemenway (1975), David (1985), Farrell and Saloner (1985) and Katz and Shapiro (1985). Since the 1980s the literature has expanded but in terms of economic theory, the contributions by Mitchell (2003) in the multi-authored book by Buzby (2003) and studies by Antle (1998b, 1999, 2000)[8] are most important.

The main theoretical contributions to the literature cover the economic role played by (food) safety standards. Here most contributions take the contribution of Akerlof (1970) as a starting point. According to this author, standards are institutional arrangements which help markets to 'get by' through overcoming market failure from information asymmetries (Akerlof, 1970). It follows therefore that food safety standards can be considered as attempts to circumvent problems of imperfect and asymmetric information on the market place (see section 2.3.2 below) and can, in this context be formulated either publicly (through a government regulation process) or privately (by private firms) (Mitchell, 2003). According to Holleran *et al.* (1999), firms might establish their own standards when the incentive to provide safe food is large enough. On the other hand, government regulation comes in when markets and standards institutions fail to provide the socially optimal level of food safety (Mitchell, 2003). Regulations are policy initiatives by a government that are aimed (in this instance) at inducing producers to provide higher levels of food safety. They

[8] See also Blind (2004) and Elgar and Hanseth (2000).

set minimum standards to be met by firms before selling their products on the market (Mitchell, 2003).

More detailed discussion of the role of standards in solving market failure problems followed Tirole's (1988) classification of standards by the type of food quality attribute they measure (i.e. whether search, experience, or credence qualities). These distinctions refer to the availability to agents of different sorts of information. The market for food is characterized by both imperfect and asymmetric information (Antle, 1998b, 1999) including about food safety. Imperfect information refers to a situation where an economic agent does not know which of the several possible outcomes (e.g. safe food, unsafe food) will result from a transaction. Asymmetric information refers to a situation where one party to a transaction does not know as much about the good (on this case its food safety attributes) being exchanged as the other does (Mitchell, 2003). This is due to the fact that some food safety attributes are of a credence nature, i.e., they are not easily observable before purchase.

Antle (1998b) discusses important violations of perfect competitive conditions resulting from an imperfect level of safety information in relation to goods with two types of attributes: experience and credence - and their implications for market equilibrium. For goods with 'experience' attributes, consumers can only recognize attributes of a product after purchase· (this is exemplified by a typical case of acute illness from some toxic residues and some microbial pathogens). Under repeated purchases of 'experience' goods, efficient market equilibrium is attained through investments in a firm's reputation as a higher/ more quality/safety producer. In a situation of a single purchase, similar results can also be attained if consumers are able to exchange information at low cost. Low cost information could be from a word- of- mouth, newspapers, or consumer information publications (Antle 1998b).

Reputation building by firms provides for a case where a market with imperfect pre-purchase information can achieve almost the same result/outcome like a market with perfect information (Grossman, 1981) provided firms expend resources to establish it (Klein and Leffler, 1981). A perfect information market on the other hand applies to 'search' goods, for which safety/ quality attributes are detectable by organoleptic inspection (sight, touch, or smell). Perfect information also exists in relation to some brand name goods where firms disclose their products' qualities. The major observation by Rosen (1974) is that under a situation of a perfect market for quality differentiated goods, the price mechanism will discriminate different quality levels.

For credence goods consumers are not able to achieve exact knowledge of product quality either before or after purchase. A typical case is goods which may contain low-levels of toxins, such as carcinogens whose effects on consumers take years or decades to occur (Antle, 1998b) and even when occurring, are difficult to associate with a particular food safety effect. This represents a case of symmetric imperfect information in which both the firms (sellers) and consumers are equally misinformed about the quality status of food item. This is distinguished from a case of asymmetrical imperfect information in which the firms have the information and can give it to consumers if they wish to or if compelled by law.

In essence therefore, reputation mechanisms can not work effectively to achieve efficient level of safety for credence goods. Moreover, in a situation where consumers are not able to distinguish between low and high quality products on the market 'Gresham's law' of product quality may set in, where, bad (low cost, low quality) products chase good (high quality, high cost) products from the market (Swann, 2000; Antle, 1998b). Antle (1998b) suggests the use of informational labelling and preventive food safety regimes such as

HACCP as regulatory tools in this scenario, to turn credence goods into experience goods. Nonetheless, as long as firms and regulators lack quality information, policies designed to fix information asymmetries alone, such as labelling requirement will be ineffective (Antle 1998b). Minimum standards or quality descrimination standards have been shown to be of help in overcoming Gresham's law (Leland, 1979). However, Boom (1995) and Swann (1993) suggest that standards can be one of the most effective ways but are not the only way to overcome Gresham's law.

Swann's (2000) study also refers to the '*market failure*' problem and observes that, according to the literature, it is normally corrected by a government action. The study however doubts the reliability of the above assertion as '*government failure*' is also always likely. Slowness of governmental systems in responding to producer and consumer needs is also intimated by other authors (Nadvi and Waltring, 2008; Homer, 2008). Nonetheless, government involvement in standardization has traditionally derived from two possibilities; the likelihood of market failures and the 'public good nature' of standards (Swann, 2000). The question is whether the new generations of food standards are still public goods given the niche markets they are sometimes meant to serve. The recent evolution of food safety, environmental and social issues as fast-moving competitive tools in agribusiness (Homer, 2008), may have eroded the 'public good' nature from contemporary food standards.

2.3.2 Food Safety Standards and Trade

According to MacGregor (2008), food supply chains have been regulated for quality for over 500 years. As indicated above, massive publicity concerning food-borne public health crises during the 1990s led to northern consumers demanding, from their governments, more assurance of food safety on the market place. This led to reinforced third party certification and labeling of products in the agri-food sector (MacGregor, 2008) but also tighter food safety laws at a national and regional (EU) level. A possible outcome of such individual government actions was several diverse national standards which would likely interfere with free international trade. There was thus a need for a multi-lateral action to avert such contingencies, hence the need to negotiate the WTO Sanitary and Phytosanitary (SPS) Agreement. This Agreement was negotiated by governmental food safety, plant and animal health regulators with a view to defining legitimate health protection requirements for internationally traded food (Stanton and Wolff, 2008). Prior to the SPS agreement international food standards were, as they still are, formulated by the Codex Alimentarius Commission (CAC) which is a joint FAO/WHO organ that was established in 1963 (GTZ, 2003, UNCTAD-UNEP, 2008). The formulation of standards by Codex is aimed at harmonization of individual national food standards globally.In Tanzania, the national CODEX inquiry/contact desk/point is maintained at the Tanzania Bureau of Standards (TBS). This point serves to provide information related to international food standards to exporters of agri-foods into various global markets. Positioning of CODEX inquiry points with national standards bodies is a practice that is adopted globally.

The Sanitary and Phytosanitary Measures (SPS) Agreement was signed in 1994, following the conclusion of Uruguay Round (UR) negotiations (1986-1994) that saw the birth of the World Trade Organization (WTO). A second aim of the WTO SPS Agreement was to provide a mechanism whereby international trade would not be harmed by otherwise disguised protectionist measures/standards which might be taken by a country purporting to protect consumers' health. The agreement provides a reference point for how food safety rules must be justified. In the WTO, member states are encouraged to base their national standards on international standards, guidelines, and other recommendations adopted by the Codex Alimentarius Commission (CAC), the International Plant Protection

Convention (IPPC), the Commission on Phytosanitary Measures (CPM), and the World Organization for Animal Health (OIE) (GTZ, 2003). Despite the SPS agreement trade conflicts are still rife in the food industry as national and/or regional standards (especially in high value markets) continue to be more stringent than those adopted by the above mentioned bodies, Codex in this case (Buurma *et al.*, 2001; Kithu, 2001; de Battisti *et al.*, 2009).

When thinking about international trade and food standards, economists have pointed out that markets do not have only different types of regulations, but also different desired levels of food safety, and different levels of compliance costs. Some countries therefore enact unique regulations of their own taking advantage of the SPS Agreement provision allowing them to set standards above the level of those in the Codex, where this can be scientifically justified (Antle, 1998b; Hoekman and Kostecki, 2001). It is these differences that frequently result in trade conflicts between nations (Mitchell, 2003). Conflicts are normally resolved in various ways including the SPS consultation procedure, trade cessation, adopting each other's regulation (harmonization), or through recognition of each other's regulation (mutual recognition) (Hoekman and Kostecki, 2001; Mitchell, 2003).

Dohlman (2003) argues that divergent perceptions of tolerable health risks between countries are largely associated with the level of economic development and the susceptibility of nations' crops to contamination. According to Hamori (1998), willingness to tolerate risks differs across countries because there are different levels of risk aversion and demand elasticity in relation to risk in different countries. Wealthy nations therefore have more stringent safety standards than poor countries given the difference in the consumers' willingness to pay for safe food between them (Mitchell, 2003).

A central microeconomic trade issue related to standards is that at the firm level, foreign firms may completely lose their share of a domestic (importing country) market when they face higher costs of complying with revised domestic standards. Conversely, when a foreign supplier is not bound by stringent regulations as is the domestic firm, a new domestic supply curve will reflect higher costs. The result is loss of market share for domestic producer in favour of cheaper imports. This will normally spur domestic protests aimed at imposing the same standards on foreign firms (Vogel, 1995). This is related to the case which is argued in Swann (2000) in which formulation of standards can be purposely influenced by powerful supply chain actors (through a *'regulatory capture'* process) to raise competitors' costs so as to prevent the latter's entry into the market.

The bottom line is that a foreign firm's market share depends on the consumer's willingness to pay for safer product, consumers' ability to distinguish safe products in the market and firms' efficiency in communicating to consumers about the safety level of its products (Mitchell, 2003). Moreover, firms located in particular countries can find that their country's reputation matters in determining whether they can sell their products abroad. Several studies have indicated that consumers form opinions about the general quality of goods coming from a particular country (Chisik, 2002).

At the industry level on the other hand, a regulation which requires a large initial expenditure on equipment might give cost advantage to large firms that can afford the expenditure and that are able to exploit scale economies by amortizing additional costs per unit over a large number of units (MacDonald *et al.,* 1996). This may also have an effect on industry structure as it might enhance vertical integration of firms in a bid to ward- off competition and enhance control of food safety attributes.

2.4 Classification of Food Standards

Efforts to classify standards are evident in the earlier literature (David, 1987; De Vries, 1999) as well as in more contemporary contributions (Mitchell, 2003; Antle, 1999). According to Swann (2000), it is important to distinguish standards because each purpose of standardization has different economic effects, and the analytical models used to understand these effects are also different. Literature incorporates various ways of classifying standards including categorization according to process used in setting them and most commonly, according to whether the stndard relates to products, processes or services. In the early literature they are classified according to the economic problems they aimed at resolving (David, 1987). In this classification, there were compatibility/interface standards, minimum quality/safety standards, variety reduction/focussing devices standards and information/measurement standards. Some contemporary literature e.g. Nadvi and Waltring (2002) alternatively categorizes standards into generations reflecting a chronological order of their inception.

Overall, the contemporary literature embodies four ways of empirically classifying food safety standards (as opposed to quality attributes Tirole (1988) mentioned earlier). The main categorizations are according to whether they refer to products or processes; how they are verified, what generation they represent, and their sectoral origin (Antle, 1998b, 1999; Mitchell, 2003; Nadvi and Waltring, 2002). These categories are not mutually exclusive. There is a fair degree of concensus between different authors in applying these categories[9].

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[9] Caswell (2003) categorizes standards into three major types namely process, performance and information (i.e. labeling) standards. However, Nadvi and Waltring (2002) refer to labels and codes of conduct as special sub-categories of standards and as not being standards in their own right.

The first classification when reference is made to production technology in use, standards is classified as either product standards or process standards. The former specifies characteristics that a product must attain (e.g. a maximum residue level-MRL- for a specific pesticide) irrespective of production technology to be used, whereas process standards specify production technology (e.g. certified organic farming of crops) on the assumption that certain techniques make food more likely to be safe (or to generate some other attributes) (Antle, 1999; Mitchell, 2003). Theory suggests that product standards are cheaper to implement than process standards in that they give firms flexibility to choose the most cost-effective way of attaining them (Unneverhr and Jensen, 1996; MacDonald and Crutchfield, 1996). On the other hand, a combined standard (i.e. product + process) especially in a processing-based production system theoretically encourages higher levels of safety but will entail higher costs of conformity (Helfand, 1991).

According to IDS (2003), the global trend in standards setting is towards process standards. This reflects the growing tendency to impose safety oversight along the entire supply chain (Henson and Humphrey, 2008). The need to put in place traceability mechanisms, especially in the EU following its requirement in EU food legislation (Henson and Humphrey, 2008), also contributes towards this trend. This can be extra compliance burden for developing country producers especially when complex and costly production technologies are involved amid restricted choices. The growing use of GlobalGAP (de Battist *et al.*, 2009) and certified organic standards (UNCTAD-UNEP, 2008), which are both process standards, in primary production of crops worldwide bears further witness to the above mentioned trend (although organic standards may not entail new or additional costs).

In relation to verification status, standards are normally classified as first, second- or third party verified (Nadvi and Waltring, 2002). First-party verification entails self-monitoring that is followed by self declaration of conformity to requirements of a particular standard whereas in a second-party verification conformity assessment is carried out by a buyer i.e. monitoring for compliance is shifted to the user of the product/services or to trade bodies acting on behalf of their members (Stephenson, 1997; Nadvi and Waltring, 2002). Third-party verification on the other hand (UNCTAD-UNEP, 2008; Nadvi and Waltring, 2002), entails an accredited independent auditor providing a written assurance that a clearly identified process has been methodically followed such that adequate confidence is provided that specific products conform to specified requirements. The importance of this type of categorization (i.e. verification method) is to do with differences in the credibility of a particular good, between the three scenarios. It is generally accepted that third party verified standards, though costly, confirm the greatest credibility of the three (Nadvi and Waltring, 2002).

According to Hoekman and Kostecki (2001), first-party verification is common in US but very uncommon in the EU. However, in some instances self-verification is also applicable in the EU, for instance, there is a component of self-assessment in the EUREPGAP/GlobalGAP standard in addition to a third-party verification requirement. Most international standards are however third-party verified e.g GlobalGAP (Humprey, 2008); the BRC global standard, EKO, the Marine Stewardship Council standard (MSC) (Van der Kloet and Havinga, 2008); the Forestry Stewardship Council standard (FSM) (Nadvi and Waltring, 2002), organic standards (UNCTAD-UNEP, 2008), Tesco's Nature's Choice standard, and the ISO 9000 series (Holleran *et al.*, 1999, Nadvi and Waltring 2002).

It is clear from the above discussion that third party verification is an increasing trend. Moreover, the ever increasing stringency of standards in response to market demand and regulatory requirements (Henson and Humphrey, 2008; de Battisti *et al.,* 2009) in developed economies, especially in the EU, suggests that the use of this type of verification will continue to increase in future. This has implications for compliance costs of small scale southern producers/suppliers, in relation to their ability to meet not only conformity but also certification and testing costs, taking into consideration their low resource-base (Luvai, 2008).

The literature categorizing standards into temporal generations is reviewed in the Nadvi and Waltring (2002) study. The study identifies three and five generations for quality management and social and environmental standards respectively. The importance of this categorization in tracing the evolutionary trend of general standards has been discussed in section 2.2 above. A notable observation in relation to this categorization is the absence of a common denominator on which contemporary environmental standards are based, as contrasted with contemporary social standards which largely refer to the ILO core labour standards and UN Declaration on Human Rights (Nadvi and Waltring, 2002). It has thus been difficult to define a common framework for minimum global environmental standards due to their divergent nature. Given that environmental and social standards are now commonly integrated in wider private standards (Homer, 2008), this shortcoming can have serious implications for trade. It might give rise to some very stringent standards that are not based on acceptable international conventions, thus undermining the WTO's objective under the SPS Agreement (see section 2.2).

A final, and also very important classification of food standards, is that based on their sectoral origin. In accordance with this categorization, standards are either public or private (Mitchell, 2003; Manarungsan *et al.*, 2004; Aloui and Kenny, 2004; Humphrey, 2008; Henson and Humphrey, 2008; de Battisti *et al.*, 2009). Private standards are formulated by firms in their quest to protect their reputations (MacGregor, 2008). Hence firms may decide to implement state-of-the-art safety practices without any intervention from the government (Mitchell, 2003). As noted earlier, private standards are usually introduced in a situation where consumers are willing to pay higher prices that could compensate firms for the extra costs incurred by the safety measures taken (Mitchell, 2003; Macgregor, 2008; Luvai, 2008). Many private standards also fall into the third-party sub-category as standard-setters seek to reduce the costs of establishing and maintaining a standard, which may in turn reduce the cost of conformity (Henson and Northern, 1998). Public standards on the other hand, are legal measures which aim to provide appropriate level of protection for consumers in general and contrast with private standards in that the latter generally do not only provide for food safety but also differentiate market product quality (Manarungsan *et al.*, 2004; Henson and Humphrey, 2008). Since retailers are liable for both the quality and safety of their products, private standards are normally more stringent than public standards (MacGregor, 2008). There is often a failure to appreciate the distinction and interrelationships between public regulation (the most familiar form of public standard) and private standards (Henson and Humphrey, 2008). As a general principle, distinguishing the two depends on whether all major functions associated with the system of standards (standard-setting, adoption, implementation, conformity assessment and enforcement) are undertaken by private entities or state actors (Henson and Humphrey, 2008).

In the literature, the most notable food safety-related private standards applied globally so far are the retailer-led standards being promoted by the British Retail Consortium (BRC global standard) and the European Union Retailer Produce Working Group Good

Agricultural and Good Manufacturing Practice (EUREPGAP - now GlobalGAP) standards (Holleran et al., 1999; Gogoe, 2003; Manarungsan *et al.*, 2004; Aloui and Kenny, 2004; Humphrey, 2008; Henson and Humphrey, 2008; de Battisti *et al.*, 2009). Other proprietary retailer standards include Tesco's Nature's Choice, which is a quality assurance scheme with food safety content (Holleran *et al.*, 1999). However some producer organizations may also promote private standards. This is how organic standards originated. Other examples include the standards of the Kenya flower Council, which is a producer organization.

According to the literature (Humphrey, 2008; Henson and Humphrey, 2008; de Battisti *et al.*, 2009) the two key characteristics of private standards are that they are voluntary and all major functions associated with their system are undertaken by private entities. In addition, they typically have dual functions – one related to risk management in foods and the other on product differentiation (Henson and Humphrey, 2008). The first function aims at assuring food safety whilst the second aims at differentiating the firm and/or its products in the 'eyes of the consumer'. One of the only potential roles for public sector in the system of private standards is to establish a credible system of accreditation within which private certification bodies operate (Henson and Humphrey, 2008).

As will become apparent below, public and private standards may influence each other in either of two ways. In the first case, public standards may influence formulation and setting of private standards. This is in respect to enhancing the mandatory conformity requirements found in public standards [Cf. Maximum Residue Limits-MRLs (Buurma *et al.*, 2001) versus the more general EUREPGAP/GlobalGAP standards (de Battisti *et al.*, 2009). In the second case (Henson and Humphrey, 2008), a well established private standard may be bestowed with legal powers to become mandatory, which is akin to its evolving into a public standard (it may however take on the status of legally mandated private standard). This is the case with organic standards as embodied in the EU organic Regulation, and the Swedish national system respectively (Gibbon, 2008).

As observed above, all public standards (technical regulations) are legally binding and are thus mandatory (Hoekman and Kostecki, 2001). This is so because they are meant to protect human life, animal life, and the environment. However, the distinction between mandatory and voluntary standards has, of late, been very elusive. Aloui and Kenny (2004) contend that this distinction has become irrelevant in practice. This is because private standards which are supposed to be voluntary have a crucial importance for competititveness in international trade (Aloui and Kenny, 2004; MacGregor, 2008; Homer, 2008) so that no exporter can do without them. They are thus implicitly mandatory.

2.5 Food Standards and Spices

In as far as primary production of spices for high value markets from least developed countries is concerned, the literature recognizes one public standard (MRLs) and one private standard (certified organic) as important[10] (Buurma *et al.*, 2001; Kithu, 2001; Jaffee, 2004; Caigher, 2004). Compliance with MRLs is mandatory in the EU (Buurma *et al.*, 2001) whereas certified organic standards are increasingly being applied for spices in major producing countries like India (Jaffee, 2004; Kithu, 2001) and LDC producers like Tanzania (Caigher, 2004). A clear knowledge of their development and application is therefore important to understanding contemporary challenges in attaining conformity. The literature on the two standards is discussed in some detail below with special reference to their trade-enhancing or trade-impeding effects.

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[10] Other standards that may apply to a few spice producers only, such as GlobalGAP/EUREPGAP which is used mainly for horticultural produce (Battisti *et al.*, 2009) are not considered in this section.

2.5.1 Maximum Pesticide Residue Limits (MRLs)

With respect to MRLs, the literature discusses their genesis and changing trends (Buurma *et al.*, 2001) as well as their implications for conformity assessment investments (Jaffee, 2004; Stephenson, 1997). In this regard, Jaffee (2004) identifies the types of physical infrastructure in terms of equipment required for their testing whereas Stephenson (1997) deals with the regulatory complexities that the physical infrastructure has to conform to in order to attain international recognition through an accreditation process (see Akyoo and Lazaro, 2008a).

According to Buurma *et al.* (2001), MRLs are set on the basis of a series of residue trials, which in the EU are performed according to the rules of 'Good Agricultural Practice' (GAP) regulations. Consumer risk assessment is carried out in a second step following the above. Intuitively, the initial stage sets out to determine a pesticide application rate that is not harmful to crops and the environment. The second stage seeks to establish an acceptable residue level that is safe for consumers of the product. The first stage thus bears on the second.

The two most important sets of MRLs are those of the EU, and the Codex CXLs (Codex Maximum Residue Limits). The EU's MRLs are set on the basis of European countries' GAPs whereas Codex CXLs are based on a number of GAPs all over the world (Buurma *et al.* 2001). Moreover, EU-MRLs are mandatory whereas Codex CXLs are voluntary references (though their importance has since increased following the signing of the WTO SPS Agreement in 1994). There is a general tendency for EU-MRLs to be lower (i.e. more stringent) or equal, and seldom higher than Codex CXL. Trade problems occur in the case where EU-MRL is lower than the Codex CXL as exporters to the EU will be compelled to comply with more stringent limits than the internationally agreed limits under Codex.

Further trade complications arise where Codex CXLs are non-existent for some pesticide/product combinations or where the EU-MRL is set at the limit of determination (LOD)[11] (Buurma *et al. 2001*).

In the EU, harmonised MRLs were first introduced for fruit and vegetables in 1976 in directive 76/895/EC (Buurma *et al.*, 2001). Over time several other directives were issued each amending the preceding directive. The amendments usually relate to changes made as a result of new MRL applications, withdrawal of authorization of some pesticides[12], coverage of new products for which MRLs are applicable, and revised specifications of proper methods of application of authorized pesticides (Buurma *et al.* 2001). Directive 2000/42/EC harmonized product/pesticide combinations where residue data was lacking (thus failing to be harmonized in the preceding directives) by lowering their respective MRLs to the LOD (Buurma *et al.* 2001). Directive 2000/42/EC dealt specifically with MRLs in and on cereals, foodstuffs of animal origin and certain products of plant origin, including fruits and vegetables (http://europa.eu/geninfo/legal_notices_en.htm). The practical consequence of a LOD corresponds to banning the application of a pesticide involved[13]. Some product-specific EU-MRLs and Codex CXLs are shown in Annex 1.

[11] MRLs are established for product/pesticide combinations for which residue data is available. For Product/pesticide combinations for which sufficient residue data is not available, a limit of determination (LOD) is established, which results in withdrawal of authorization. In principle, setting EU-MRLs at the LOD level takes place in two types of cases: (i) When the product involved is not grown in the EU and (ii) When the pesticide involved is not registered in EU (Buurma *et al.*, *op. cit*). Against this background, LOD limits are potential non-tariff barriers to free trade.

[12] Following Directive 2000/42/EC authorization of 324 pesticides out of 834 'old compounds' was withdrawn in the EU effective 2003. Of late, EU parliament voted to ban 22 pestides in January 2009 amid protests from pesticide companies and European large scale farmers (Leisa, 2009).

[13] See foot note 10 above. According to the joint FAO/UNEP convention, export of a chemical can only take place under the prior informed consent (PIC) of the importing country. This is supposed to prevent unwanted imports of dangerous chemicals and pesticides. The PIC clause notwithstanding, residues of some banned pesticides (e.g. DDT and monocrotophos) are still found in agricultural products imported from the developing world (Buurma *et al.*, *op. cit).*

Implicitly, these apply also to spices[14] as there are no dedicated MRLs for spices but only horizontally derived ones from general foodstuffs (Jaffee, 2004). Compliance with EU MRLs on the part of developing country smallholders is likely to be an uphill task given the frequent pesticide reviews which are normally followed by withdrawal of authorizations for some previously applying pesticides as discussed above.

From 1 September 2008, EC regulation No. 396/2005, amending Council Directive 91/414/EEC (regarding the placing of plant protection products on the market), came into force (http://europa.eu/geninfo/legal_notices_en.htm). In an apparent effort to strengthen earlier harmonization efforts (as under Directive 2000/42/EEC), the regulation was meant to harmonize all pesticide MRLs (in and on all food and feed of plant and animal origin) for the EU. The regulation established two major rules (http://www.food.gov.uk/...):

(i) That the European Food Safety Authority would now assess MRL applications for new pesticides; and

(ii) A default limit of 0.01 mg/kg was set for all pesticides /commodity combinations for which no MRLs have been set.

The EC regulation No. 396/2005 has since been amended by subsequent EU Commission Regulations 178/2006/EC (1.2.2006), 149/2008/EC (29.1.2008) and 260/2008/EC (19.3.2008) (http://europa.eu/geninfo/legal_notices_en.htm). Notwithstanding the various amendments above, EU pesticide MRLs are still seemingly complex and difficult to understand by many developing country exporters. In recognition of this shortcoming, there are lately some efforts from the EU to disseminate information regarding its

[14] Specific EU MRLs of prime relevance to spices, in the form of microbial pathogen contamination limits, heavy metal contamination limits, and aflatoxins are presented in annexes 1, 9, 10 and 11.

regulation 396/2005 to major exporters in the developing world[15]. Such dissemination efforts are also likely to be extended to East Africa as Kenya is one of the leading exporters of horticultural produce into the EU (de Battisti *et al.*, 2009).

Ocassionally, EU-MRLs may be set at levels which are below the required dosages for effective pest control of some important pests in some producing countries. In other cases, the only effective pesticide for a certain pest is either not a registered pesticide in the EU or its MRL has already been set at LOD. Under these circumstances, exporters from these countries cannot access the EU market unless they find an alternative way of cultivating the crop in question, or according to Buurma *et al.* (2001), if they apply for 'import tolerances'. This application is only granted when manufacturers of pesticides are able to provide residue dossiers for the chemicals in question in order to authenticate the application. However, for minor crops for which Codex CXLs are mostly lacking (e.g. nuts, small fruits, vegetables and spices), pesticide manufacturers find it uneconomical to produce such residue data and exporters of these are thus unlikely to benefit from the arrangement (Buurma *et al, 2001*). Under the new Regulation (EC) 396/2005, evaluation of import tolerance applications will take about twelve months.

According to Kithu (2001), least developed and developing nations also find it difficult to conform to EU-MRLs because of their diversity from one member state to another. Despite previous and current efforts to harmonize EU MRLs, the on-going efforts under the EC 396/2005 suggest that there are still some pesticide limits in the EU which are yet to be harmonized.

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[15] The Business Information Centre of the Delegation of the European Commission to Thailand, the Thai Department of Agriculture and the Thai National Bureau of Agricultural Commodity and food Standards jointly organized a one-day seminar in Bangkok on 26.03.2009 for explaining the provisions of Regulation (EC) 396/2005 to stakeholders (EU Business Information Centre *et al.*, 2009).

2.5.2 Organic Standards and the EU Organic Regulation

In principle, organic farming is a sustainable and environmentally friendly production method (UNCTAD-UNEP, 2008) which has the following key characteristics:

(i) Relies primarily on local, renewable resources;

(ii) Ensures efficient use of solar energy and the production potential of biological systems;

(iii) Seeks to maintain and improve soil fertility;

(iv) Maximizes recirculation of plant nutrients and organic matter;

(v) Observes strict non-use of substances foreign to nature (e.g. GMOs and agrochemicals);

(vi) Maintains diversity both in the production system and the agricultural landscape; and;

(vii) Provides farm animals with life conditions that correspond to their ecological role and their natural behaviour.

The literature on organic standards covers the scope and origins of organic standards and makes a distinction between its certified and non-certified versions, especially as it concerns high value market access (Gibbon and Memedovic, 2006; Taylor, 2007; UNCTAD-UNEP, 2008; Twarog, 2006). It also explores the cost implication of ICS-based versions of third party certification and highlights the strengths and weaknesses of some of the available alternative systems that have been tried (LEISA, 2008, 2009; Renner, 2008; UNCTAD-UNEP, 2008,). Practical compliance complications which are associated with these standards have also been discussed in the literature (Gibbon and Bolwig, 2007; LEISA, 2008; UNCTAD-UNEP, 2008; Stephenson, 1997).

Organic standards are defined under two sets of international standards- publicly under Codex Alimentarius[16] and privately under the International Federation of Organic Agriculture Movements (IFOAM) (UNCTAD-UNEP, 2008). They are also defined by a large number of national public regulators, plus a large number of private arrangements (Gibbon, 2008). Many private organic standards go beyond the public one in certain areas (mainly animal welfare). They also tend to be more detailed and applied more strictly (Gibbon and Memedovic, 2006). Most operators approach organic farming with the intent to access a niche market (UNCTAD-UNEP, 2008). This is true in least developed countries like Tanzania whose domestic organic markets are non-existent or underdeveloped.

The main private international standard is the IFOAM Basic Standard (UNCTAD-UNEP, 2008; Gibbon and Memedovic, 2006). This is based on the four (formerly seventeen) IFOAM principles – health, ecology, fairness, and care (Taylor, 2007). There is some criticism that IFOAM Basic Standards have been developed in the 'North', despite 75 percent of IFOAM's members being from the 'South'. Thus it is claimed that these standards do not consider southern climates or economies (LEISA, 2008)[17]. The Codex standard is largely based on the IFOAM Basic Standard (Gibbon and Memedovic, 2006).

In terms of export market access, the EU, Japan and US have implemented systems for approval of organic imports based on their own distinct mandatory regulations. Market

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[16] The joint FAO/WHO commission for food standards established in 1963

[17] The claim that standard setters fail to recognize diversity of local environments during formulation of their standards is not however unique to organic standards. Citrus and tomato farmers in Morocco are reported to find it difficult to comply with pesticide limits under EUREPGAP/GlobalGAP protocol for reasons related to pesticide availability, pesticide registration status in the EU, and required protective gears during pesticide application. In the last of these cases, the suggested specifications for clothing, hats, and gloves are incompatible with the local weather conditions (Aloui and Kenny, 2004). Moreover, laboratory facilities in Morocco cannot detect pesticide levels to the limits required by this protocol, necessitating testing of samples to be done in Europe thus making compliance more costly.

access is thus conditional on exporters being compliant with the EU's organic regulation 834/07 (formerly 2092/91), the Japanese national organic regulation (JAS), or the US National Organic Programme (NOP) regulation (UNCTAD-UNEP, 2008). Such access is possible either where production in the exporting country is directly certified to these regulations or where equivalent standard verification mechanisms are recognised. Equivalence agreements have however not been possible between the three main markets and although each recognises a handful of other countries as having equivalent systems (UNCTAD-UNEP, 2008), the first option (i.e. certification) remains the most viable strategy. Conformity to the EU organic regulation is not enough to gain free access to the EU market. Market entry conditions demand that organic products, like other agricultural products, must meet all Sanitary and Phytosanitary (SPS) requirements in the importing countries, which include mandatory MRLs, traceability and – in the case of foods of animal origin – HACCPs (Twarog, 2006).

Reflecting the lack of equivalence agreements as well as the salience of certain private organic and non-organic standards, export-oriented organic producers are increasingly acquiring multiple certifications. For instance, fair trade certification (under the Fair-trade Labelling Organizations International – FLO) ensures that producers can sell their products at pre-determined and guaranteed prices, including a premium. The growing concern about 'food miles[18]' and 'carbon footprints[19]' are also likely to push producers into acquiring certification in relation to 'ethical trading', carbon labelling, and private climate change

[18] Refers to how far food travels from farm to plate. Standards based on these criteria are likely to impact heavily on LDC organic producers that depend on EU market.

[19]Refers to the amount of greenhouse gases emitted during the 'lifecycle' of a product which is then used as a measure of its impact on the environment.

standards especially when products are destined for the UK market[20] (Gibbon and Bolwig, 2007; LEISA, 2008).

ICS is described as a documented quality assurance system that allows the external certifying body to delegate the annual inspection of individual group members to an identified body witin the certified operator (co-operatives, farmers' associations or exporters) (Van Elzakker and Rieks, 2003; UNCTAD-UNEP, 2008). Certification costs under ICS-based system can be reduced in either or both of the two ways, delegating annual audit to a local entity and/or use of group (instead of individual) certification. However for many small farmer organisations, even the costs of third party ICS-based organic certification to international standards (and especially to EU organic standard) are prohibitive (UNCTAD-UNEP, 2008; Renner, 2008). Alternative certification systems that are loosely based on IFOAM's Basic Standards but with some necessary modifications to reflect respective local environments are now being implemented in some countries. Most modifications involve reduced certification costs and amounts of paper work plus another more significant structural change namely, that inspection is performed by 'peers' – other farmers – rather than by a professional body. The shared emphasis on participation in these alternative systems has led to their collective name 'participatory guarantee systems (PGS) (Renner, 2008). The Mexican Network of Organic Markets is an example of a growing PGS (Nelson *et al.*, 2008). Unfortunately, PGS have little use, if any, for organic products destined for niche markets in the 'North' since they are not recognized under the EU regulation (Renner, 2008). Hence there are no operating PGSs in East Africa.

[20] The Soil Association's proposed ban on air freighted organic product has now been dropped. Tanzanian organic spice exports into EU are anyway sea freighted.

While PGSs are of no use in accessing 'Northern' markets, such systems will be beneficial in areas with vibrant domestic organic markets like Mexico. In a more or less similar development, there are efforts to formulate national and regional organic standards in the 'South'. An example is the East African Organic products standard (EAOPS) that was launched in May 2007 (EAC, 2007). However, the domestic organic markets in East African countries, with the possible exception of Kenya, are underdeveloped and in some countries non-existent. The question is whether in such a situation national and regional organic standards are of any use, especially where almost all production for the countries is exported into high value markets like the EU. As noted earlier, mutual recognition of each others' standards has not been easy in the three major global organic markets. Attaining such recognition for the EAOPS is thus quite unlikely in the foreseeable future. This signifies that certified ICS-based organic production systems are probably still the most optimal means of gaining market access for export-oriented 'Southern' producers. Efforts towards assisting these producers to become certified to the EU standard look more relevant at the moment rather than formulation of own standards.

2.5.3 Organic Standard and the Tanzanian Spice Industry

Practical moves to change or develop standards-compliant product and production system are expected to be carried out by the industry itself – effectively the exporters and producers (Caigher, 2004). The first safety standard on spices in Tanzania was formulated by Tanzania Bureau of Standards (TBS) in 1988 vide Tanzania standard (TZS) 404: 1988 which established microbial specifications in spices (TBS, 1988). All the other national standards prior to this were only on quality attributes that spanned from physical to chemical characteristics of spices (TBS, 1979a, 1979b; and 1988). These were not however implemented[21].

[21] A detailed account of Tanzanian national standards on spices is given in chapter four

The 1990s saw development of organic agriculture in general thanks especially to coming of EPOPA (Export Promotion of Organic Products from Africa) in 1994. The EPOPA[22] programme was created by the Swedish International Development Cooperation Agency (SIDA) as a private sector initiative aimed at stimulating national and international trade, while benefiting the rural communities and the environment (EPOPA, 2002). It offered to assist in the process of obtaining organic certification for smallholder farmers, technical consultancy, field staff training, product quality management, marketing support for exporters, and seed money for farmers' inputs. EPOPA played a major role in the establishment of the local organic inspection and certification body – TANCERT-which was founded in October 2003 and the subsequent development of the national organic standard (EPOPA, 2002).

The first draft of the TANCERT Organic Standard for organic production and processing in Tanzania was issued in December 2004 (TANCERT, 2004). This was a general standard that made referenced organic farming in crop production, animal husbandry, produce handling and processing, and social justice. Just as is the case with other international food safety standards scenario, Tanzanian spices organic standard was to be horizontally derived from the general standard above. The under-developed domestic organic market limited the use of this national standard.

Recent development has seen the establishment of a common East African Organic Products Standard (EAOPS) which was inaugurated in May 2007. It has since been adopted as an official standard for Burundi, Kenya, Rwanda, Tanzania and Uganda (EAC,

[22] EPOPA wrapped up its activities in Tanzania in 2007 and its activities were taken over by M/S AGRO ECO which was one of its two (the other being GROLINK) previous consulting companies.

2007) under its official name EAS 456:2007. It is claimed to be the second regional organic standard in the world after the EU's[23] and the first ever to have been developed in cooperation between the organic movements[24] and the national standards' bodies. Its formulation attracted members from the national standards bodies, national organic movements and organic certifying bodies of Kenya, Tanzania, Uganda, Burundi and Rwanda, and the East African Business Council.

Formulation of EAS 458:2007 was meant to take advantage of the growing domestic organic market in East Africa (EAC *opp.cit*). The national standards like the TANCERT's have thus become redundant. The EAS: 2007 standard is to be certified by the national certification bodies of participating countries. Difficulties of winning equivalence recognition with high value markets like EU are still outstanding (even after the inauguration of EAOPS) with the prevailing challenges in inspection, certification, and testing facilities (see details in chapter four).

2.6 Economic Effects of Food Standards

Much of the theoretical discussion on food standards and on the impact of standards on trade has been covered in section 2.3. There is however large empirical literature that addresses the practical effect of particular standards in particular countries. There are also a few effects to generalize from this literature. The case studies include works by de Battisti *et al.*, 2009; Gogoe, 2003; Aloui and Kenny 2004; Manarungsan *et al.*, 2004; Jaffee, 2004; and Maertens *et al.*, 2008. Effects to generalize from these empirical papers

[23] However, EAOPS is a voluntary standard and not embedded in a regulation as that of the EU.

[24] These are the Tanzanian Organic Agriculture Movement (TOAM), the Kenyan Organic Agriculture Network (KOAN), and the National Organic Agriculture Movement of Uganda (NOGAMU).

include Henson and Northern, 1998; Holleran *et al.*, 1999; Segerson, 1999; Swann, 2000; Reardon and Farina, 2001; Buzby *et al.*, 2001; and Nadvi and Waltring, 2008.

Case studies of particular economic effects of particular food standards focus on two major topics and their ramifications. First, cost-benefit analysis of food standards in relation to producers (Henson and Northern, 1998; Segerson, 1999; Dolan and Humphrey, 2000; Reardon and Farina, 2001; Buzby *et al.*, 2001; Gogoe, 2003; Aloui and Kenny, 2004; Manarungsan *et al.*, 2004; Battisti *et al.* 2009) and second, the impact of standards on the governance of specific value chains following adoption and implementation (Hobbs *et al.*, 2000; Croom *et al.*, 2000; Hobbs and Young, 2001; Kheralla and Kirsten, 2001; Maertens *et al.*, 2008; Gogoe, 2003; Aloui and Kenny, 2004; Manarungsan *et al.*, 2004). Practical experience in the developing world shows that implementation of food standards has usually seen closer coordination between chain actors through vertical coordination (or integration in some cases) and/or contract farming between smallholder farmers and exporting companies (de Battisti *et al.*, 2009; Gogoe, 2003; Aloui and Kenny, 2004; Manarungsan *et al.*, 2004; Maertens *et al.*, 2008).

2.6.1 Costs and Benefits of Food Standards

Changes in production costs in relation to standards are a result of costs for adjustments in the production system (Michell, 2003) and costs of conformity assessment procedures (UNIDO, 1996; Boselie, 2008). However, some authors cite exceptional cases where production costs fall in these situations (for example Gogoe, 2003 and UNCTAD-UNEP, 2008 for globalGAP and certified organic standards respectively). Moreover, proponents of organic standards (e.g. LEISA, 2008, 2009), often recommend it for smallholder farmers on the assumption that it is a low cost system, thus its adoption will have neutral effects or lead to decrease in production costs. An empirical example where even quite demanding food safety measures have not resulted in an escalation of production costs is found in Gogoe (2003) where pineapple farmers in Ghana are reported to have saved on pesticide costs by adopting less toxic and cheaper alternative pesticides in complying with EUREPGAP/GlobalGAP standard.

In essence, because any exporter focusing on EU and US markets will have to comply with at least EU-MRLs, as well as a range of others depending on the situation and product type, market entry entails both private and public quality-related investments. These investments may be numerous and substantial. In a case study of Indian spice exports (Jaffee, 2004), these investments had to be made in respect to:

(i) Mobile testing laboratories for on-farm testing,

(ii) Improved drying facilities – entailing construction of cement drying yards in producing areas,

(iii) Training farmers on post harvest methods in addition to supporting them to acquire improved materials and facilities for spice drying,

(iv) Mechanical grading, washing and drying, and packaging equipment,

(v) Sterilization equipment- for both ethyl oxide (ETO) and steam sterilization equipment,

(vi) Certified quality management systems like HACCP, ISO 9000, and In-Process Quality Control (IPQC),

(vii) Public laboratory facilities and equipment which focus beyond physical and chemical parameters to include testing for pesticide residues, aflatoxin and heavy metals. This involved acquisition of gas chromatographs for pesticides; high performance thin layer /liquid chromatograph equipment for detecting aflatoxin (at parts per billion-ppb); and atomic absorption spectrophotometers for detecting heavy metals,

(viii) Compensating farmers for loss in yield through risk taking (i.e. premium prices and/or subsidies); and

(ix) Maintenance cost for additional equipment.

By implication, any spice producing country that targets high value markets like the EU and US will be compelled to make similar investments. However, an important question is whether conformity with some types of standards carries lower costs than those listed above. This may be the case with organic standards, where while in addition to certification requirement there are requirements for testing for aflatoxins, MRLs, heavy metals, and microbial pathogens (especially in the EU market) organic importers typically do not require HACCP (for foods of non-animal origin), ISO 9000 or IPQC (Twarog, 2006). Another question is whether local conformity assessment is cheaper than use of foreign facilities.

Notwithstanding the possible increase in production costs as noted above, firms still find enough incentives to supply safe food for the following reasons;

(i) To promote firm's reputation and thus earn an edge over its competitors (mostly in the cases of non-mandatory standards) (Reardon and Farina, 2001),

(ii) To refrain from imposing costs of reduced demand on other firms as a result of damaged reputation of the industry as a whole. This is based on the fact that when a particular firm's unsafe goods are hard to identify on the market place, the tendency is for consumers to eschew all products in that category (Segerson, 1999).

(iii) The need to meet consumers' demand for some degree of food safety (Holleran *et al.*, 1999). However, due to shared interest between participating firms, certification bodies and importers, it is unlikey for the latter to enforce sanctions against firms on less central aspects of non-compliance.

In examining food standards, the literature rests on the premise that firms will adopt higher food safety standards if the benefits to it outweigh the costs that the firm will have to pay to implement new safeguards (Segerson, 1999; Mitchel, 2003; Antle, 1998a). However, it is not always easy to establish the balance of costs and benefits of standards adoption as some theorized benefit items are non-financial and thus difficult to quantify e.g. innovation (Swann, 2000), improved field management, and wider farm management benefits (de Battist *et al.*, 2009). Producers are however more likely to be concerned with tangible benefits like premium prices (Luvai, 2008). Studies on the GlobalGAP standard in the Kenyan horticultural industry have shown that participating farmers are most concerned with the financial burden of implementing the standard (Graffham *et al.*, 2008). The worst case scenario is that compliant farmers do not receive premium prices for their produce (Luvai, 2008).

The literature on globalGAP standard in Kenya (Humphrey, 2008; Luvai, 2008; Graffham *et al.*, 2008 and de Battisti *et al.*, 2009) provides for a case where smallholder producers are excluded from high value supply chains partly due to high compliance costs and partly due to complexity of the standard itself[25]. Exclusion of small scale producers is not unique to Kenyan smallholder producers or the GlobalGAP standard. For example in Morocco (Aloui and Kenny, 2004), the higher costs required for infrastructure, equipment, and

[25] It is contended that 60% of participating farmers dropped out from the Kenyan globalGAP scheme in the first three years following its introduction in 2003 (Graffham *et al.*. 2008).

certification under the GlobalGAP code has resulted in only large scale farmers (>400ha for citrus and >10ha for tomato) being able to comply. Aloui and Kenny (2004) speculated that the cost would be higher if producers were to simultaneously comply with globalGAP and BRC standards. Further extreme evidence of this exclusion is found in Maertens *et al.*, (2008) for tomato farmers in Senegal. In this case, the extreme consolidation of both downstream (trade, transport, distribution) and upstream (production) activities in the supply chain has resulted in the tomato export trade being taken over by large scale producers and thereby reducing smallholder farmers to farm/estate labourers.

Smallholder farmers' ability to attain standards conformity using their own resources seems to be a distant prospect. In Ghana for instance, though farmers reportedly saved on pesticides after adopting the EUREPGAP/GlobalGAP protocol, none could meet the costs involved without a bank loan and the support from the contract farming company – Blue Skies (Gogoe, 2003). And while this study states that Ghanaian pineapple farmers recorded low differences in cost structures between pre- and post- EUREPGAP periods, this could be associated with omissions of some important costs as discussed in section 2.7(i). The Kenyan case on the same standard has shown the same trend whereby the high compliance costs for the globalGAP standard are only met as a result of *de facto* cost-sharing; farmers paying 36 percent, exporters 44 percent, and 20 percent by donors (Graffham *et al.*, 2008; de Battisti *et al.*, 2009).

It is consistently observed in the studies by Gogoe (2003), Aloui and Kenny (2004), Manarungsan *et al.* (2004), Humphrey (2008) and de Battisti et *al.* (2009) that compliance with the EUREPGAP/GlobalGAP standard by smallholder farmers in developing African and Asian countries is only possible with donor spport. It is further observed that the schemes in Ghana, Morocco, Thailand and Kenya were all implemented through contract farming (discussed below) between smallholder farmers and exporting companies. This arrangement is not only inspired by a need to reduce transaction costs on the part of the exporters but also provides a way to enable smallholder farmers to mitigate some implementation costs. The trend is also observed in the Tanzania organic spices farmers (Caigher, 2004) and Ugandan organic pineapple farmers (Gibbon *et al.*, 2008).

The literature also depicts a rare indirect positive effect of high compliance costs for international food standards on domestic markets. This is observed in the Indian spice industry (Jaffee, 2004). According to Jaffee, following the EU's stringent application of standards that saw many detentions of spice consignments in the late 1980s, the industry responded by developing a domestic market for spices. Reportedly, the efforts have paid-off and the country is currently a net importer of spices with domestic product prices higher than those offered in the world market (Jaffee, 2004). In any case this is an example to be emulated by other developing country producers though the sizes of industries in question and purchasing power of corresponding populations may be limiting factors.

2.6.2 Vertical Coordination and Food Safety Standards

Food safety oversight is cumbersome where production and consumption is separated geographically. In addressing this problem, suppliers are normally compelled to operate in well coordinated and competitive supply chains that enhance their ability to meet the requirements of their target markets. This is commonly observed in the literature. For example, according to Kheralla and Kirsten (2001), various supply chain governance/ vertical coordination structures are developed and/or adopted by actors in a bid to minimize transaction costs involved in accessing end markets situated at a considerable distance (see also Hobbs *et al.*, 2000; Croom *et al.*, 2000; Hobbs and Young, 2001; and Omta *et al.*, 2001). These include not only contracts but also vertical integration, joint ventures and strategic alliances (Mighell and Jones, 1963).

Vertical integration[26] is mostly adopted as a measure for reducing information costs, in place of contracting, as in the latter it is costly to verify whether contractual obligations are being met especially for credence goods (Williamson, 1971). Vertical integration can better guarantee the safety and quality of a firm's inputs and enhance ability to trace product ingredients or processes back through the food production and marketing chain (Buzby and Unnevehr, 2003). However, vertical integration is also expensive to undertake (Maertens *et al.*, 2008).

More commonly therefore, quality management is rather through vertical coordination (not integration) including contract farming between farmers and exporting companies. Under such arrangements the exporting company may give technical assistance, standard specifications of fertilizer and pesticide under the GlobalGAP standard and a price guarantee to participating farmers (Thailand, Manarungsan *et al.*, 2004). In Ghana, the pineapple exporting company (the buyer) provides financial and technical support to farmer. The Moroccan case (citrus and tomato farmers) is also characterized by vertical integration between exporters and larger farmers (Aloui and Kenny, 2004). Producers in these arrangements have access to imported technologies and benefit from exporters' know-how and logistics. In the Senegalese cherry tomato industry (Maertens *et al.*, 2008), the export company's successful attainment of multiple certification (GlobalGAP, ETI, BRC, ISO, and Tesco's Nature' choice) has resulted into extreme consolidation of the supply chain as discussed earlier. In this case, smallholder farmers are reported to indirectly reap benefits of a standards-conforming system through the labour market. It is debatable whether such benefits parallel the would-be gains that farmers could obtain were

[26] Vertical integration occupies one extreme end of vertical coordination with spot market occupying the other (Mighell and Jones, 1963). The literature on vertical coordination and modalities of various supply chain governance structures includes Coase (1937), Hobbs (1996), Hobbs *et al.*, (2000), Croom *et al.*, (2000), Hobbs and Young (2001) and Omta *et al.*, (2001).

they to get directly involved in the supply chain although the evidence is inconclusive (McCulloch and Ota, 2001).

2.6.3 Contract Farming and Food Standards

The widely-recognized increasing salience of Contract Farming (CF) is linked with globalization and market liberalization (Setboonsarng, 2008). Complex contracts between global food producers and retailers, and food producers and suppliers in the developing world started to increase during the 1990s (Dolan and Humphrey, 2000). This followed the need for closer co-ordination of agri-food value chains to ensure conformity to the food safety and hygiene standards required by food importers (retailers, supermarkets and large-scale processors) in the developed world (Dolan and Humphrey, 2000; Miyata and Hu, 2007). CF has been also associated with poverty alleviation strategies in the third world (Sida, 2006; Prowse, 2008; Setboonsarng, 2008) as a means of integrating poor 'Southern' smallholder farmers into lucrative global high value agri-food chains (Sida, 2006; Lusby, 2007). Its evolution is thus linked with the capacity to address problems of market and institutional failures that hinder agricultural development in these countries (Setboonsarng, 2008; Simmons, 2003). Market failure is common in relation to endemic lack of information on demand and price, and product technology and credit. These in turn often reflect a low level of infrastructural development (Setboonsarng, 2008). Institutional failures, meanwhile, are largely a result of the transformation from state-controlled to market-driven economic system (Setboonsarng, 2008). Hence Warning and Soo Hoo (2000) (citing Dirven, 1996 and Schejtman, 1996) contend that CF is a private sector strategy that fills the gap left by the state in the wake of neo-liberal reforms in the agrarian sector i.e. it solves problems in regard to provision of inputs and extension services.

Contributions from the literature on CF can be divided into the following: description of its content (definition, evolution and scope) (Ringo, 2007; Prowse, 2008; Setboonsarng, 2008), differentiation of types (Eaton and Shepherd, 2001; Ringo, 2007; Kasim *et al.*, 2009; Setboonsarng, 2008), identification of benefits and risks (Simmons, 2003; Sida, 2006; Prowse, 2008; Setboonsarng, 2008) and studies of its impact on income (Warning and Soo Hoo, 2000; Warning and Key, 2000; Miyata and Hu, 2007[27]). Warning and Soo Hoo's (2000) and Simmons's (2003) studies are rather unique as they cover both the theoretical explanation of CF and provide empirical evidences from South East Asia and Central America respectively to substantiate these. The studies by Bolwig *et al.* (2009) and Akyoo and Lazaro (2008b), directly assess the impact of CF on the incomes of smallholder farmers within the East African region.

In the literature, CF is sometimes defined as a system which involves a contract between a farmer and a purchaser established in advance of the growing season for a specific quantity, quality, and delivery date of an agricultural output at a pre-determined price. The purchaser undertakes to provide technical assistance, inputs, credit, and extension services in exchange for a guaranteed steady supply of produce from the farmer (Eaton and Shepherd, 2001; Setboonsarng, 2008). Many authors follow this definition especially in regard to the basic responsibilities for the purchaser and the farmer.

However, some contemporary authors (Setboonsarng, 2008; Prowse, 2008) are taking still more restructured definition by specifying that the purchaser must be a private firm/company. Other authors like Setboonsarng (2008) do not recognize as CF informal contracts which do not provide technical assistance and quality improvement or those

[27] One of the unique findings of this Chinese case study is that income effect in CF can be realized either through increase in price or increase in yield.

providing only in-kind inputs the cost of which is deducted from output sales at season end. Other studies relax a number of the criteria cited above. The contract studied by Bolwig *et al.* (2009) specified only quality on the farms' side and coverage of certification costs on the side of the exporter, although a price premium was paid in practice. These inconsistencies as to what counts as CF have led some commentators to define no less than five types of CF models i.e. a centralized model, a nucleus model, a multipartite model, an informal model, and an intermediary model (Glover and Kusterer, 1990; Eaton and Shepherd, 2001; Ringo, 2007; Kasim *et al.*, 2009[28]).

2.6.3.1 Benefits of Contract Farming

Several studies on CF are positive about beneficial effects of the system to farmers, firms and the public (Glover and Kusterer, 1990; Eaton and Shepherd, 2001; Warning and Key, 2000; Warning and Soo Hoo, 2000; Simmons, 2003; Miyata and Hu, 2007; Prowse, 2008; Setboonsarng, 2008). The studies identify farmer benefits including market access, increased incomes, reduction of price risks, improvement in financial and credit intermediation, timely availability of inputs, increased labour employment, lessened labour monitoring during production, reduction of production risks through risk-sharing, and prospects for high value crop introduction. The exporting firm is also likely to benefit from improvements in cost efficiency (avoiding land purchase and labour monitoring) (Hayami, 2003; Patrick; 2004), greater quality consistency, higher prices, and political prestige (Eaton and Shepherd, 2001).

This same literature and other contributions also discuss a range of concerns over the CF system. These include its monopsony (single buyer) control, the burden of labour

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[28] Ironically, the Kasim *et al.*, (2009) study is a word-for-word repetition of Eaton and Shepherd (2001) work on the categorization of contract farming models.

management on farmers, problems of contract enforcement in the developing world due to weak legal infrastructure, bias towards large farmers, requirements for increased management skills, increased production risks inherent in non-traditional crops, and possible health and environmental implications in case of agro-chemical use in production (Glover and Kusterer, 1990; Eaton and Shepherd, 2001; Patrick, 2004, Prowse, 2008; Setboonsarng, 2008). It does not seem proper to refer to some authors as critics and others as proponents of CF as both these discussions are found in every single study. The major critique of CF however concerns its potentially exploitative use by multinational agro-industrial firms given the unequal power relationships with growers (Glover and Kusterer, 1990; Little and Watts, 1994). A related argument is marginalization of the poorest of the poor i.e. the landless and those with small pieces of land who are not qualified to participate in CF projects in a locality (Setboonsarng, 2008).

The literature provides justifications for most of the critiques that are leveled against CF and some are discussed below. The studies by Warning and Soo Hoo (2000), Simmons (2003) and Setboonsarng (2008) are particularly important. Warning and Soo Hoo contend that CF's effect on overall income distribution will depend on the selection process for contractees. If contracts are entered with large scale farmers, income stratification in the community will increase and vice versa. The argument is also echoed by Simmons (2003) who asserts that the structuring of a CF project determines whether it will generate positive forward and backward linkages that will reduce socio-economic marginalization. The study recommends that projects use mostly locally sourced inputs if these linkages are to materialize.

Warning and Soo Hoo (2000), using a review of some empirical studies in Mexico (frozen vegetables and processed tomato) and Senegal (confectionery peanut), have shown that where decisions to pick contractees are truly based on the need to reduce transaction costs then larger farmers will be explicitly preferred. This is echoed in the literature by the general view that contracts with small farmers are associated with high transaction costs (Glover and Kusterer, 1990, Eaton and Shepherd, 2001; Simmons, 2008; Setboonsarng, 2008). It is however shown in some contributions that transaction costs will not necessarily work against smallholder farmers always. Warning and Soo Hoo (2000) have shown for instance, that smallholder farmers' shadow prices for credit, risk premium and family labour are good incentives for their preference for CF to open farming systems. They have also shown that weak institutional development in a country may serve as an incentive for firms to contract with small farmers as transaction costs are higher when contracting with large scale farmers in this case.

A Senegalese case (Warning and Key, 2000; Warning and Soo Hoo, 2000) not only reports a scenario where both small and large scale farmers can be equally contracted, but also where the use of an intermediary in screening contractees can make smallholder farmers equally competitive for contracts due to reduced monitoring costs on the part of firms. Warning and Soo Hoo (2000) also see recovery of transaction costs by firms, through the use of differentiated contracts, as a more viable alternative for selecting contractees rather than focusing exclusively on reducing them. This, if adopted, will play out to small scale growers' advantage.

Moreover, Simmons (2003), Setboonsarng (2008), and Warning and Soo Hoo (2000) have contemplated about a possible solution to the problem of the uneven balance of power between contractors and small farmers. While observing that, anti-trust legislation is not likely in the foreseeable future thus Simmons (2003) suggests formation of commercially oriented farmers' groups that can interact with NGOs in contract negotiation and arbitration. The three studies have also explored a possibility of exploiting the opportunity of 'social sanction' for defaulters on the farmers' side. However this is only likely to work when the CF project is affecting the livelihood of majority or all farmers in a locality. Firms can thus structure their CF projects in a manner that will take advantage of this to make contracting with smallholder farmers viable. Warning and Soo Hoo (2000) further observed that inclusion of family members of contracting farmers in other activities of the contractor enhanced successful implementation of CF projects. This is due to reduced monitoring costs for the CF project on the part of the firm.

The literature is mostly silent on the possibility of firms reneging on (breaking) contract terms. In fact however, contract failures may be caused by firms (see Akyoo and Lazaro, 2008b) reneging on commitments, thus the need persists for something that could play a role equivalent to anti-trust legislation. This is where governments may fulfill a useful role (Simmons, 2003). Moreover, as observed from an Asian case study (Mekong area- Lao PDR, Cambodia, Thailand and Myanmar), government legislation on CF may even act as a tool that can be used in fostering regional cooperation in agricultural produce trade (Setboonsarng, 2008).

2.6.4 Economic Effects of Organic Farming in Developing Countries

Organic farming's distinctive features are its emphases on building soil fertility and controlling weeds, diseases and pests through rotations and encouragement and application of naturally occurring materials and organisms. Reliance on non-local inputs is reduced to a minimum and use of synthetic inputs is generally forbidden. Meeting the requirements of organic certification on the other hand mainly involves elimination of synthetic inputs rather than following a list of prescribed techniques. This reflects the fact that organic standards emerged in countries with widespread and heavy use of synthetic inputs. Here, yields would typically collapse in the absence of use of synthetics unless rotations and alternative soil fertilisation methods were adopted. Hence there was no need to require these in standards (Gibbon *et al.*, 2010).

Against this background, economic studies of organic agriculture in Northern countries focus mainly on trade-offs from replacement of synthetic-based practices by more labour-intensive techniques. Generally, the literature finds that losses from lower yields and higher labour requirements are offset by reduced input costs and price premiums (for overviews of recent findings see Dmitri and Green (2006) for the US and Nieberg and Offerman (2003) for the EU). However, premiums are rather unstable and, at least in Europe, the profitability of organic farming also depends upon public support to the process of conversion (Padel and Lampkin 1994).

Only a handful of studies comparing organic with conventional farming in the tropics have been published (Bray *et al.*, 2002, Van der Vossen 2005, Lyngbaek *et al.*, 2001, Bacon 2005 and Damiani 2002). None report comprehensive farm budget related survey data, and most are based on sample sizes of 20 or fewer. A further limitation is that most report results from Latin America, where the conventional farming systems with which comparisons are made are relatively high-input ones. No studies are available from Africa, where chemical use amongst smallholders is much lower than in other tropical regions and has stagnated for some years (Kelly *et al.*, 2005). As a result of the prevalence of low-input systems, most African smallholders can conform to the requirements for organic certification without making significant changes to their farming methods – and thus without incurring new costs (or savings).

On the other hand, public support to farming in Africa, including to organic farming, is almost entirely absent. Thus while organic certification should be technically easy to obtain, in practice this occurs only in the context of donor financial support. Typically this occurs in the context of a smallholder contract farming package that also involves farmer training and in which certification is on the basis of an internal control system (ICS). The ICS is an apparatus for farmer registration, designation of internal inspectors, and reconciling farmer sales against their production capacity (see section 2.5.2). Training may include dissemination of specifically organic farming techniques, but contracting companies often chose to place greater emphasis on generic crop/field maintenance and post-harvest processing techniques. Thus, in addition to the classic confounding variable confronting the economic evaluation of contract farming schemes (selection), evaluation of organic contract farming schemes needs to take into account a second source of potential bias. This is that the farming methods utilised in these schemes need not necessarily be significantly more 'organic' than those used by 'conventional' African smallholders (Gibbon *et al.*, 2010).

2.7 Quantification of Compliance Costs and Benefits

There are three approaches used in the estimation of regulatory and standards costs namely; accounting, economic-engineering, and econometric approaches. The accounting approach uses data from pilot programs or from surveys of firms/plants that have adopted e.g. quality control systems to construct estimates of the costs of components of the quality control system, such as additional labour, and additional capital requirements for process control. The economic-engineering approach uses engineering data combined with data on input costs to construct a quantitative model of the production process and thus derive empirical cost functions. The econometric approach, on the other hand, utilizes data sets that are representative of an industry to statistically test hypotheses related to behaviour and production structure (Antle, 1998b).

Each of these approaches has its advantages and disadvantages. The accounting approach is operationally straightforward, and can accommodate detail specific to particular food safety or quality control systems. Being survey-based it is also capable of identifying information that is otherwise diffuse and difficult to measure or qualitative such as poor management, poor project appraisal, and low involvement of stakeholders by project sponsors etc.

Disadvantages of the accounting approach include its probable inability to cost all the inputs required by a system, data bias associated with sensitivity by respondents that their data could be used for regulatory purposes, and an inability to measure the effect of a regulation/standard on the overall operating production efficiency of a plant/firm/industry. In addition, survey based approaches are costly to conduct thus they are typically recommended mostly for use in a situations where no other sources of information are available (Beghin and Bureau, 2001; Antle, 1998b).

The economic-engineering approach (more suited to processing industries) is able to provide a detailed picture of a plant's/firm's production process. However, its disadvantages include its complexity and its inability to capture industry's heterogeneity by only providing cost information that is general to an industry (as is also the case with accounting approach). Nor can econometric models provide the level of detail that is possible with the other two approaches, although they have the advantages of being able to use large data sets (like census data of a particular industry) and are able to allow estimation of the effect of an individual regulation/standard on production efficiency of a firm/plant (Antle, 1998b).

The realm of regulations/standards is however much less concerned with costs of compliance alone than the need to carry out in-depth cost-benefit analyses that are useful in making informed decisions on their implementation. The analyses involve calculations of benefits of a particular regulation/standard as weighed against the costs of implementing it. This is based on the fact that implementation of a regulation/standard (should) occur only when its benefits outweigh its costs (Sergerson, 1999).

Recent years have seen the adoption of simplified accounting methods by some survey-based studies of CF schemes where standards are applied. These methods are then complemented with the use of tools borrowed from the evaluation literature. The objective of these studies is to determine econometrically (or using a combination of methodologies) whether the adoption of or participation in a standard has a significant effect on the adopters' income. The study by Bolwig *et al.* (2009) for Ugandan organic farmers is a case of this kind. The study is reviewed below.

The discussion below presents some relevant studies which have adopted each of the three methodologies discussed above:

(i) Accounting Method

As already discussed above, this method has been used by Aloui and Kenny, (2004), Manarungsan *et al.* (2004), Gogoe (2003), Jaffee (2004), Bolwig *et al.* (2009) and de Battist *et al.* (2009) to study costs of conformity to standards for citrus and tomato farmers in Morocco, asparagus and soybean farmers in Thailand, pineapple farmers in Ghana, and Indian spice farmers and exporters, and horticultural crops in Kenya and coffee farmers in Uganda. It is important to note that all of the above studies were conducted in a primary agricultural production system and in a developing country set up. It has also been used in the shrimp processing industry in Bangladesh (Cato and Santos, 2000). All the studies, irrespective of the production system type, compared 'with and without' scenarios with respect to the standard in question.

In these studies, data collection concerning primary agricultural production was through surveys and participatory budgetary approaches (in groups and individually). These were used specifically for pineapple farmers in Ghana and coffee farmers in Uganda (Gogoe, 2003; Bolwig *et al.*, 2009). However, data for Thailand, Ghana, and Morocco farmers was all gathered during pilot programmes under EUREPGAP/BRC initiatives. The Indian study was rather general in perspective but it touched on compliance costs incurred by both private and public sectors. The data from the Kenyan case studies was collected via field surveys using semi-structured questionnaires. The Bangladesh study was through faxed questionnaires and the response level of 30% was rather low to be considered representative of the whole shrimp industry in the country. The latter study also gathered information in respect of public/government level compliance costs however.

As observed earlier, there seems to be some omissions from calculations of cost in some of these studies which led to the overstatement of net benefits from participation:

(i) Cost of rejects was calculated for Ghanaian farmers but it was not incorporated in the final results.

(ii) In the Ghanaian study, increased stay time on the farms by farmers as a result of the standard, was recorded as a 100 percent benefit to the farmers while it also has a cost dimension (e.g. compelling famers to over exert in providing extra labour for attaining conformity).

(iii) In the Thailand case study for asparagus, costs in respect of training farmers, laboratory services, certification, inspection, and quarantine incurred by the government were not included as compliance costs as they were termed as regular government outlays. The study assumed that it was only Research and Development (R&D) for GAP and test kits for pesticide residues that could be attributed as compliance costs to the government. Such omission is likely to understate costs of compliance; hence, if governments transferred these costs to farmers, the latter would not be able to realize expected benefits.

The study by Bolwig *et al.* (2009) referred to earlier assess the revenue effect of farmers' participation in certified organic farming for coffee in Uganda. In this Ugandan study, a modified accounting method was used to quantify participation costs and benefits. Factor endowments were then controlled for using an estimation of Heckman's two stage analysis model to determine revenue effects from scheme participation and from use of organic farming methods. The study found a positive revenue effect from participation. Heckman's two stage analysis model, used to control for selection bias into the respective schemes, is briefly reviewed below.

Selection bias in a sample is normally controlled for by employing the two-stage estimation procedure (Heckit method) as proposed by Heckman in 1976 (hence Heckman's model). The method uses Inverse Mill's Ratio (IMR) to take care of the selection bias problem. IMR (also known as 'selection hazard') is a statistical concept which refers to the ratio of the probability density function over the cumulative distribution function of a distribution (Warning and Key, 2002; Benfica *et al.*, 2006). The two stages of the Heckman's model are:

(a) Regression for observing a positive outcome of the participation dependent variable as modeled with a probit or logit model. Estimated parameters here are used to calculate the IMR for each observation.

(b) Including the calculated IMR in (a) above in the income equation as an additional explanatory variable in its estimation using the normal Ordinary Least Squares (OLS) procedure.

The model's first stage runs the participation model which is defined as:

$$\Pr(c_i = 1/z_i) = \Phi(\gamma z_i) \qquad 5$$

Where c_i indicates participation in a standard, z_i is vector of exogenous determinants of participation, and γ is a vector of coefficient estimates for the z_i.

The second stage runs the net income regression model which is specified as:

$$Y_i = \beta\chi_i + \rho\lambda(\gamma z_i) + \mu_i \qquad 6$$

Where χ_i are a subset of z_i from the participation determinant model (first stage), λ is IMR obtained from every observation *i*, and β and ρ are coefficients for the respective variables.

(ii) Economic-Engineering Method

This has been used by Jensen and Unneverh (1999) in estimating the compliance costs of the HACCP system in US pork processing. The study adopted an economic optimization model to choose the most effective interventions to meet a set of pathogen limit standards. Data in respect of costs of equipment and inputs were sourced directly from suppliers. Data in respect of pathogen reduction were drawn from two previous pathogen studies. This methodology is applicable in an industry where comprehensive data sets are available. It has little use in a primary production industry like the Tanzanian spice industry given the prevailing data paucity.

(iii) Econometric Method

Studies by Antle, (1998a, b; 1999; 2000) provide important information on the construction of typical structural and functional forms of different costs in a quality-differentiated production. All studies are based on the meat industry in USA. However, the structural forms can easily be transposed into primary agricultural production systems as all basic cost components such as variable costs, quality-related costs and fixed costs will be identical. The problem is that many primary production systems in the LDCs are lacking in requisite data sets thus limiting application of this method on their cases.

Antle (1998b) characterizes a multiple-output production function as; f(y, q, x, k) where f satisfies the standard properties of multiple output technologies (Chambers, 1988); y is product output; q is quality; x is a vector of inputs; and k is capital stock. Quality is interpreted as a second output in this production process. Analysis of product quality/safety cost implication issues in this relationship needs an understanding of the nature of input-output separability/inseparability and jointness/non-jointness in inputs of the production process.

The problem with the above asumption is that the analysis will be perfect only when there is a clear understanding of whether the inputs required to produce the two outputs (the product itself and quality/safety) can be separated or are intimately intertwined. Also, whether the safety attributes of inputs can be separated from their primary functions of being 'the normal inputs' required in the production process. The bottom line is that only if quality/safety-related[29] cost components embodied in inputs can be isolated from their

[29] Organic fertilizer, for example, has a primary role of providing nutrients to crops as an input. It also has a safety dimension given its organic nature. The two attributes are joined in this particular input and can not be separated in the course of producing the final results (product + safety). The other side of this would be to ask whether it is possible to quantify them individually/separately. A practical measure of separation of the

other components, will it be easy to come up with specific cost functions that will be able to forecast the behaviour and magnitude of the safety-related cost component in case of anticipated changes in the production system. On the other hand, if the two outputs are not separable, it means increase or decrease of one will result in a change to the other in the same direction and vice versa if they were separable.

In relation to regulations/standards, this approach entails estimation of cost function basing on a general specification c(y, w, R) where y is output, w is vector of prices of inputs, and R is a measure of regulatory compliance costs. This formulation was used by Klein and Brester (1997) to estimate a translog cost function in the meat industry and to test jointness of safety with the rest of the production process by testing the statistical significance of R in the cost function (Antle, 1998a). Antle (2000) also estimates a translog function in the meat industry which was then used to forecast related costs in the pork and poultry industries in USA.

A general non-separable, joint representation of the dual cost function is characterized as c(y, q, w, k) where w is a vector of prices corresponding to input vector x. In a separable and non-joint in input production, there are distinct production functions and thus dual cost functions exist of the form $C^y(y,w,k)$ and $C^q(q,w,k)$ (Hall, 1973). The cost function (Antle, 1999) for production processes with quality therefore takes the general form:

$$C(y,q,w,k,\alpha,\beta,\gamma) = vc(y,q,w,k,\alpha) + qc(q,w,k,\beta) + fc(k,\gamma) \qquad 7$$

Where C(•) is total cost which is composed of a component of variable cost vc(•) that is joint in conventional production inputs and some quality control inputs, variable cost qc(•)

two components in this input would be to compare its cost with that of a related input that has no safety dimension (with- and without- comparison).

that is non-joint in conventional inputs and certain quality control inputs, and a conventional fixed cost component fc(•) that is independent of both output and quality. α, β, γ are respective parameters of the cost function components.

In addition, isolating safety from the rest of the product quality attributes the specification of the cost function (Antle, 2000) takes the form c(y, s, q) where y is output quantity, s is product safety, and q is a vector of other non-safety quality attributes. The general functional form thus becomes:

$$C(y,s,q,w,k) = vc(y,s,q,w,k) + qc(s,q,w,k) + fc(k) \qquad 8$$

Where; C(•) is total cost, vc(•) is variable cost that depends on both output and product quality, qc(•) is a separate component of variable cost associated with quality control that is independent of y but dependent on s and q, fc(•) is a conventional fixed cost component for capital k which is independent of both output and quality.

The results of the above studies are mainly relevant to food processing industries in a developed economies setting rather than for primary production systems in developing economies. Moreover, the results are quite specific to particular industries' cost structures and behaviour with little relevance to others. However, the studies do provide a deeper understanding of how to approach regulatory compliance costs, especially as these concern their breakdown/itemization and quantification.

2.8 General Observations on the Literature Review

This review of literature has identified the following main points:

(i) The ingredients of the heightened attention received by food safety are twofold – advances in technology and increase in consumer concerns. The former enhances human ability to determine health hazards in food and the latter underlies consumers' interest in 'safe' food. Food standards are a mechanism to ensure consumer safety or other preferences in the world of imperfect market information. Food suppliers (including exporters from LDCs and developing countries) are thus challenged to meeting them if they are to gain access to these markets.

(ii) The economic rationale of standards relates to their ability to address the problem of information asymmetries in the market place for enhancing smooth transactions. But standards are also potential market access barrier especially in international trade. Global initiatives like the WTO SPS Agreement have been adopted to control, with limited success, the protectionist use of standards in international trade.

(iii) Private standards have, of late, become important competitive tools in trade. Consequently, some have become *de facto* compulsory standards for exporters of some crops. This development has made distinction between public and private standards difficult.

(iv) Trends in the development of food safety standards are many and diverse. They include their ever increasing number, their increasing broad coverage, the increasing diversity of standard setting organizations, their escalating stringency, their changing verification requirements, and the diminishing degree of voluntariness of private standards (due to their commercial importance). These have both direct and indirect implication for compliance costs. The emergency of closely coordinated chains has been one immediate response. Direct and indirect value chain actors (producers, retailers, NGOs and other donors) are now cooperating in ensuring standards compliance. On the other hand, exclusion of smallholder farmers from some of these chains has been a concern. When Contract farming is adopted, smallholder farmers are more likely to be integrated within these chains. However, poor institutional development especially legal framework infrastructure in developing countries is a disincentive to development of contract farming.

(v) Demands for exporters to conform to multiple standards in different markets are likely to remain given the difficulty of forging Mutual Recognition Agreements (MRAs) that would establish 'equivalent' standards between trading international partners.

(vi) Contract farming usually favours large scale producers due to high transaction costs associated with smallholder farmers. However, contracting with smallholder farmers in developing nations can thrive under the prevailing conditions if local transaction cost–reducing synergies are taken advantage of. These may include strategies such as using local intermediaries for screening potential contractees and use of social sanction mechanisms for curbing default problems.

(vii) Cost – benefit studies are important for making informed decision on the implementation of a regulation/standard. There are three basic methods of quantifying regulatory costs and benefits – accounting, economic – engineering, and econometrics. Many of the classic studies in all of the three methodologies have been dependent on a breadth and depth of data that is unrealistic to expect in low-income countries, however. But some recent studies from these countries have successfully used accounting methods combined with tools borrowed from the evaluation literature [see section 27(i) above].

CHAPTER THREE

RESEARCH METHOLODOGY

3.1 Overview

This chapter describes the study's conceptual framework, and then goes on to describe its methodology. Different approaches were adopted to address the study's main objectives. Generally, data collection was organized in two major stages; an initial qualitative survey of stakeholders and institutions followed by an in-depth farmer survey. During the qualitative survey, the approaches used differed between stakeholders depending on the specific objective being pursued.

3.2 Conceptual Framework

The research's conceptual framework is summarized in figure 1. It models the inter-relationship between markets, food safety, and vertical coordination in agri-food supply chains. The interplay of these variables leads to inter-dependence between various supply chain actors i.e. food producers, processors, distributors and consumers.

Markets would normally signal the level of safety that consumers demand on the market place. The level of safety demanded will differ between high and low value markets and also between international and domestic markets. It will always reflect differences in consumer incomes and level of technology advancement, especially as it concerns the ability to detect food-borne hazards, between internationally trading countries/blocs. Low income consumers would normally demand less stringent safety levels while the converse is also true (Hamori, 1998; Dohlman, 2003; Mitchell, 2003).

Food producers must be able to provide the safety demanded to be able to sell their produce in the respective markets. This may be enforced by governments formulating regulations on food safety for producers to comply with, and/or it may be enforced by retailers/industry/the sector/the sub-sector formulating standards that will ensure compliance with consumers' demand (Mitchell, 2003). In either case compliance costs will be incurred by producers for specific safety-related investments required for standards compliance. Further compliance costs will also be usually incurred for putting in place the relevant conformity assessment infrastructure. These requirements may entail public or private investments or both.

Delivery of supplies produced according to specific standards to market entails various forms of vertical movement of produce from producers to retailers (vertical coordination). These forms are distinguished by the nature of relationships that exist between different actors along a particular supply chain. The main concern in developing a competitive supply chain is to keep transaction costs at their lowest (Kherala and Kirsten, 2001). The magnitude of transaction costs will however depend on the prevailing institutional environment, product characteristic, and transaction characteristic (Hobbs and Young, 2001). Depending on these therefore, different chain governance structures[30] will develop in relation to different end-markets in a bid to reduce the ensuing transaction costs. These governance structures range from using spot markets or various forms of contract to use of vertical integration e.g. joint ventures, strategic alliances, etc. (Hobbs and Young, 2001).

[30] Details on the various forms of chain governance structures can be obtained in Hobbs (1996).

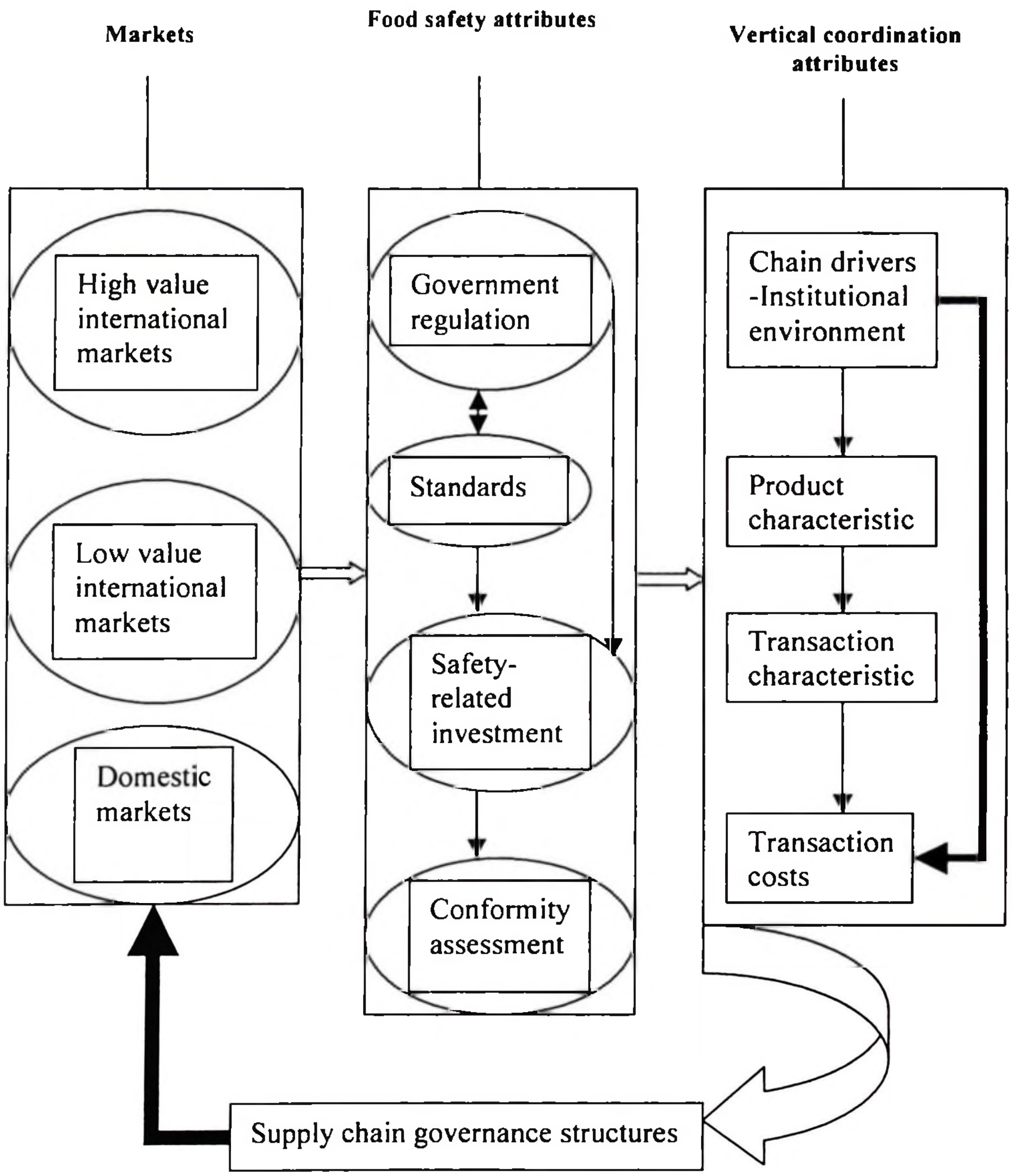

Figure 1: The research conceptual framework

Source: Derived from Antle (1995, 1998a, 1998b, 1999, 2000); Beghin and Bureau (2001); Buzby and Unnevehr, (2003); Henson, (2003); Henson et al. (2002); Hobbs and Young (2001); Kherala and Kirsten, (2001) and Mitchell (2003).

Two of the three specific objectives of the research are derived from this model or are aimed at complementing it. The first provides the background for this effort, by describing the development and current status of the Tanzanian spice industry. The description encompasses its market destinations (local, regional, and overseas), the food safety standards (national and international) applied to it and the nature of its supply chain (vertical coordination). This account is based partly on secondary sources but mostly on producers, traders, and spice-related private and public institutions.

The second objective focuses upon the public contribution to Tanzania to assessment of conformity to food safety standards relevant to spices. Conformity assessment capacity, as shown in the framework, is one of the most important conditions for meeting food safety requirements.

The third objective relates to an issue touched on by the model but not directly addressed. Arguably however it should occupy centre stage in any economic analysis of food safety standards. This is whether standards generate meaningful incentives for conformity by different categories of private actors, depending on the form of supply chain coordination present. Realization of benefits is thus understood as a function of the nature of relationships that exists between the actors, as discussed above.

3.3 Specific Methodological Approaches

The study had three specific objectives as listed and explained in section 1.5 of this report. The objectives were studied using different methodological approaches below:

3.3.1 Description of Tanzanian Spice Industry

Descriptive data on the sector was collected mainly using two methods; literature search and key informant interviews. Secondary data sources include the two earlier referred to (see chapter one) diagnostic studies - BET (2002) and Caigher (2004), the various spice-related reports generated during the early to mid 1990s under the ODA (now DfID) financed Zanzibar Cash crop Farming system Research Project (ZCCFSRP), and the internet (the Eurostat website). Grey information from EPOPA and TANCERT (Tanzania Organic Certification agency) were also other secondary data sources.

Interviews followed standardised checklist (Annex 2). Interviews in Zanzibar involved key personnel from the Commission for Agriculture, the Commission for Investment, from the certified organic spice companies (TAZOP, ZANGERM), the conventional spice companies (MADAWA Ltd and the Zanzibar State Trading company (ZSTC)), Kizimbani spice farm (government owned), Kizimbani Agricultural Documentation Centre, the Zanzibar Chamber of Commerce, and spice traders in Zanzibar town central market and the Stone Town area.

The Dar es Salaam survey covered traders only. Interviewees included key personnel from former and current leading conventional spice exporting companies (M/S Export Trading Co. Ltd, Mohamed Entreprises, and Fidahussein Co. Ltd) as well as two leading Kariakoo market traders (*dalalis*).

Most of the data collected was all qualitative except the Eurostat data on Tanzanian spices exports to the EU over the years. Data on production levels and trade seemed to be unavailable, even from the Ministry of Agriculture, Food Security and Cooperatives (MAFSC). An attempt to obtain data for traded volumes from Zanzibar customs also proved futile. The organic companies' record figures in respect of their dealings, but these were not solicited at this stage of the research (they were then collected during the in-depth survey stage).

3.3.2 Description of the Study Area

The study area includes both Tanzania mainland and Zanzibar isles. In a general perspective a total of four mainland and three isles regions were involved in this study. The mainland regions were Arusha, Dar Es Salaam, Morogoro and Tanga whereas research in the isles involved all of the three regions in Unguja (Urban west, North and South). Involvement of Arusha, Dar Es Salaam and Unguja Urban west was in respect of the visited spice-related institutions that are based in their municipalities. Morogoro and South Unguja were involved in the preliminary survey stage of the study. In-depth surveys were carried out in Muheza (Tanga) and Unguja North 'A' (Unguja North) districts. The research area described below covers those locations which were involved in the in-depth surveys i.e. Muheza and Unguja North 'A' districts.

3.3.2.1 Muheza District

Muheza is one of the eight districts of Tanga region (the most north-easterly coastal region in Tanzania). The district surrounds Tanga city on the latter's west, north, and south borders. Muheza district has a total area of 1974 square km and a population of 184 585 (2007 estimate).

The major spice crops grown in the district include cardamom, cloves, black pepper and cinnamon. However spices are not regarded as among the major cash crops by the district authorities. The main food crops grown include banana, paddy, cassava and maize. While these are also a source of cash income to farmers, the major cash crops are sisal, tea, rubber, cashew nuts, coconuts, and oranges. Cultivated areas31 and average output of the spice crops for 2005/06 season are summarized in Table 2.

Table 2: Spice crops cultivation in Muheza for the 2005/06 season

Crop	Cultivated area (ha)	Output (tons)
Cardamom	1 883	485
Cloves	91	49
Black pepper	278	93
Cinnamon	174	49
Total	2 426*	676

*The area forms only 2.06 percent of the total cultivated area in the district

Source: Muheza district profile report (2008).

Muheza district has a total of four spice-producing divisions i.e. Amani, Bwembera, Maramba, and Muheza. Bwembera division leads in black pepper farming in the district. It has seven spice producing villages namely Nkumba Kisiwani, Kwamhosi, Bombani, Tongwe, Kumba Kibanda, Ubembe, and Kiwanda. Selection of villages in the study was based on their production potential for black pepper[32] (see chapter 2).

The three villages eventually selected as sites for field research in Muheza were Tongwe (mostly conventional black pepper farming), Kwamhosi (predominantly organic black pepper farming) and Bombani (predominantly conventional black pepper farming). Selection of Kwamhosi and Tongwe villages was based on their leading potential for black pepper production. Bombani was selected because conventional farming predominates there, while it enjoys a very close proximity to Kwamhosi village which is largely organic.

[31] Due to scarcity of secondary data on the industry, actual production sites for the different spice crops were established only during the preliminary survey.

[32] According to Muheza district Agricultural Development office (Crops and Extension district officers) and Nkhumba ward Agricultural development officer, Mr Juma Mbwambo.

Comparison of Kwamhosi organic farmers with Bombani conventional farmers might thus give a good comparison of the 'with organic' and 'without organic' situations in Muheza for black pepper. It was difficult to identify conventional farmers in Kwamhosi village as most farmers are registered with the organic scheme. This position has a historical explanation, as the village was the first 'landing site' for the organic companies during the initial stages of introduction of the scheme.

3.3.2.2 Unguja North 'A' District

Zanzibar is made up of the two major islands of Unguja and Pemba[33]. While an integral part of the United Republic of Tanzania, it enjoys a significant degree of autonomy from the Union government. The bigger Unguja island is located about 40 km east of Bagamoyo on the Tanzania mainland. Pemba Island is situated 50 km north of Unguja. Zanzibar's population is slightly below one million people (URT, 2003).

Due to its historical significance as a producer of clove (as world leader), nutmeg, cinnamon, and pepper, Zanzibar has traditionally been referred to as the "Spice Islands". Other crops grown include cassava, sweet potato, rice, maize, plantain, citrus fruit, coconut and cocoa. Fertile soils are limited to the western half of Unguja Island. Unguja North 'A' district is the major producing area for chilli in Zanzibar.

The chili producing wards in Unguja North 'A'district are Kijini, Matemwe, Pwani Mchangani, Kidoti, Tazari, Kigunda, Nungwi, Kandwi, Gamba and Mkwajuni (Silima, *pers. comm., 2007*)[34]. The leading five of the above mentioned wards, in descending order, are Kijini, Kandwi, Kidoti, Tazari, and Gamba. Chilli farmers from Kijini and Gamba

33 Unguja consists of three regions that are Unguja north, Unguja south, and Unguja urban west. Pemba, on the other hand, consists of North and South regions. Zanzibar is thus made up of five regions in total.

34 Mr Silima was the North 'A' district Agricultural Development Officer at the time of the survey.

ward were selected in the study. Both wards are the priority areas for the organic company. Kijini is favoured for its high production potential for chilli while Gamba has always provided a source for the other important spices like turmeric. The largest number of registered organic spice farmers is thus found in these wards.

3.3.2.3 Organic Scheme Structure

The leading organic schemes for the two spice crops (black pepper and chilli) are located in Muheza and Unguja North 'A' districts (see the schemes' descriptions in Akyoo and Lazaro, 2007). These are private schemes that are operated by local Zanzibar-based organic spice companies – M/s TAZOP Ltd in Muheza and M/s ZANGERM Entreprises Ltd in Unguja. Black pepper and chilli are the *de facto* target spice crops for these leading local organic export companies in the respective areas alongside a range of other spices that they deal in. In both cases these crops are the second major spice for the companies, after ginger (from Kigoma region, western Tanzania).

M/s ZANGERM was the first organic spice company to start operation in Tanzania in 1991. Its first organic scheme started in 1992 with rosella (*Hibiscus spp.*) production on the 280ha *Jeshi la Kujenga Uchumi* (JKU) (Zanzibar State National Service Force) farm[35] at Bambi in Central Unguja district. The organic spice scheme studied was established during the 1994/95 season with smallholder producers in Unguja, Pemba and Tanga. The following seasons, the scheme extended to other areas including Morogoro and Kigoma. M/s ZANGERM Enterprises could not participate in the export market on its own account during the 2005/06 season due to lack of adequate crop finance. All of what it purchased was sold on to other organic companies. The annual average performance for M/s ZANGERM is as shown in Table 3.

[35] The farm was/is owned by the Zanzibar State Government.

Table 3: M/s ZANGERM Enterprise's average annual exports 1999/2000 - 2004/2005

Crop name	Source	Average volume handled per annum (Kg)	Average value per annum (US$)
Chilli	Zanzibar	3 000	9 000
Black pepper	Tanga	5 000	17 500
Green pepper	-	0	0
White pepper	Tanga	500	2 500
Ginger	Kigoma	20 000	68 000
Cardamom	Tanga	2 000	18 000
Cinnamon	-	0	0
Turmeric	Zanzibar	3 500	11 900
Nutmeg	-	0	0
Clove	-	0	0
Galgant	-	0	0
Lemongrass	Zanzibar	1 000	2 100
Citrus peels	-	0	0
Total		35 000	120 000

Source: Bente Saidi – Managing Director, ZANGERM Zanzibar (2007)

ZANGERM's performance has declined over the years following two major operational shocks. The first was the break away of M/s TAZOP Ltd in 1999 and the second, the alleged opportunistic actions of its foreign sister / partner company in the early 2000s. These shocks have seen the company's exports falling from 250 tons in the late 1990s to nil in 2006 (Akyoo and Lazaro, 2007). The company is now set for a major reorganization. All of the requisite investments such as office building, warehouse, tarpaulins and other post-harvest processing equipment are intact. Intuitively, accessing working capital (which is the major deficiency currently) should not be difficult with the presence of these investments.

M/s TAZOP is a splinter company from M/S ZANGERM which was established in 1999. Its organic spice scheme started in the same year with smallholders in Unguja, Pemba, Tanga, Morogoro and Kigoma. Besides the Muheza scheme, M/s TAZOP Ltd also operates an organic contract farming scheme for cinnamon in Morogoro. But the company's major target crop is black pepper hence its selection for the study. M/s TAZOP participated fully in the export market for black pepper (and other spices) during 2005/06 season. The actual exports for M/s TAZOP over the five years ending 2006 are shown in Table 4.

M/s TAZOP Ltd has a capacity to handle a total of 200 tons per annum (Akyoo and Lazaro, 2007) of the various organic products in Table 4 above. However, due to supply shortages only about 30 percent of the target is attained currently. This situation has forced the company to think about integrating backwards by also becoming spice producers. They have already acquired 500 acres of land in Kilindi district (formerly part of Handeni district) in Tanga region for the purpose. The farm will also serve as a source of planting materials for its registered farmers (Akyoo and Lazaro, 2007).

Each company has a foreign sister/partner company for marketing and providing access to finance. ZANGERM has a sister company in Germany while TAZOP's is in Switzerland.

Notwithstanding these partnership arrangements, the foreign component dominates the local component in the shareholding structure of both companies. With respect to organic farming of spices in general, TAZOP and ZANGERM had about 320 and 700 registered farmers respectively scattered all over spice producing centres from Pemba, Unguja, Morogoro, Tanga, to Kigoma during the survey period[36]. Other organic spice export companies operating in Tanzania include M/s Kimango Farm Ltd (a large scale producer-

[36] Data according to interviews with the respective Managing Directors (Akyoo and Lazaro, 2007).

exporter in Morogoro) and M/s Golden African Ltd (a newcomer organic spices and herbs export company in Arusha).

Table 4: TAZOP Ltd exports 2002 - 2006

Product	Volumes of exports in kg						
	2002	2003	2004	2005	2006	Total	Average
Cardamom	112	50	0	0	0	162	32
Cinnamon	3 634	3 376	930	1 560	2 950	12 450	2 490
Chillies	55	0	160	790	1 940	2 945	589
Cloves	1 374	13 590	7 175	14 680	2 169	38 988	7 798
Ginger	11 000	18 160	4 905	17 342	53 176	104 583	20 917
Lemongrass	1 965	1 677	19 510	15 065	3 650	41 867	8 373
Lemon peels	4 747	2 159	8 515	8 040	8 734	32 194	6 439
Nutmeg	16	0	0	0	0	16	3
Orange peels	646	0	620	5 167	8 380	14 813	2 963
Turmeric	1 248	772	0	2 460	1 648	6 128	1 226
Black pepper	16 039	3 191	3 020	5 305	16 610	44 165	8 833
White pepper	200	0	254	270	63	787	157
Galgant	0	107	0	105	0	212	42
Total in kg	41 034	43 081	45 089	70 784	99 320	299 308	59 862
Value in US$	83 353	91 805	105 400	193 119	310 502	784 179	156 836

Source: TAZOP Ltd Head office, Zanzibar (2007)

3.3.2.4 Source of Organic Spices and Contracts

As stated in Akyoo and Lazaro (2007), sourcing by Zanzibar-based exporters from mainland organic spice producers is imperative for ensuring importers' volume requirements. This is true for most spices like black pepper, ginger, turmeric, cardamom, and cinnamon. However, the trend is different for bird's eye chillies. There is special preference amongst importers for chilli that is produced on the dry coral rag area of North Unguja region. M/S ZANGERM Enterprises for instance, only has contract chilli farmers in this area. The potential to increase production (ability to thrive on the vast coral rag land and to provide the requisite critical volume) in the context of high export market demand for this spice influenced its selection for this study. Moreover, chilli was recommended in earlier studies (e.g. by ODA under the Zanzibar Cash Crop Farming System Research

Programme in early 1990s) as a potential supplementary export crop to clove for Zanzibar so its selection on policy grounds is worthwhile.

The organic companies' main obligations under the contract farming arrangements are to provide organic certification for farmers and to buy the resulting crop. For a time, ZANGERM also provided organic planting materials. Most black pepper farmers obtain planting materials from their own farms. However ZANGERM claimed that the farmers also used seed from other sources thus failing to maintain the genetic purity of the given seed. This led to contract breakdown as the company declined to buy the claimed 'contaminated' crop. Farmers maintained that the differences between expected and actual crop appearance (which largely concerned the size of chilli pods) - on which ZANGERM based its claim - were due to differing soil fertility conditions and not contamination through cross pollination (Plate 1). This incident led the organic company to cease supplying free seed to their registered farmers. In addition, both companies initially provided loans for inputs to registered farmers but during the survey had already ceased to do so. The cause (as identified by operators) of the termination of the loan schemes was farmers' poor repayment records. There is, of late, an apparent reluctance by the organic companies to provide services other than buying and extension to their contract farmers, reflecting growing mistrust between the two parties.

I II III

Plate 1: The fruit-bearing chilli plants in Kijini ward

3.3.2.5 Extension Services under the Spice Organic Schemes

The organic companies' provision of tailored extension services to their registered farmers was initiated by EPOPA during the introduction of the schemes. Over time the companies are gradually taking-over the EPOPA-led extension, as was planned under EPOPA's promotional efforts for organic agriculture on spices in these areas.The serving agricultural field officer employed for the TAZOP-initiated extension service in Muheza, as established during the survey, had no formal training. During the heyday of EPOPA[37], agricultural field officers with formal training were used. The existence of the government-led extension staff in almost every village is an opportunity for developing human resource for the specific technical aspects of spice crops husbandry[38]. However, no company-led extension was available for chilli farmers at the time of the survey though it was claimed to have existed in the past.

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[37] Following official closure of EPOPA activities in Tanzania in 2007, M/s Agro-Eco has assumed its role. It is not clear whether the company will provide support on extension services as its predecessor.

[38] The capacity of the government extension staff is also deficient in this regard. Currently, some agricultural colleges' curricular do not put emphasis on matters related to spices as they have since been categorized as supplementary/minor crops.

Initially, company-led extension for black pepper farmers covered primarily farming methods. The companies were at this time handling all the post-harvest processes on their own. Over time, and after proper training on post-harvest handling processes, some farmers were allowed to dry their crop before selling[39]. However, the larger part of the black pepper produce is still sold while fresh for onward processing by the companies. Chilli produce is normally dried on the farm by producers before onward sale to the companies, perhaps due to its hot and pungent nature. The organic company dealing in chilli was thus to train farmers on both pre-harvest and post-harvest handling processes right from the beginning. Both off-farm and on-farm farmer training methods have been employed in the company-led extension. Most off-farm training sessions have been organized in centres located within or closer to the producing villages. In the case of very specialized training that takes place beyond the confines of the villages' boundaries, a few progressive farmers are selected to attend and later train their fellows.

3.3.2.6 Conformity Assessment in the Organic Schemes

Pre-harvest and post-harvest organic rules are enforced on the basis of the schemes' Internal Control Systems (ICS). According to IFOAM, an ICS is a documented quality assurance system that allows for an external certification body to delegate the annual inspection of individual group members to an identified body/unit within the certified operator (UNEP-UNCTAD, 2008). The audits for compliance in the black pepper and chilli schemes are carried out by local inspectors from the organic companies (for continuous monitoring of compliance) and external inspectors from IMO[40] during certification (this is done annually).

[39] Producers favour selling crop in dried form as it is thought to be more profitable.

[40] Lately inspectors from the local certification body –TANCERT- are contracted by IMO instead of sourcing them from Europe as the case was previously.

The ICSs are updated annually by the companies but generally the main issues that are constantly emphasized for compliance in the document include non-use of all types of agro-chemicals, non-use of farm yard manure from drug-treated livestock, use of compost/farm yard manure, non-use of fire for farm clearing, improvement of biodiversity in production through intercropping (tobacco excluded), non-littering of spice plots with domestic waste (dry cells and plastic materials), submission of yield estimates by farmers at season start (for 'input-output' control'), non-harvesting of immature crop, and non-drying of harvested crop on bare ground (the emphasis on using tarpaulins).

3.3.2.7 Organization of the Schemes

In brief, the general *modus operandi* of those Tanzanian organic schemes is typical of others in Africa, such as those described by Bolwig *et al.* (2008) for pineapple, cocoa, vanilla, and coffee in Uganda. All are operated under contract farming arrangements between smallholder farmers and the organic export companies above. Moreover, they are IMO certified with certification and inspection costs being met by the companies, who as a result have ownership of the certificates (Akyoo and Lazaro, 2007).

Under such arrangements, certified farmers are not compelled to sell to the company that registers them. However, if they are to sell their produce as organic, and thus obtain any premium available, they will have to sell to the company. This is because generally, there are no competing buyers who are organically certified. Rundgren (2007) observed this to be a trend throughout East Africa. Since it means that surplus production above whatever the exporter can purchase has to be sold as conventional, this is an impediment to the development of domestic organic markets in the region[41].

[41] An exception is organic fresh vegetables in Kenya. Here however it is the export firm that sells surplus production to local organic retailers.

3.3.2.8 Land Tenure System

In Tanzania land is legally public property. It can however be leased to citizens for different periods (normally 33 or 99 years) depending on the use for which occupation is sought. Much of the rural land in the villages is owned under customary law[42], and is neither formally titled nor surveyed.

In both research areas, farmers acquired farm plots either through inheritance, private purchase, allocation by village government, or allocation by central government. Some plots were also either rented or communally owned (the latter applies to the coral rag area in Unguja). In Muheza, part of the land used to grow spices is rented from landlords, although landlords in Muheza do not normally allow renters to grow long term perennials like black pepper.

In Zanzibar, part of the land under chilli was allocated by the central government under the famous post – independence policy that sought to allocate 3-acre plots of land to all dispossessed families. These plots are not automatically inherited along family lines in case of the death of the original owner. In such event the land is supposed to be surrendered to the government for re-allocation.

Both black pepper and chilli farmers' land holdings take the form of a number of dispersed plots (all of which are cultivated). Most organic and conventional black pepper farmers in Muheza own three farm plots whereas most organic and conventional chilli farmers own two farm plots. Generally, chilli farmers own a maximum of four plots whereas some black pepper farmers own over five plots.

[42] The 1999 Land Law Nos. 4 and 5 devolved the authority to register rural land to village governments. This was part of a land reform process that aimed at fast-tracking registration of rural land so that farmers could use it as collateral to borrow from banks and other financial institutions. However, the system is yet to work in this manner.

Typically, not more than one plot is allocated to black pepper or chilli, except in the case of organic black pepper where most farmers allocate two plots to the crop (conventional black pepper farmers allocate only one). Chilli farmers, irrespective of the farming practice type, have a single plot for the spice crop. For some black pepper farmers in Muheza, the scattered plots plus the intensive intercropping system necessitated estimation of actual farm areas under the spice crop. This did not however apply to chilli farmers in Unguja, where the spice crop area could be directly observed.

3.3.2.9 Farming System

The typical farming system for spices in Tanzania is described in Akyoo and Lazaro (2007). This holds for both Muheza and Zanzibar. Production is smallholder based and organic-by-default with some certified organic farmers contracted under contract farming operated by export companies.

The most notable features of farming systems in the study areas (Muheza and Unguja North 'A' districts) are the intensive intercropping cultivation methods and multiple plot ownership by farmers. The intercropping observes no definite pattern with regard to the type and number of intercrops involved. Spice intercrops include tree crops, cereals, fruits, legumes, and vegetables. Farmers' overriding objective, in both districts, was found to be meeting household food needs prior to engaging in commercial cropping.

In Muheza, black pepper farmers grow multiple spice crops (either intercropped or in pure stands). The other spice crops grown include cinnamon, turmeric, cardamom, ginger, vanilla, and lemon grass (a herb). However, black pepper is not among the two most widely cultivatedcrops in the district as it is secondary to maize and citrus. Trees and tree crops are the most important intercrops for black pepper in Muheza.

The non-spice crops grown are citrus, mango, coconut, banana, palm oil, jackfruit, cassava, maize, cocoyam, and cocoa. Lemon grass (*mchaichai*) is also included in the organic contract agreement. Spice farmers in Muheza cultivate the two major cash crops – black pepper and citrus – in tandem rather than shifting to either one of the two.

Intercropping is also common in Unguja North 'A" district. The most common intercrops for chilli are pawpaw and legumes. Turmeric is the only other spice crop that is cultivated in significant quantities by chilli farmers in the district (Plate 2). The non-spice crops grown include egg plant, pigeon peas, sweet potato, pawpaw, millet, rice, and vegetables. Similarly, chilli is not amongst the two most widely cultivated crops in the district as it is subsidiary to maize and legume in Kijini ward; and to egg plant, maize, and banana in Gamba ward. Currently, many chilli farmers have shifted into egg plant and pigeon pea farming. This reflects the change of farmers' priority between cash crops following the recent poor performance by chilli.

3.3.2.10 Infrastructure

Generally, with exception of few spice plots in steep highland areas, black pepper plots in Muheza are easily accessible by road. This makes farming, storage and marketing activities relatively easy. Bicycles are the major means of transport, though they were hardly used in the highland village of Tongwe within the study area.

Plate 2: A backyard turmeric plot in Gamba ward, Unguja

Chilli plots, particularly in Kijini, are not accessible by road. Plots are remotely located, usually over 3 km distance from the homestead. Haulage of dried produce from the farm to storage or market by manual labour (with the added problems of the crop's hotness and pungency) using roughly defined paths on the coral terrain is an exacting activity. Neither vehicles nor bicycles can access chilli plots in the coral rag area in Kijini ward. The coral rag area in Gamba is less rocky and bushes are thinner, so that bicycles can be used to access the plots.

Black pepper producing villages lie within the wettest zones of Muheza district (bimodal rainfall of about 1000 mm per annum). Availability of drinking water for labour and household members while working the farms is guaranteed.

Chilli plots in Kijini are in amongst the driest areas in Zanzibar. Whilst the climate is very conducive for chilli production, availability of drinking water for farm workers is very limited. This led to M/S ZANGERM, in the early 1990s, drilling a deep bore hole for provision of drinking water in the farming area. The costs of the bore hole were wholly borne by the company. Water availability situation for Gamba chilli farmers is fairly good.

3.3.3 Analysing Local Capacity for Standards Conformity Assessment

This entailed carrying out institutional mapping/tracing (which was done twice during the first and second quarters of 2005 and 2007 respectively) and interviews with the main actors involved in the spice industry and/or testing and certification (undertaken in November 2007 and February 2008). The 2005 institutional tracing was part of the wider preliminary exercise that aimed at establishing a list of all spice-related institutions in Dar es Salaam. Interviews were held with key personnel in the institutions in order to establish the roles played by each in the industry. At this time, no attempt was made to assess the level of safety-related investments each institution had made.

The second tracing exercise was done during June 2007, specifically to establish the capacity level of local institutions for testing hazards in foods. The aim at this stage was to establish the types of hazards that each institution was able to detect/test, given its level of investment in equipment and other safety-related investments. The institutions surveyed include the Tanzania Bureau of Standards (TBS), the Tanzania Food and Drug Authority (TFDA), the Government Chemical Laboratory Agency (GCLA) and the Tanzania Industrial Research and Development Organization (TIRDO). At the time of the survey TIRDO and TBS operated under the Ministry of Industry, Trade and Marketing (MITM) whereas TFDA and GCLA were under the Ministry of Health and Social Welfare.

The follow-up interviews carried out in November 2007 and February 2008 were for gap filling and validation of information that had been compiled previously. Interviews with the Dare es Salaam-based TANCERT (the sole local organic certification body for organics in the country), and the Tanzania Tropical Pesticide Research Institute (TPRI) laboratory in Arusha were also carried out during this time. Data on the National Fish Quality Control Laboratory (NFQCL) in Mwanza and the IMO (International Marketecology Organization) organic certification agency were solicited through lists of questions sent via e-mail. The actual food hazards in spices subject to mandatory testing before they are allowed entry into different export markets were determined via a literature search, resulting in a list of food hazards presented in Annexes 1, 9, 10, and 11.

3.3.4 Analysis of Costs and Benefits of compliance with Certified Organic Standard on Spices

Generally, as earlier discussed, food standard compliance is thought to be associated with an increase in production costs for producers (Mitchell, 2003; Antle, 1999; Jensen *et al.*, 1998 and Ollinger and Mueller, 2003). This is a result of putting in place new infrastructure, changing farming or post-harvest practice as required under the standard in question as well as the costs of conformity assessment. In some cases however adoption of a standard may entail stopping the use of a costly input in favour of a cheaper alternative, which will result in reduction of production costs (Gogoe, 2003). The balance of costs and benefits represents the incentive structure for conformity.

This study aims at determining the costs and benefits to specific actors in Tanzania of conformity to one set of international standards (those for organic produce). In the latter context, conforming farmers are normally assumed to incur a cost related to yield loss which is associated with stopping the use of fertilizers, insecticides, and pesticides - hence the need for a premium price to make conformity economic (Mitchell, 2003; Dmitri and Oberholtzer, 2005). However, this is specific to the case where the conversion is from an 'industrial' type of conventional production to a certified organic system. In fact, black pepper and chilli farmers in Muheza and Unguja North 'A' districts respectively do not and have never used chemical fertilizers and agro-chemicals on their farms. Yield losses should not therefore arise from conversion.

Moreover, there are other locally relevant factors which will determine a balance of costs and benefits different from that depicted in most analyses of conformity to organic farming standards in the north. These relate to the specifics of vertical coordination - contract farming in this case. On one hand organic contracts may specify future produce price and on the other, scheme operators can introduce other requirements over and above those for organic certification. In Uganda, for example, additional quality requirements included in organic contracts for coffee and cocoa include specific post-harvest treatments like fermentation, and drying for a specified period whereas organic pineapple producers were also to comply with additional requirements related to specific ways for fruit cut and packaging, and fruit size specifications (Bolwig *et al.*, 2009). The organic scheme participants in the southern hemisphere (the South) are also likely to receive training and other inputs from scheme operators, benefits which are not available to other spice farmers. The discussion above underscores the fact that contract farming can modify price transmission mechanisms between the market and the farmer.

Premium prices are not always guaranteed to farmers even in the North (Parsons, 2004). Although as is shown above, local factors are mainly responsible for this in the South, it is clear that in general persistence of premium prices for organics will depend on changes in supply and demand. If supply grows faster than demand then premium prices will decline or disappear (Dmitri and Oberholtzer, 2005). In the understanding that local factors have influence on the costs and benefits of organic farming, analysis of its costs and benefits are thus more meaningful when undertaken on a case by case basis and referring to specific locations. Under this objective therefore, the following hypotheses were tested:

(i) Certified organic spice farmers incur higher production costs than conventional spice farmers.

(ii) Certified organic spice farmers realize higher prices for their products than conventional spice farmers.

(iii) Certified organic spice farmers have higher yield levels than conventional spice farmers

(iv) Conformity with certified organic standards leads to higher farm revenues amongst farmers

These hypotheses were studied on the basis of surveys of spice farmers. Black pepper farmers in Muheza district, Tanga and chilli farmers in Unguja North 'A' district in Zanzibar were selected for the study. For black pepper, farmers from three villages – Kwamhosi, Tongwe, and Bombani were interviewed. Chilli farmers from Kijini and Gamba wards were interviewed. The hypotheses tested and their expected results are summarized in Table 5.

Table 5: Summary of survey hypotheses

Hypothesis	Test of significance	Expected sign	Actual results reference
1. Certified organic black pepper/chilli farmers incur higher production costs than conventional farmers	t-test	+	Tables 28, 29 and 30
2. Certified organic black pepper/chilli farmers realize higher prices for their produce than conventional farmers	t-test	+	Tables 33, 34, 35 and 36
3. Certified organic black pepper/chilli farmers have higher yield levels than conventional farmers	t-test	+	Tables 28 and 32
4. Conformity with certified organic standard leads to higher incomes amongst black pepper/chilli farmers	t-test	+	Tables 38

3.3.4.1 Selection of Black pepper and Chilli for Quantification of Costs and Benefits

The leading organic schemes for the two spice crops (black pepper and chilli) are located in Muheza and Unguja North 'A' districts (see the schemes' descriptions in Akyoo and Lazaro, 2007). These are private schemes that are operated by local Zanzibar-based organic spice companies – M/s TAZOP Ltd in Muheza and M/s ZANGERM Entreprises Ltd in Unguja. Black pepper and chilli are the target spice crops for these leading local organic export companies in the respective areas alongside a range of other spices that they deal in. In both cases these crops are the second major spice for the companies, after ginger (from Kigoma region, western Tanzania). Besides the Muheza scheme, M/s TAZOP Ltd also operates an organic contract farming scheme for cinnamon in Morogoro. But the company's major target crop is black pepper hence its selection for the study.

As stated in Akyoo and Lazaro (2007), sourcing by Zanzibar-based exporters from mainland organic spice producers is imperative for ensuring importers' volume requirements. This is true for most spices like black pepper, ginger, turmeric, cardamom, and cinnamon. However, the trend is different for bird's eye chillies. There is special preference amongst importers for chilli that is produced on the dry coral rag area of North Unguja region. M/S ZANGERM Enterprises for instance, only has chilli contract farmers in this area. The preference, due to a perceived potential to increase production (based on the ability of chilli to thrive on the vast coral rag land and to provide the requisite critical volume) in the context of high export market demand for this spice influenced its selection as a research site for this study. Moreover, chilli was recommended in earlier studies (e.g. by ODA under the Zanzibar Cash Crop Farming System Research Programme in early 1990s) as a potential supplementary export crop to clove for Zanzibar so its selection on policy grounds is worthwhile.

3.3.4.2 Sampling of Interviewees for the Cost and Benefit Analysis Study

The original plan was to interview a total of 60 farmers from each of the selected villages in each of the districts in order to provide a total of 240 respondents roughly balanced between organic and conventional farmers. However, meeting the implied target was not possible in Muheza district since neither of the two villages originally selected had as many as 30 spice farmers in each category. Due to this shortcoming, it became necessary to add a third village to the population studied.

The organic black pepper farmers were selected through a systematic random sampling method. A list of black pepper farmers in Muheza was obtained from the organic export company M/s TAZOP Ltd through their field representative stationed at Kwamhosi village. The list contained a total of 152 organic farmers (after exclusion of 52 sanctioned[43] farmers). Respondents in Kwamhosi village were systematically picked from the list using a uniform sampling interval while, since there were limited number of organic farmers in Tongwe and Bombani villages, all those listed were interviewed.

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[43] Certified organic farmers are sanctioned from the schemes in event of first time violation, before permanent exclusion for consistent non-conformity to organic practices.

The lack of any similar list for conventional black pepper farmers necessitated adoption of a purposeful sampling method. This first involved listingall farmers who were described as conventional by the government extension agency staff and the Nkumba ward agricultural officer whose names did not appear on tle organic list in the respective villages. All conventional farmers in Kwamhosi village were interviewed as there were less than 30 conventional farmers in all in this village. Conventional farmers in Bombani village were selected using systematic random samplingmethod from the prepared list.

No list of organic or conventional chilli farmers was available in North 'A' Unguja district. The same purposeful sampling procedure was ıed whereby the listing of both conventional and organic farmers was done with thessistance of agricultural officers for the respective wards. ZANGERM had a total of 1? registered farmers in the whole of Zanzibar. The 100 registered chilli farmers in NorthUnguja region were scattered all over North Unguja 'A' (90 farmers) and 'B' (10 farmers) districts. The listing established 40 and 34 registered farmers in Kijini and Gamba ards respectively. Conventional chilli farmers in the two wards were respectively 35 and 9. Organic farmers in both wards were randomly picked using a simple lottery method from the prepared list. All listed conventional chilli farmers in Gamba were interviewed whereas those in Kijini were randomly picked using a lottery method. Tablepresents a summary of the geographical distribution of respondents by district and villageward.

3.3.4.3 Data Collection for Quantification of Costs and Benefits of Organic Farming

In-depth interviews were carried out with th organic and conventional farmers and traders. Farmer interviews were held duringeptember - October 2006 and April – May 2007 in Muheza and Unguja North 'A' dists respectively.

The lack of any similar list for conventional black pepper farmers necessitated adoption of a purposeful sampling method. This first involved listing all farmers who were described as conventional by the government extension agency staff and the Nkumba ward agricultural officer whose names did not appear on the organic list in the respective villages. All conventional farmers in Kwamhosi village were interviewed as there were less than 30 conventional farmers in all in this village. Conventional farmers in Bombani village were selected using systematic random sampling method from the prepared list.

No list of organic or conventional chilli farmers was available in North 'A' Unguja district. The same purposeful sampling procedure was used whereby the listing of both conventional and organic farmers was done with the assistance of agricultural officers for the respective wards. ZANGERM had a total of 150 registered farmers in the whole of Zanzibar. The 100 registered chilli farmers in North Unguja region were scattered all over North Unguja 'A' (90 farmers) and 'B' (10 farmers) districts. The listing established 40 and 34 registered farmers in Kijini and Gamba wards respectively. Conventional chilli farmers in the two wards were respectively 35 and 29. Organic farmers in both wards were randomly picked using a simple lottery method from the prepared list. All listed conventional chilli farmers in Gamba were interviewed whereas those in Kijini were randomly picked using a lottery method. Table 6 presents a summary of the geographical distribution of respondents by district and village/ward.

3.3.4.3 Data Collection for Quantification of Costs and Benefits of Organic Farming

In-depth interviews were carried out with both organic and conventional farmers and traders. Farmer interviews were held during September - October 2006 and April – May 2007 in Muheza and Unguja North 'A' districts respectively.

Table 6: Distribution of respondents by district and village/ward

Farming practice type	Muheza district				Unguja North 'A' district			Grand total
	Tongwe village	Kwamhosi village	Bombani village	Sub-total	Kijini ward	Gamba ward	Sub-total	
	Number of respondents							
Certified organic	22	30	9	61	30	31	61	122
Conventional	30	10	31	71	30	29	59	130
Sub-total	52	40	40	132	60	60	120	252

Complementary data was collected for producers and traders using a structured questionnaire (Annex 3) and a checklist question guide (Annex 4) respectively. Interviews for the organic and conventional exporter companies/traders were held in their respective headquarters in Zanzibar and Dar es Salaam. In the case of TAZOP Ltd, staff at their agency at Kwamhosi village in Muheza and warehouse facility at Tangasisi in Tanga municipality provided additional clarification on the compliance costs incurred in production, transportation, and post-harvest processing. Retrospective data on prices and quantities of conventional spices that have been traded over the years in Kariakoo market were obtained using a specially designed checklist question guide (Annex 5). The important variables for which data were collected are summarized in Annex 6.

3.3.4.4 Cost Variables and their Quantification

Due to differences in spice crop type, geographical location, land tenure system, farming system and infrastructure, the components or categories of production and investment costs used in the analysis require further explanation. The main cost categories considered are the recurrent costs of ploughing/harrowing, planting, weeding, pruning/thinning, harvesting, post-harvest handling, as well as non-recurrent cost for farm equipment. These are discussed in turn.

(a) Ploughing and Harrowing

Ploughing and harrowing is normally required for land clearance purposes, and entails use of family labour and/or the hiring of tools and labour (normally in a team of contractors). These costs did not apply to black pepper farmers in Muheza. This is because most, if not all, black pepper farms were cleared years ago when the crop was firstly established since black pepper is a long term perennial. Only 1.5 percent of black pepper farmers incurred this cost in the form of using family labour during 2005/06. This related to newly opened-up non-rented land.

Chilli farmers in Unguja North 'A' incur ploughing costs every two years. Chilli is a short term perennial and Unguja farmers establish new plots over a cycle of two years. Shifting cultivation is carried out on the coral rag area (Plate 3). Ploughing is almost always carried out using family labour (97.5 percent of cases reported by respondents). In estimation, the costs for different ways in intercropping situations are distributed proportionately according to their share of the planted area.

Plate 3: A chilli farm in Bayani area, Kijini ward. The nature of the coral rag terrain is seen in the foreground

(b) Planting Cost

In most cases black pepper farmers replaced individual dead plants annually rather than varying area cultivated. Chilli farmers incurred this cost every two years whilst establishing new plots. Given the rocky nature of the coral rag area the activity was relatively costly and special tools like pick axes (*'msaha'*), pointed iron bars (*'mitaimbo')* and straight sickles replaced ordinary hoes and machettes for working the land (see Plates 4 and 5).

Plate 4: A pick axe pictured from Gamba ward

Plate 5: A straight sickle

(c) Weeding Cost

In most cases, black pepper was intercropped with citrus, banana, mango and coconut. Chilli too was intercropped with other crops like pawpaw, maize, pigeon peas, cassava, and legumes. Weeding occurred for all crops simultaneously. In estimation, the cost for different crops in the situation of intercropping is thus distributed proportionately according to their share of the total area.

(d) Pruning/Thinning Cost

The pruning cost for black pepper vines was sometimes included in the cost of weeding as labour is required to remove unwanted basal vines as part of weeding activity (plates 6 and 7). Spice crop pruning was occasionally distinguished from stake tree pruning but generally this cost was not significant. The major pruning work is for the stake trees – *Glyricidia sepium - ('mjengaua')* that hold the black pepper vine. This is an annual activity and is costly. Chilli is not pruned.

Plate 6: A well managed black pepper farm in Tongwe village, Muheza

Plate 7: A farmer tending a black pepper plant in Tongwe Village, Muheza District in Tanga Region

(e) Harvesting Cost

The harvesting season for black pepper spans the period between September (mostly October) and February (for early and late harvesters). Picking is renumerated in terms of a bag of 40 – 50 kg and differs between villages. Depending on the distance from farmers' homestead to the black pepper farm, the picking cost might or might not involve the cost of transporting the bag from the farm to homesteads. When farms are far away from homesteads, the cost of transporting the harvest is paid separately from picking cost.

Harvesting is considered a highly exacting activity for chilli due to the crop's hot and pungent nature. Hired labour for this activity is thus costly. Picking is normally renumerated in terms of a *'pishi'* (a mat woven basin) that can hold 2kg of fresh produce, equivalent to 0.5 kg[44] of the dried crop. Chilli farmers can have up to four harvests in a year depending on frequency of weeding.

[44] This is according to farmers' assessment. ZCCFSP Reports no. CFS/1 and CFS/2 (ZMALNR, 1995a & b) state that a *pishi* contains 0.6kg in dried crop equivalent, or 1.6kg of fresh produce. This lower ratio of dried to fresh crop reported by farmers could be due to a decrease in crop quality in the post ODA (DFID) and GAPEX eras in the Isles and on the mainland respectively. This study has adopted the farmers' assessment which reflects the current position on the ground.

(f) Post-harvest Handling Costs

These are incurred by black pepper farmers who process / dry their crop before selling. The costs are incurred for de-husking ('*kupukusua*') and sun drying. The latter takes three days, thus three person days are assumed necessary for each harvest though the rates between villages differ. De-husking costs vary between farmers as they are mostly negotiable. Minor material costs also figure as part of post harvest handling costs as, whether farmers were drying the produce or not, purchase of tarpaulins is imperative. Besides use for drying, tarpaulins are also used for gathering together the crop on the farm while harvesting before onward transportation to homesteads.

All chilli farmers dry their crop before selling. In addition, especially in Kijini, some build a makeshift on-farm hut for drying the crop on the farm (plates 8 and 9). The hut also provides temporary protection for farmers against scorching sun or rains while working on the farm.

Besides for drying materials, costs are further incurred by black pepper farmers for bagging materials. Drying mats made from dried coconut leaves can be used as an alternative to tarpaulins. These may also be homemade from used polypropylene bagging materials (plate 10). Tarpaulins (drying materials) may be classified as variable costs or as investments depending on the materials used. The costs for homemade types of tarpaulins are normally variable costs which are incurred annually. Costs for tarpaulins specially made by manufacturers are investment costs that are spread over the asset's economic life.


Plate 8: An on-farm makeshift hut for chilli drying at Bayani area, Kijini ward


Plate 9: The side view of the on-farm makeshift hut

Ladders are important during black pepper harvesting but very few farmers incur the costs of making one. This is due to the fact that ladders are freely loaned from one farmer to another.

Chilli farmers incur equipment costs in respect of bagging materials and drying mats/tarpaulins. Ladders are not needed in chilli harvesting. These minor equipment costs are collectively included in the category of 'other costs'.

Plate 10: A chilli harvest from Gamba ward stored in an uncharacteristic plastic bagging.

3.4 Valuation of Non-Recurrent Costs

Non-recurrent costs were incurred for equipment used in production and post – harvest processing by farmers. For farmers, for whom most of the involved equipment was low cost hand tools (ordinary hoes, pick axes, machettes, straight sickles, and pointed iron bars), actual reported costs incurred during the 2005/06 season (which actually mean all equipment that was bought between late 2004 to early 2006) are used in the analysis. Investment in and income from sale of land was not included in these calculations as such investments are minimal (given the nature of land acquisition in the study area as per section normally financed from savings over long periods.

3.5 Farmer Revenue

Individual farmer revenue (gross income) was taken as the horizontal summation of all black pepper/chilli sales made to different buyers in 2005/06 season. Calculations are done separately for the two groups i.e. the control group (conventional farmers) and the treatment group (organic farmers in the schemes). Home consumption of black pepper is insignificant in the research area (it occurs mostly during Ramadan fasting month for Muslim households) and non-existent for chilli. Rejects at the producer level are also insignificant. No allowances are therefore given for household consumption and crop rejects during revenue calculation. Produce prices were those declared by individual farmers during the interviews.

3.6 Consideration of Organic Farming Methods

The selection of organic farming methods examined in the study was based on the requirements of the scheme's ICSs (see section 4.4.2.3). This examination was aimed at determining the extent of adoption of the recommended organic farming practices by spice farmers. The extent of use of each of the following farming practices was therefore examined:

(i) Use of household food residues and farm yard manure

(ii) Non-use of chemical fertilizers,

(iii) Use of mulching materials,

(iv) Use of irrigation,

(v) Non-use of chemical pesticides,

(vi) Non-use of fire in farm clearing,

(vii) Post-harvest processing activities before selling (e.g. produce drying), and;

(viii)Adoption of organic cropping systems' in the form of intercropping.

3.7 Data Analysis

3.7.1 Qualitative and Quantitative Analyses

The analysis of qualitative data from key informant interviews involved inductive interpretation of information provided in comparison with similar situations observed or documented in the literature. In other cases, where the information given concerned a variable group unique to the study (e.g. information about the relationships between local export companies and their overseas sister companies) it was interpreted without formal comparison. The qualitative data collected was mainly in regard to objectives one and two i.e. description of the Tanzanian spice industry and analysis of local conformity assessment capacity. Quantitative data from the in-depth surveys was subject to statistical analyses before making inferences in relation to the hypotheses tested. The details of the statistical analyses are presented below.

It was originally planned to undertake data analysis in two phases. Firstly, organic and conventional farms would be compared on demographics, factor endowments and costs/benefits of farming operations for black pepper and chilli. These would be purely descriptive comparisons employing tests of statistical significance (t-test, Pearson chi – square and Pearson correlation coefficient). In the second stage, multiple (ordinary least squares) regression was to be used to test for whether participation in organic farming leads causally to higher incomes, controlling for other factors. This would then be followed by a fulll estimation of Heckman's two stage analysis model. However, continuation into this stage would depend on whether positive significant participation effects for organic farmers in the two schemes would be found in the first phase.

Phase one of data analysis was completed as planned. The demographic variables considered were average age of household head, education level of household head, size of household and household labour capacity. The factor endowment variables considered were farm area, spice crop area and number of spice plants. The production and post-harvest costs considered are those described in section 3.3.6 above. Similar comparisons were also made on farming methods, producer prices, and farmer revenue in each scheme. The point of these comparisons was to test for selection bias (selection into the scheme) and participation effect. A Correlation test was carried out for only one relationship; farmer's yield levels in relation to length of participation period in certified organic farming.

Following the absence of a finding of significant participation effects, except a counter-intuitive one for chilli in a case of contract failure (see chapter 4), it was not considered meaningful to proceed to the second stage of analysis i.e Heckman's model was not estimated. Given that the idea of running a 2-stage Heckman model was abandoned, it was also considered unnecessary to test for selection bias into the schemes. However, a review of the descriptive statistical results on factor endowments and demographics suggested that there was little probability of selection bias anyway.

3.7.2 Data Analysis Techniques

Data analysis was performed separately for the two schemes. The analysis entailed testing for significance differences in the means for the above mentioned variables of concern for conventional and certified organic farmers in each scheme ('with' and 'without' comparisons). The technique employed was comparison of means for unpaired samples using the Student's t-test test statistic. Student's t-test was employed for all variables with continuous data (which involved practically all of the tested variables mentioned above except educational status of household head) whereas chi-square was used for variables with discrete/categorical data (in this case, the educational level of household head was the only variable).

Prior to carrying out means comparisons, important adjustments were made to the data for the purpose of controlling for data bias that could interfere with fair comparison of the variables. The three major adjustments include; first, re-defining of all cost and benefits data on a per hectare basis (this did not apply to total output traded for which actual raw data was adopted). This approximated controlling for farm sizes to ensure correct comparison of diverse data obtained from farmers with varying plot sizes. Second, calculating weighted cost shares for various farming activities in consideration of intercrop farming system for spices (see section 3.3.7). The weighted shares were established using the average percentage proportion of these crops in all intercropped plots owned by a farmer. This adjustment was meant to avoid overstatement of cost variables. Third, converting fresh crop yield into its equivalent dry weight yield using the 4:1 fresh: dry ratio. This was to enhance uniform reporting of farmers' yields and to ease their comparison.

3.8 Limitations of the Data Collected

The data collected during this study was associated with some limitations which include the following:

(i) Farmers in the research area do not keep written records thus all data depended on memory. This is characteristic of many studies involving smallholder farmers in least-developed and developing countries.

(ii) Secondary data on spices was lacking from the parent Ministry of Agriculture and Food Security (MAFS) and other relevant sources like the National Bureau of

Statistics (NBS). This limited the scope of comparisons of the findings with other spice and non-spice sub-sectors in Tanzania.

(iii) Attempts to solicit data from accredited EU-based testing laboratories proved futile. The failure to obtain applicable toll rates for testing various food hazards from these laboratories ruled out a comparison of standards conformity assessment costs between the EU and Tanzania (as exporters into the bloc).

(iv) Survey data is normally prone to under- or overstatements depending on the perceptions of the interviewees regarding the future use of the data being sought. This study depended solely on survey data and it was thus also susceptible to this problem.

3.9 General Issues on the Research methodology

The important points in this research methodology chapter can be summarized as follows:

(i) The review of literature assisted in establishing and substantiating the study's specific objectives and their interrelationships in the realm of international food standards. Further schematic representation of these relationships in the conceptual framework helped in breaking them down and portraying individual variables worth studying in addressing the objectives.

(ii) Identical cost variables seemed to behave differently between farmers. Their correct quantification had to therefore take care of specifics in individual farmers' production activities.

(iii) Notwithstanding the credibility of the collected data, both qualitative and quantitative data for this study were subject to the limitation normally encountered in survey research methods.

(iv) Data analysis is normally carried out on a step-wise basis with successive steps adding to each other. Rigorous analytical methods are therefore applicable only when preliminary results are positive thus pointing to a need for more concrete confirmation. The non-estimation of Heckman's two stage model in this study was based on this understanding.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overview

This chapter presents the study's results and their discussions. They are presented separately for each specific objective to enhance smooth flow of ideas, clarity and easy follow-up.

4.2 Description of the Spice Industry in Tanzania

4.2.1 General profile of the industry

(i) Production

Cultivation of spices in the surveyed areas is generally smallholder-based, save for the 63 acre Nasibu farm (private), the Kizimbani government farm in Unguja, and the reported (but not visited) Kimango estate on the mainland. In Unguja, farm sizes are mostly below one acre with very few exceptions. The latter mainly concern chilli farmers on the coral rag area, who may farm up to 8 acres. Coral rag forms more than 50 percent of Unguja Island and it is only chillies (in terms of spices) that can thrive on this rocky terrain. Pressure on remaining arable land is very high, so that the prospects for increasing acreage are quite low.

The types of spices grown in Unguja include clove, chillies, cinnamon, cardamom, turmeric, black pepper, nutmeg, ginger, and vanilla. Similar spices are grown on the mainland, as well as paprika and coriander seeds. Due to lower land pressure on the mainland, farm sizes for spices are relatively bigger thus providing for the critical volumes needed for trading. Close cooperation between mainland spice farmers and Isles spice traders is inspired by this reality.

Information from District Agricultural Officers in the surveyed areas confirmed that there are currently policy directives to introduce vanilla and paprika in the Muheza (Tanga) and Morogoro spice producing areas on the mainland. The reason for these moves is a perception that there is high demand locally and internationally for these crops and that they command high prices.

According to the Kizimbani farm field officer however, vanilla needs special skills to manually pollinate its flowers. This could perhaps limit its rapid introduction in the proposed areas. According to Caigher (2004), Bukoba (North-west Tanzania, bordering Uganda) provides an environmental niche in Tanzania for vanilla cultivation and efforts by the Belgian TRIAS organisation are geared towards exploiting this advantage.

(ii) Farming Systems

In Tanzania, with the possible exception of cinnamon, spices are mostly intercropped with other crops including banana, citrus, and a variety of tree crops (pawpaw, coconut, bread fruit and mango). Under situations of intensive intercropping, it becomes more relevant to ascertain individual farmer's scale of production through counting the number of spice trees/bushes/plants or vines owned, rather than farm acreage being cultivated. This is especially relevant for spices like black pepper and vanilla. For others like chilli and turmeric, plot sizes are more relevant, notwithstanding the prevailing intercrop systems. Intercropping is a coping strategy that aims at mitigating the risk of loss in relation to any specific crop, through spreading it over a number of different crops. It is also a direct response to pressure on arable land.

Lemongrass, a herb, is intensively cultivated in tandem with spices in Unguja (Zanzibar) and Muheza (Tanga). It is bought from farmers by the same organic companies that buy spices. It is in demand for its essential oils content. In Unguja, other traded sources of essential oils include clove, eucalyptus, and galgant *(mrehani)*. There is a strong overlap between trading of herbs and spices worldwide, as reflected in the inclusion of herbs in most discussion of global supply and demand trends for spices (ITC, 2001).

Shade-loving crops like cardamom have always been cultivated in the vicinity of natural forest. Their production levels have dwindled lately following displacement of farmers from the areas gazetted as national natural forest reserve. Evictions have occurred to cardamom farmers in Turiani (Morogoro) and Amani (Tanga).

Spices in all production centres are produced organically in the sense of non-use of fertilizers and pesticides. During focus group discussions, it became clear that this is a result of farmers' inability to meet the costs involved in acquiring these inputs, rather than reflecting intentional decisions aiming to uphold organic farming principles. However, the fertility levels of these areas (as assessed on the basis of available biomass data) hardly justify usage of fertilizer in any event. Spices are also minimally infested with plant pests and diseases, thus synthetic pesticides/insecticides are also hardly required. Some spices like clove and pepper are natural repellents to insect pests. The major hazards during production are drought and weed infestation (if crops are left unattended). Mould infestation may also occur in cases of poor post-harvest handling.

Some certified organic farmers are found both in Zanzibar and on the mainland. Certified organic farming is carried out under contractual arrangement between farmers and Zanzibar-based organic export companies [see details in section (iii) below]. The difference between the 'organic-by-default' nature of Tanzanian spice production generally (following from low input, traditional farming practices) and the certified organic status of a part of this production is yet to be comprehended by most conventional spice buyers. This observation stems from the fact that, during the survey, there were appeals to the researcher by some conventional buyers seeking help in confirming to importers that their crop was also 'really' organic.

(iii) Certified Organic Production and Trade

In Tanzania generally, certified organic spices are dealt with by two major companies, namely M/S TAZOP Ltd and ZANGERM Ltd. M/S TAZOP Ltd is historically a splinter company from M/S ZANGERM. Both companies have their headquarters in Zanzibar. They maintain field representatives and warehouses in all major spice producing areas in Tanzania. As of July 2005, M/S TAZOP contracted a total of 320 certified farmers at five sites – Unguja, Pemba, Morogoro, Kigoma, and Tanga, whereas M/S ZANGERM had a total of 700 farmers – in Unguja and Pemba (150), Tanga (300), and Kigoma (250). Kigoma region in western Tanzania is renowned for its ginger crop production.

M/S TAZOP Ltd deals in an assortment of spices that include chillies, ginger, cardamom, cinnamon, turmeric, nutmeg, clove, and pepper (green, black, white). It handles about 200 tons per annum of different organic products that include the mentioned spices, herbs (galgant, lemongrass) and citrus peels (undated company brochure, 2005). In the surveyed areas, TAZOP dominates the market for black pepper and lemongrass in Muheza (Kwamhosi village), and for cinnamon in Morogoro rural. ZANGERM's presence was not felt in the mainland, but in Zanzibar it dominated the market for bird's eye chilli farmers in Makunge village, Kijini ward (Northern Unguja).

All certified organic farmers are certified through one or another of the organic export companies. The companies meet all certification and inspection fees (for annual audits) which would be quite beyond the ability of their registered farmers. At the same time, a contract is entered into between the company and the farmer, under which the farmer undertakes to comply with organic standards and to deliver his or her crop to the company at an unspecified price. Certified organic standards are monitored on the basis of an Internal Control Systems (ICS), and the results are updated annually by the company. Compliance is assessed by organic company field staff and designated internal inspectors.

The contracts are not legally enforced however. Thus farmers are not bound to sell their crop to the contracting company. Likewise companies have reneged on contract provisions that require them to buy farmers' entire crop. Usually the sales-related contract provisions are observed only subject to market demand. However, non-compliance with certified organic standards has consequences for farmers, ranging from temporary to permanent exclusion from the scheme, depending on the extent of the violation. Lack of enforcement of sales provisions is illustrated by the fact that only 65-70% of roughly 350 tons of certified ginger produced by ZANGERM's registered farmers in Kigoma is normally bought by the company, whilst the rest is sold locally. Chilli farmers at Makunge village in Northern Unguja also complained that their contracting company (ZANGERM) frequently failed to buy their entire crop, as provided for in their contract.

Organic certification agency is carried out by the Swiss-based International Marketecology Organization (IMO). IMO undertakes an annual audit of a sample (either square root method or 10% sample size) of certified farmers to ensure compliance; while (as already indicated) compliance by all farmers is insured via internal inspections. Given the costliness of external inspection exercises in terms of logistics and living allowances for IMO's inspectors, sometimes the two companies (which are otherwise bitter rivals) cooperate in meeting local logistical costs.

According to the literature (Mitchell, 2003), process standards like those for certified organics are more expensive to implement than product ones. On the other hand, implementing a certified organic system of production for Tanzanian spices may eliminate the requirement to purchase special testing equipment for product testing for hazards like aflatoxin, heavy metals, and minimum pesticide residue levels (MRLs) that would otherwise be required for exporting spices to the EU. At the same time, it should be noted that, in the conventional spice marketing chain to the EU, the requirement for testing for some of these hazards is also being complemented by demands for conformity to standards such as Eurep-GAP which are mainly process-oriented (Reardon and Farina, 2001).

(iv) Marketing

Marketing of spices is done by organic companies, conventional companies, and various small scale traders. The organic companies have already been discussed above. There are two main conventional companies in Zanzibar, M/S Zanzibar State Trading Corporation (ZSTC) and MADAWA Ltd. MADAWA LTD deals in processing of medicinal spices and herbs for the local market.

M/S ZSTC is endowed by law with the privilege of being the sole dealers in clove and clove products in Zanzibar. It also deals in conventional chillies, according to producers in South Unguja. Clove is the main export crop for Zanzibar and is mainly exported to cigarette manufacturers in Indonesia. According to ZSTC, Zanzibar clove is preferable to other origins for cigarette-making, due to its low eugenol content. ZSTC also exports raw clove and clove oils into the Middle East (Gulf states), India, Singapore and Pakistan. However, clove exports into Singapore and India also finally end up in Indonesia, 2005).

The organic companies are private and their produce is destined for EU market – specifically Switzerland and Germany. Both organic companies have a foreign-based sister company that assists in marketing the product abroad. TAZOP has a Swiss-based sister company whilst ZANGERM's partner is based in Germany. Relationships with sister companies are strong, and are underwritten by foreign partners' shareholdings in the local companies. TAZOP Swiss, for instance, owns 49% of shares in TAZOP Zanzibar.

These partnerships are aimed at minimizing information costs in relation to compliance with organic standards. The quasi-vertical integration involved also helps to minimize buyer search costs, price discovery costs, and monitoring costs. It further ensures product supply reliability. The arrangement is quite consistent with the literature on the factors that determine the nature and magnitude of transaction costs in a primary production system (Hobbs and Young, 2001).

The local partner ensures organic standard compliance (certified organic) and availability of steady product volume needed by the market. The foreign partner (at least in the TAZOP case) meets inspection and certification fees, canvasses for business internationally, and ensures that favourable prices are secured.

Similar partnerships have been seen in asparagus and soybean farming in Thailand (Manarungsan *et al.*, 2004), as well as for citrus and tomato farming in Morocco (Aloui and Kenny, 2004) in a context of compliance with Eurep-GAP and BRC protocols. Such arrangements are well-documented generally in the literature on the importance of vertical integration in minimizing information costs on standards compliance (Antle, 1999).

According to available statistics, the value of EU spice imports from Tanzania is generally dwindling over years as shown in Table 1 (see chapter 1). This trend is probably accounted for by the industry's low productivity rather than non-compliance to standards. This stems from the fact that exporters' major problem so far is the inability to procure critical volumes needed to meet orders at hand.

There are no organic companies buying spices in Morogoro, Tanga, and Dar es Salaam regions on the mainland. The survey identifed only two active conventional companies – M/S Fidahussein & Co. (cardamom and black pepper) and M/S Export Trading Company Ltd (cardamom, clove, and cinnamon). The list of spice exporting companies provided by Caiger (2004) thus needs a lot of updating as for example, M/S Mohammed Entreprises ceased dealing in spices (cardamom) about 10 years ago. Others like Samed Co.Ltd and Saifi Industrial Complex Ltd could not be located at the addresses given in Dar es Salaam and ZANOP Ltd in Zanzibar has since ceased operation. One of the active conventional companies (M/S Export Trading Co. Ltd) exports to Asian markets (Indonesia, Singapore, Philippines, India, Pakistan, and Malaysia) and Europe (United Kingdom, and Portugal). The reported export of conventional spices into the EU was rather unexpected given the stringent food safety standards thought to apply to non-certified organic exports. M/S Fidahussein & Co. Ltd exports spices to Sudan, Korea, Dubai and Pakistan. More generally, there is a two-way product flow between these markets and Tanzania as many Asian, Middle Eastern and African spice products are found in urban markets and spice shops in Tanzania. Examples of these products include Indian cinnamon, Iranian black cumin, and Kenyan 'white' ginger.

Small scale spice traders constitute a spectrum of dealers ranging from village-based brokers (village *dalali*), village traders, distant/external traders, to urban market brokers (market *dalali*) in spice producing areas and Dar es Salaam. In the conventional trade, central urban (bulking) markets are the main supply sources for other markets within producing and non- producing regions in Tanzania, as well as nearby regional markets. For instance, Tanga central urban market supplies other small markets within Tanga, urban markets in Arusha and Kilimanjaro regions, and neighbouring Kenya and Zanzibar markets.

Kariakoo (bulking) market in Dar es Salaam is the major destination for all spices being produced in Morogoro and Tanga. It is also the major supply source for informal Tanzanian exports to regional markets like Zambia, Zimbabwe, Malawi, Comoros, DR Congo, and Botswana (see below). There is a paucity of data on the volumes of spices being traded in this way. Kariakoo market traders (*dalalis*) are the major suppliers of these markets, but do not formally record their transactions, nor do government authorities in the region.

(v) Extension Services and Broader Government Involvement

Government-provided extension services specially tailored for spice farmers were absent in all areas surveyed. Field extensionists admitted their lack of competence to provide extension to spice farmers. Caigher (2004) reported the low impact the government system was making on the spices sector on this front, and observed that this was understandable given the system's restricted experience of spices. Organic companies do however provide tailored extension services to their certified farmers to ensure that organic farming practices are adhered to.

More widely, despite the scattered initiatives at central and local government level described earlier, government involvement in the promotion of the sector has in reality been minimal. This reflects the fact that the crop is still officially designated as of 'minor' status in the government's overall agricultural development plans. It is also reflected in the absence of an apex or umbrella organization to monitor production, exchange, and distribution in the sub-sector at the macro level.

(vi) The Economic Institutional Environment

The institutional environment as understood in New Institutional Economics (NIE) refers to the 'rules of the game' as these affect behaviour and performance of economic actors, and in which organizational forms and transactions are embedded (Kherala and Kirsten 2001). Williamson (1993) describes them as the set of fundamental political, social, and legal ground rules that establish the basis for production, exchange and distribution.

Generally speaking, macro-level rules of the game in Tanzania have been steadily transformed in a market-based direction over the last two decades. Private ownership and business transactions have become norms, although they are by no means well-institutionalised to the extent evident in developed countries. At a micro level, NIE analysis is concerned less with the overall 'environment' than with specific institutional arrangement (Kheralla and Kirsten, 2001) The latter (Williamson, 1993) concern modes of managing transactions, and include market, quasi-market, and hierarchical modes of contracting. Analytical focus is on arrangements between economic actors that govern the way in which they routinely cooperate and/or compete.

From the viewpoint of this perspective, micro-institutional arrangements in the spices sub-sector are very weak. In respect of marketing, for example, not only do buyers not observe written contracts but there is also widespread free-riding behaviour and buyer collusion. In fact, opportunistic behaviour by different economic actors involved in the spice supply chain appears to be the norm, with producers (both conventional and certified organic) bearing most of the adverse consequences. Collective action might always curb the free-riding and buyer collusion problems, but the observed lack of farmer groups/associations and trader associations in the sub-sector, suggests that the problems are here to stay.

It seems difficult to address the prevailing weaknesses of institutional arrangement without first addressing the lack of consistent government interest in the sub-sector. Although the macro-level institutional environment is more favourable than in earlier periods, it is not sufficiently institutionalised to guarantee well-functioning micro-level institutional arrangements. In the meantime, the big issue is therefore how to get the government to formulate and implement pro-spice policies, around which a synergistic private–public sector partnership in the industry could develop.

4.2.2 Supply Chain Structure

Caigher (2004) characterized the Tanzanian spice supply chain structure as fragmented. It is not very clear as to the exact meaning of this characterization. The survey established that the chain has two basic structures (Annex 7). Hence, in the first instance, the chain as a whole is better characterised as segmented. Within this overall structure, a sub-structure is made up of a very closely coordinated chain with well-defined vertical stages from production to final consumer. This is the chain based on certified organic farming. It takes the general form:

Farmer→ organic company (local) →sister company (abroad) → high value market.

The second sub-structure is made up of numerous actors whose relationships are loosely coordinated through short- or long-term business transactions. These relationships are not institutionalised through contracts or vertical integration and they change rapidly over time. This chain is characterized by lack of well-defined roles and stages from production to consumption and is based upon conventional spice production.

Especially in the loosely coordinated chain, free-riding and other types of opportunistic behaviour upstream (in dealings with farmers) is accompanied by high levels of leapfrogging further down the chain, as actors pursue multiple strategies to maximize profit. Relationships between actors in the conventional spice chain are thus variable and impermanent. This is perhaps what is referred to as a fragmented structure by Caigher (2004). The chain structure takes the general form:

Farmer → dalali / traders → urban markets ↔ regional markets / Local consumer.

This structure reflects the fact that regional markets operate with the same (lack of) safety standards as the Tanzanian domestic market.

Annex 7 depicts the type of actors in the two chains and the interrelationships between them. The number of layers of intermediaries between production and consumption is likely to change in every transaction, depending on prevailing circumstances. The larger the number of layers of upstream actors (village *dalali*, village traders I and II, and distant traders), the lower the share of the price received by the farmer. Current efforts by AMSDP to link farmers direct to buyers/processors are based on this understanding. The *modus operandi* of each and every actor in Annex 7 is discussed below. The informal names applied to each group of actors are provisional and intended to enhance understanding of the categories involved. Kiswahili names are given in italics. Owners and employees of the larger organic and conventional companies have already been discussed above and are thus excluded.

(a) Farmers

Farmers sell produce either to village *dalali*, village trader I, village trader II, or to an external trader. The produce can be sourced at the farm gate or else delivered to the buyers' business premises. Normally, these are spot market transactions on cash terms. However, farmers sometimes sell on credit terms to certain buyers with whom they have long trading ties.

Forward sales are also practiced whereby farmers sell their crop on-farm before harvesting or even before reaching full maturity. Notwithstanding the sale, they will be required to protect the crop from fire and theft till the buyer harvests it. The price is negotiable and either party faces risk of loss from over or under-valuation.

(b) Village Broker/*Dalali ('Mlanguzi')*

This is a village-based broker that is contracted by village trader I, village trader II, or an external trader, to collect spice(s) on their behalf. The contract is entered into verbally and is based on trust. The contract is a forward sale arrangement whereby the village *dalali* and a trader agree on a price. Payment is made in advance to the village *dalali* by the trader (the principal) at the agreed price, as the former lack working capital. The village *dalali* then collects spices from farmers at whatever price he or she can negotiate until the required volume is delivered to the trader. Merchandize is normally purchased at farmers' premises.

The village *dalali's* commission is supposedly the difference between the actual prices paid to farmers and the forward sale price agreed on previously, plus an agency commission of Tshs 100/- per kilogram. Because they are known to command high margins on a risk-free basis, village *dalali* are often referred to as '*walanguzi*' (racketeers) by locals. For turmeric in Northern Unguja, *dalali* commissions are fixed at Tshs. 5,000–6,000/- per consignment, rather than by the kilogram. A trader will typically advance a dalali Tshs. 100,000/- for such a consignment.

Traders take precautions in selecting the village *dalali* that they deal with, as the opportunity cost of using an unscrupulous one can be very high. Total loss of the advance payment, delivery of crop below standard or in lower volumes than agreed are all experienced. Risk is considered higher when dealing with small *dalalis* ('*dalali wadogo*') than with big ones ('*dalali wakuu*'). Big dalalis may have their own small business stalls in areas with village markets, such as the MVIWATA-built markets in Morogoro. Often, external traders go to the villages with names of prospective *dalalis* that have already been vetted by their experienced trader colleagues.

(c) Village Trader I ('*Mnunuzi wa kati*')

Village trader I may double as, or graduate from the status of big village *dalali* (*'dalali mkuu'*). He/she operates on their own capital to buy merchandize from farmers for onward selling to external traders and/or to village trader II. They normally own business stalls at the village market and would be normally considered more trustworthy than 'ordinary' village *dalalis*. They may collect merchandize direct from farmers' premises or else farmers may deliver it to traders' premises.

The above facts do not preclude them from the forward sale arrangements with other traders. However, in these cases the principals may just agree with them on the terms of purchase via the telephone and 'trader I' would then use his/her own money to procure merchandize before receiving money from the principal. On top of having their own working capital, having connections with large external traders represents a second competitive advantage for this group over village *dalalis*.

However, village trader I exists only where there are established village markets. In the absence of these markets, the trader I layer disappears from the supply chain and his/her place is occupied by village trader II. This fact was ascertained by observing the difference between supply chain actors in Morogoro and Muheza (Tanga). Muheza district has no established village markets, while Morogoro rural district has. The trader I layer is absent in Unguja for the same reason.

(d) Village Trader II ('*Mnunuzi msafirishaji*')

These are local traders with enough capital to buy spices from farmers for onward transportation and selling into urban markets. These village traders II could broker for incoming big external traders and also could use village *dalalis* and village traders I as their own brokers. Some times they collect merchandize direct from farmers especially during harvest season in order to gain a price advantage.

The career transition from village *dalali* – village trader I – village trader II is a gradual process that is governed by one's capital level. Many would start as village *dalalis*, gradually becôming a trader I after accumulating enough capital to meet the requirements of the rank and finally climbing into a trader II position as their capital grew further.

In the past, all these traders were men. Recently, women have appeared as *dalalis*, trader Is, and trader IIs in Morogoro rural district. In Unguja, in Muheza, and in the highland Tegetero village in rural Morogoro women are typically more engaged in spice farming than trading. Women's involvement in spice trading is influenced by the traditional customs of the area in question.

(e) External/Distant Traders (*Wafanyabiashara wageni*)

These are inter-regional traders that collect spice consignments from farmers in the villages directly in person or indirectly through brokers as already explained above. The survey established four main sources of these traders namely; Zanzibar, Tanga, Morogoro and Dar es Salaam. The consignments purchased are transported to the urban markets in question as well as to spice shops in these locations, for onward selling to local consumers and export into low value markets such as Comoros, Kenya, Saudi Arabia, and Uganda. Tanga traders export the consignments they collect into Kenya.

Conventional companies' agents are among the major external/distant traders encountered in the villages. However, they are not easily identifiable as they do not have specific buying centres. Buying centres are always operated directly by the companies themselves. An example observed during the survey was a M/S Fidahussein buying centre (warehouse) for cardamom in Turiani division, Mvomero district in Morogoro region.

(f) Bulking Market Broker/D*alali*

This is a broker at a central urban market that sells consignments brought to the market by incoming village trader II or by an external trader to buyers. The bulking market *dalali*, like the village one, never owns the consignment. Brokerage terms are such that the seller and the market *dalali* agree on a selling price for the merchandize. Thereafter the *dalali* may take over possession of the consignment. The seller will be paid after the consignment is sold to the buyer by the market *dalali*, whose commission consists in the difference between the two prices.

There are big and small urban bulking market *dalalis*, as there are village *dalalis*. Big market *dalalis* have their own business stalls in the market and have long term reputations as brokers. They are thus entrusted with possession of large consignments. Small market *dalalis* are not trusted, and therefore do not actually take possession of them. Instead they simply look for buyers and - on finding them - they will take incoming sellers to them. A price will have been agreed in advance between the *dalali* and the incoming seller, and the difference between the actual price paid by the buyer and this price will constitute their commission.

Kariakoo market *dalalis* in Dar es Salaam are the main players in this category. The reason is that Kariakoo is the major destination market for all spice consignments from up-country spice producing areas. It thus serves as a supply source for many urban markets in non-spice producing regions in Tanzania, for other primary produce markets in Dar es Salaam, and for numerous regional markets within Africa. Kariakoo spice traders maintain very close relationships with spice traders in urban markets in producing regions, especially those based in Tanga and Morogoro and Unguja. This is important for supply intelligence in cases of shortfalls of specific spice types on either side.

Regional export markets (Comoros, Kenya, Zambia, Zimbabwe, Malawi, Botswana and DR Congo) are all served by Kariakoo market. Spice(s) could either be transported by Tanzanian traders to these markets or else traders from these destinations might come to collect from Kariakoo. Major destinations in the former case are Nairobi, Mombassa, Kampala, Lusaka and Blantyre (to a smaller extent than the others). Due to security threats, spice exports into war torn areas like Ethiopia, Sudan and Somalia are routed through Kenya, taking advantage of the presence of traders from Nairobi.

(g) Spice Shops/Processors

Spice shops and processors are mostly found in Dar es Salaam and Unguja. These operations buy spice(s) from either market *dalalis* or direct from village trader IIs. They also grind spices for onward selling to local consumers and for sales into low value export markets like Kenya, Comoros, and Saudi Arabia. M/S MADAWA Ltd is a leading processor and blender of medicinal herbs and spices in Unguja. However, all spice traders at urban markets in Tanga, Morogoro, Dar es Salaam, and Unguja also grind and mix spices for local consumers. Furthermore, this seems to be a general practice in many other urban markets in Tanzania.

4.2.3 Conformity to International Food Standards

Conformity to EU Certified Organic standards entails that organic companies ensure adherence by their contracted farmers to certified organic regulations. In order to do so they provide extension and supervision. It also entails rigorous control of all post-harvest processes, particularly to maintain segregation. Post-harvest processes are therefore entirely confined within their warehouses. The companies believe that certified organic standard is more likely compromised during post-harvest processing, hence this intervention.

Verification of compliance involves maintaining an ICS, as described, as well as maintaining farmer records in order to assure traceability and maintenance of a reliable 'input-output' balance. 'Input-output relationship' refers here to assurance that certified farmers deliver only their own certified produce to the organic company.

Organic companies also reported the existence of a practice which requires them to submit samples to their EU buyers at the start of every season for analysis (during the second surveys in November 2006, exporters confirmed that samples are now required for each and every EU destined consignment). It was not clear (to the exporters) whether the analysis concerned was to test for substances or residues whose presence was banned or restricted under EU food safety rules, or whether it concerned testing for quality attributes, or both. Nor was it clear by whom the testing was actually carried out. Aloui and Kenny (2004) report a similar practice of sending samples abroad for testing, on the part of Moroccan citrus and tomato exporters complying with Eurep-GAP standards. In this case however, the analysis was explicitly for chemical testing.

Conventional spice producers do not knowingly comply with any specific food safety standard. While fertilizers and pesticides are not used in spice farming in Tanzania, other sources of food safety risk are present. Conventional farmers typically sell their produce in a dried form. Drying is sometimes done while the produce is spread on bare ground or on sub-standard drying mats, thus the risk of microbial contamination is very high.
Conventional buyers observe three quality traits; proper drying, produce maturity, and absence of physical contaminants. However, even when one or more of these traits is absent, the produce will always be purchased. Under certain circumstances, a price penalty might be imposed if the buyer has to correct a failure -as is common for improperly dried produce. Inspection for these traits is done visually.

Harvesting of immature crop is instigated by roving middlepersons. In the absence of by-laws restricting this practice, farmers are easily lured into harvesting and selling their crop in an immature state. They however incur weight losses as immature crop is lighter than mature crop. This weight loss results in financial losses as lighter produce earns less. It is due to this that conventional farmers in some of the surveyed areas were found to be indulged in intentional adulteration of their produce with various contaminants in an attempt to reduce weight loss. The physical adulterants used vary according to location, as shown in Table 7.

Table 7: Common adulterants of spice produce in the surveyed areas

Location	Adulterant (common/local name)	Adulterant (scientific name)	Spice produce affected
Morogoro	Fine sand and pebbles	-	Various
	'*Mkumburu*' barks	*Synsepalum msolo (Pachystela msolo)*	Cinnamon
Muheza	Papaya seeds	*Carica papaya*	Black pepper
	Mvuti seeds	*Lantana camara*	Black pepper
	Avocado barks	*Persea americana*	Cinnamon

Immature produce not only has short shelf life but also is of low quality in terms of its active ingredient. An example given was that of immaturely harvested black pepper. Farmers boil immature peppers before drying so that they will attain their proper black colour. The boiled product is however said to be of low piperine content and also blacker than dried mature crop. In addition, the effects of some of these physical adulterants being added to spices might be potentially harmful to consumers.

4.2.3.1 Compliance Costs

Since, as noted, the main standard conformed to by Tanzanian spice farmers was the organic one (for certified producers only), the discussion of compliance costs presented here will confine itself to actors in this chain. The actors incurring such costs comprise organic spice farmers and export companies. On the part of farmers in the surveyed areas, compliance costs are incurred under following headings:

- **Land Clearance**

Certified organic spice farmers are required to strictly adhere to a 'no burning' policy. By implication, organic farmers will incur additional labour costs, as compared to conventional farmers, in removal of plant residues and other trash for either onward processing into compost or final disposal. Violations of this requirement is however rampant in North Unguja's 'A District', as chilli farmers practice shifting cultivation. New areas of the coral rag are brought into cultivation at 2-3 year intervals. The difficulty of clearing coral rag lies behind these violations.

- **Planting**

Treated seed may not be used by organic farmers. Hence, a part of farmers' produce must be used as seed. The cost implication is that the organic farmer incurs the opportunity cost of not selling this part of the crop on the market at a premium price (less whatever the cost of purchasing treated seed would have been). In conversion situations, organic farmers could be compelled to establish their own nurseries or acquire planting materials from approved nurseries (sometimes subsidized by exporters). Both moves are likely to entail significant costs as compared to conventional farmers, who would not be bound by this requirement.

- **Fertilizer Application**

Inorganic fertilizer is not permitted so, if fertilizer is to be used, it must be organic. This can have the following cost implications:

(i) Necessity to make compost or collect farmyard manure, which might call for more labour.

(ii) Organic fertilizer is more bulky than inorganic fertilizers thus it might be more costly to transport it.

Of course, these costs need to be balanced against the savings entailed by the non-purchase of inorganic fertilizer. However, the real compliance cost entailed here will be influenced by the extent to which use of organic fertilizer is prescribed by scheme operators, and by the extent to which fertilizer use is customary in conventional agriculture.

- **Pest and Disease Management**

Certified organic farming forbids the use of chemical pesticides. This may have the following cost implications:

(i) Loss of farmers' produce due to pest attacks.

(ii) A need to prepare biological pesticides from fermented plant extracts like ginger, chillies, onions, garlic, neem, marigold ('mtegeta'), Tephrozia spp('Utupa') and moringa (a legume). This could relatively be more costly in terms of time, labour, and costs of raw materials when compared to conventional farming.

- **Harvesting**

Under conventional spice production, harvesting (for example turmeric) may be extended over a six months period. However, in the organic schemes surveyed, farmers are given shorter specified harvesting periods (say 2-3 weeks) to enable homogeneous bulk post-harvest processing ready for export. In the first case, farmers may not need to hire labour for harvesting but in the second case they are compelled to hire labour to meet the harvest deadline. This extra labour is a compliance cost. It should be noted that this cost is not entailed by the adoption of organic farming practices as such, rather it is an add-on requirement by scheme operators.

- **Post-harvest Handling**

Organic farmers are allowed to carry out drying of some spices. However, exporters do not allow this for spices like turmeric, cardamom, black and white pepper, as these are very sensitive. In situations where drying is allowed, farmers are expected to incur costs in purchasing drying membranes (tarpaulins), and polythene rolls for fencing processing sites. These materials are not usually used by conventional farmers. Farmer dried produce is subject to further drying by exporters to ensure attainment of proper moisture content level.

- **Training**

Farmer training is done either individually during on-farm inspections or in groups through arranged seminars/workshops. The latter has a cost implication for the farmer as he or she will have to forego labour time in training in terms of labour hours that would otherwise have been used working on the farm. On the other hand, this cost needs to be weighed against the possible benefits of training, in terms of increased productivity of capital and labour and – in the cases observed – income from training allowances.

On the organic companies' side, compliance costs are incurred in relation to:

(i) Farmer registration – Registration entails surveying the farm of each farmer on a given scheme and calculating their expected cash crop output.

(ii) Documentation/record-keeping - In order to conform with certification requirements, the company records for each farmer their land preparation methods, training and extension received internal inspection results and sales. The latter are checked against the estimates of output made during farmer registration, to prevent cases of fraud.

(iii) Internal inspection costs – salary and overtime allowances for internal inspectors.

(iv) External inspection – inspection fees rate per farmer, transport, and accommodation for IMO (International Marketecology Organization- Swiss based) inspectors.

(v) Training costs for farmers - these are fees and allowances paid to participating farmers. Normally, there are 3 seminar sessions per year involving 50 farmers in each session.

(vi) Agency costs – salary, allowances and transport costs for field representatives.

(vii) Office costs – salary and wages for permanent and temporary staff and computer for record keeping.

(viii) Post – harvest processing: -

(a) Costs of tools and instruments – tarpaulins, saucepans, trays, disinfectant (soap), firewood, packing materials.

(b) Labour costs – for boiling, first sorting, drying, second sorting, packaging, salaries and allowances for permanent and temporary processing staff.

(c) Warehouse costs – rent, annual inspection fees, fumigation fees, annual renovation and repairs.

(d) Sample analysis - testing fees and courier service charges.

(e) Price premium - however, the survey did not observe payment of price premiums to certified organic spice farmers in the surveyed schemes.

4.2.3.2 Benefits of Compliance

For farmers, four main benefits of compliance were reported during the surveys, viz:

(i) Enhancing smallholders' ability to access high value markets (eg. EU) for their high value crops (spices). However, this benefit can be said to be realised only if a price premium is observable and if farmers are assured that their crop will be purchased. Neither of these seems to be the case (see section 4.3). This concern was also aired in one of the Tanzania Organic Agriculture Movement (TOAM) policy initiative forum, held at the Courtyard Hotel in Dar es Salaam in May 2006. At this forum, the response from the organic exporters present was that premium prices were things of the past. Market access, environmental conservation, and improved human health were stated instead as the major benefits of organic agriculture promotion.

(ii) Besides the possible cash savings referred to in the discussion of costs above, organic farmers may benefit from increased productivity, as a result of higher yields. The latter may arise from greater use of yield-enhancing techniques such as composting, or from techniques adopted as a result of participation in farm training.

(iii) A spill-over effect of safe products (spices in this case) being traded on the local market, contributing to improved health for locals. Probably more than 50% of produce from certified organic spice farmers ends on the local market.

The major benefits for scheme operators are market access to the EU, with its higher prices for spices; any organic premium received in addition to these prices; improved access to working and sometimes investment capital via European partners; access to donor support via projects like EPOPA; and improved public profile through association with more environmentally-friendly forms of production and trade.

4.2.4 Vertical Coordination in the Sector

According to Mighell and Jones (1963), the term vertical coordination describes the different ways in which vertical stages of production and marketing may be related. Some of the alternative means of coordination are the market/price system, vertical integration, contracting, and cooperation singly or in combination. The term thus encompasses a continuum of possibilities from open market spot transactions at one end to full vertical integration at the other - including strategic alliances, joint ventures and different types of contracting (Hobbs and Young, 2001). Theoretically, these different coordination forms are seen as means of minimising the transaction costs facing particular supply chain actors in different situations.

Three coordination forms can be discerned in the Tanzanian spice industry namely, spot market transactions, contracting, and vertical integration. Section 4.1.2 profiled the whole range of supply chain actors and described the nature of the relationships that exist between them. It also illustrated the movement to closely coordinated supply chain when farmers convert from traditional agriculture methods to certified organic production methods through producer: buyer contracting. This is important in two ways; first in making the organic chain more responsive to buyers' needs and secondly, in allowing the local smallholder farmers to conform to international agro-food standards.

The non-organic chain is characterized by spot market transactions, while contracting and vertical integration are absent. This chain serves local, regional (within Africa), and low value Asian export markets that have less differentiated and stringent consumer demands - thus making close chain coordination unimportant. Vertical integration has however surfaced in a special way in the spice value chain and is therefore discussed further below.

Full vertical integration occurs when a single firm carries out two or more consecutive stages of the production-to-distribution chain (Hobbs, 1996). Both backward and forward vertical integration are evident in the Tanzanian organic spice value chain. As already noted, the two are inspired by the need to guarantee crop supply volume reliability and to meet specific export market requirements. Backward vertical integration is mainly concerned with the former and is also a more recent phenomenon in the sector.

(i) Backward vertical integration

In a bid to address incessant supply problems facing the spice sector, Tanzanian organic spice exporters are now integrating backwards by becoming producers whilst maintaining their original buyer roles. M/s TAZOP, for instance, has acquired 500 acres (with 300 more in the offing) in the newly inaugurated Kilindi district, formerly part of Handeni district. The firm's ambition is to source some of its supply requirements from its own farm and more importantly, to become a source of planting materials for various spice types for their registered farmers.

It is not clear as to whether this approach will also be adopted by other non-producer organic companies that are dealing in spices in Tanzania. M/s ZANGERM Enterprises (the first organic spice company to operate in Tanzania) had originally planned to carry out primary production in Zanzibar way back in 1991. Production was to be carried out jointly with the Zanzibar Economic Brigade Force (*Jeshi la Kulinda Uchumi Zanzibar)* over a 100 acre area. The plan did not materialize for undisclosed reasons.

Levels of organisation and financial strength are a major precondition for a company to move towards this type of vertical integration. For instance, much of the capital investment requirements for M/S TAZOP's project, especially those in relation to farm machinery, are met by its international partner – M/s TAZOP Swiss. In these regards, M/s TAZOP look better off than the other operating organic spice companies given their higher levels of sales, management resources, numbers of registered farmers and territorial coverage.

(ii) Forward vertical integration

This is exemplified in the structure of most existing organic spice export companies, whereby M/s TAZOP Ltd and M/s ZANGERM Ltd. maintain a foreign partner for both working capital augmentation and marketing abroad. It is unclear whether it applies also to the upcoming non-producer export company, M/s Global Africa (Arusha), or to the Morogoro-based producer-exporter of organic spices, Kimango farm.

The partnerships between the local companies and their allies abroad are institutionalised on the basis of share subscriptions rather than simply contracts. For instance, M/s TAZOP Swiss owns half of M/s TAZOP, while M/s ZANGERM Germany owns over 60% of the shares of M/s ZANGERM. Despite these arrangements, relationships between these partners have not always been beneficial to the local companies. M/s ZANGERM Zanzibar, for example, is said to have been brought to its knees over the last 2-3 years (counting from 2006) following opportunistic behaviour by its foreign partner (Bente Saidi, *pers. comm.*, 2006)[45]. On account of working capital constraints, the company's exports declined from 32 containers (over 250 tons) in the late 1990s to nil in 2006. In the latter year the company managed only to sell to other exporters.

However, according to company personnel, there is no possibility of operating without a foreign partner – not least because trust is said to be minimal in the international spice trade. Local companies are compelled to have foreign allies to closely follow up matters abroad; otherwise losses will always be experienced. These kinds of partnerships will thus continue in future notwithstanding their ineffectiveness in some cases.

4.3 Analysis of Local Conformity Assessment Capacity on Spices in Tanzania

4.3.1 Theoretical Discussion

Safety standard compliance for agro-food exports is essential for gaining market access, especially to high value markets (Mitchell, 2003; Henson, 2003; Holleran *et al.* 1999;

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[45] Bente Saidi is the Managing Director for M/s ZANGERM Zanzibar.

Gogoe, 2003; Manarungsan *et al.* 2004; Aloui and Kenny, 2004). This is the case for the spices sector as well (see Jaffee 2004 for the specific export standards required for entry into the EU and US markets).

Conformity assessment refers to any procedure, direct or indirect, that is used to determine whether relevant requirements in technical regulations or standards are fulfilled (Stephenson, 1997). It covers four areas, namely; declaration of conformity (own assessment), testing of products (by independent laboratory), certification (by unbiased third party evaluator), and quality system registration (by quality system registrars). Each of the four areas covered by conformity assessment activities can be carried out at three different levels. The first level is assessment or evaluation, second is accreditation, and third is recognition. Assessment can be done by producers/manufacturers, laboratories, certifiers, and quality system registrars and involves comparing a product or process to a given standard (Stephenson, 1997).

Accreditation is a process of evaluating testing facilities for competence to perform specific tests using specified test methods (Stephenson, 1997). It involves evaluation and formal documentation of a facility's testing competence. It determines whether a particular testing facility has the required personnel qualifications, equipment and/or ability to perform tests. The presence of accredited facilities thus enhances the possibility of forging Mutual Recognition Agreements between internationally trading partners.

To attain recognition certification bodies must be accredited to ISO/IEC guide 62, 65, and 66; laboratories (testing and calibration) to ISO/IEC 17025; and inspection bodies to ISO/IEC 17020. The trend in accreditation is to establish a worldwide network of national or regional groupings of accreditation bodies which will, through Multilateral Agreements, ensure that the competence of certification bodies and laboratories are assessed on the same principle regardless of where in the world they are located. These assessments are based on the harmonized ISO standards (www.sanas.co.za).

The challenge of conformity assessment becomes clearer on recognition that acceptance of equivalence requires not merely the physical presence of institutions/organizations that are equipped to carry out necessary tests, inspections and certification. Requirement for these to be accredited may be more demanding than the need to put in place the required physical and human infrastructure (equipment and staff) for these tasks as is shown later in this study.

As already shown in chapter 1, the EU and the United States (US) are the major spice importers in the world. When intra-EU trade is included, the EU is currently the largest importer of spices (22 percent). Excluding intra-EU trade, the EU becomes the second largest importer (17 percent) behind the US. Among the biggest EU importing countries are Germany and Netherlands. Other major EU importers include France, Spain and UK. Japan accounts for 10 percent of world spice imports[46].

LDC exports are focused primarily on the US and EU markets (ITC, 2001). As far as Tanzanian exports to high value markets are concerned, it is only cloves that are reportedly exported to Japan[47]. The overwhelming bulk of Tanzanian sales to high value markets go to the EU (mostly Germany and Switzerland). However, exports as a whole include substantial but undocumented levels of sales to Asian markets (various countries) and regional markets (various African countries).

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[46] Domestic production of spices constitute 10%, >40% and <10% of domestic consumption in EU, US and Japan respectively (Jaffee, 2004).

[47] These are sold locally to M/s TAZOP Ltd (a private spice export company) by M/s Zanzibar State Trading Company (ZSTC) (the clove crop monopolist public company). The latter exports most of its clove product to various south-east Asian markets, the biggest buyer being Indonesia (Akyoo and Lazaro, 2007).

Asian and African markets import Tanzania's conventional spices without clear quality criteria, whereas Tanzanian sales to the EU market are almost entirely of certified organic spices (Akyoo and Lazaro, 2007). EU official attention to these products relates to their conformity both with the EU's organic agricultural regulation and with rules on pesticide residue limits, Aflatoxin limits, and heavy metal contamination levels (Jaffee, 2004).

Two major challenges are thus critical in conforming to export standards in high value markets. The first is the need for producers to adhere to approved production methods (in the case of certified organic product)[48] and food safety requirements (for all products). The second is the need for producing countries to have adequate capacity to assess conformity for exportable food items with respect to importer country requirements. This study evaluates prevailing local capacity to carry out standards conformity assessment for Tanzanian spice exports to the EU. The focus on the EU market is based on the fact that it is the major high value destination market for the crop.

4.3.2 Export Standards for Spices

According to the Tanzanian National Trade Policy (URT, 2003a), local standards for any export oriented product should be aligned to match those of the country's major importers. Theoretically, this is in order that conformity with them may act as a stepping stone to conformity with international standards. Whilst this is a policy statement, its implementation, at least in the spice industry, is yet to take effect to date as shown in section 4.3.3.

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[48] Principles and rules for organic crop production and governing imports of organic product are laid down in EU Regulation 834/07 of 2007, replacing Regulation 2092/91 of 1991.

4.3.3 National Standards

Most national standards for spices were formulated during the late 1970s and 1980s. This is attributed to the fact that the local market for spices during the period was vibrant enough to merit their formulation and enforcement (Masaga, *pers. comm.*, 2007). Standards initially concerned quality attributes. Later, in the late 1980s, safety attributes were introduced through Tanzania Standard (TZS) 404: 1988, establishing microbiological specifications in spices (TBS, 1988).

During the late 1970s, five standards were formulated for black pepper (TZS 30: 1979), chillies and capsicums (TZS 31: 1979), curry powder (TZS 29: 1979), ginger (TZS 47: 1979), and turmeric (TZS 46: 1979). In the second half of 1980s three more standards came into being – clove (TZS 357: 1987), cardamom (TZS 358: 1987), and the earlier mentioned microbiological specification for spices (TZS 404: 1988). Meanwhile, in 1981, six other associated standards were established which related to acceptable sampling and analytical methods for microbiological analyses in general foodstuffs (TBS, 1979a, 1979b; and 1988).

Formulation of these national standards involved setting limits for several parameters including colour and size of a mature crop, odour and flavour, freedom from fungi, and insects, extraneous matter limits, limits for immature, marked or broken berries, fineness, and chemical requirement limits. These addressed five parameters, namely: moisture content, total ash, acid insoluble ash in hydrochloric acid, crude fibre, and non-volatile ether extract. Annex 8 summarizes the requirements on these attributes for black/white pepper and chillies and capsicums.

Microbiological limits, on the other hand, referred to five parameters, namely: Mesophilic aerobic bacteria, *Salmonella, Bacillus cereus, Clostridium perfringens,* and yeast and mould. The microbiological analysis was based on the establishment of total count of each micro-organism in a specified spice sample. The introduction of a microbiological specification standard for spices in 1988 (TZS 404: 1988) was in line with global trends in safety standards evolution for general food stuffs. According to Jaffee (2004), incorporation of health and hygiene specifications in commercial supply chains for spices started in the early 1990s. Before this period, it was only quality and cleanliness standards that were of concern. By implication, the publication of this standard meant that Tanzania was keeping pace with the level of safety standards in high value markets. For instance, zero tolerance to *Salmonella* was also established as a requirement in EU at this time. Table 8 shows the acceptable micro-organism limits for different spice types under the standard.

Table 8: Limits of micro-organisms in spices (Tanzania national standards)

Spice type	Micro-organism type				
	Mesophilic aerobic bacteria (maximum number per gm)	*Salmonella* (maximum number in 25 gms)	*Bacillus cereus* (maximum number per gm)	*Clostridium perfringens* (maximum number per gm)	*Yeast and moulds* (maximum number per gm)
B/pepper + w/pepper	10^5	0	10^3	5×10^2	10^4
Chillies + capsicums	10^5	0	10^3	5×10^2	10^3
Cardamom	10^4	0	10^3	5×10^2	10^2
Curry powder	10^5	0	10^3	5×10^2	10^3
Cloves	10^4	0	10^3	5×10^2	10^3
Ginger	10^5	0	10^3	5×10^2	17×10^3
Turmeric	10^6	0	10^3	5×10^2	10^3

Source: TBS (1988)

In reality, even at this time Tanzanian standards fell short of those applied in some of the major European spice markets, such as Germany and Netherlands. Table 9 shows the general acceptable microbiological limits in these markets. Differences in standards' stringency between member states within the EU on identical parameters for a particular product as depicted in Table 9 have always impacted negatively on LDCs' compliance efforts.

4.3.4 EU Food Safety Standards and Spices

There are no specific food safety standards for spices in the EU (Jaffee, 2004). These are instead derived from general food standards. Annex 9 summarizes most of the standards which are currently applicable in the European Union (EU) and provides details on what testing equipment is necessary in relation to them. A brief discussion of each standard is presented below. All technical details, unless otherwise cited, are from Jaffee (2004).

Table 9: General microbiological specification - Germany & Netherlands

Parameter	Standard Value	Danger Value
Germany		
Total Aerobic Bacteria*	$1\times10^{5}/_g$	$1\times10^{6}/_g$
E-coli	Absent	Absent
Bacillus cereus	$1\times10^{4}/_g$	$1\times10^{5}/_g$
Staphylococcus aureus	$1\times10^{2}/_g$	$1\times10^{3}/_g$
Salmonella	Absent in 25g.	Absent in 25g.
Netherlands		
Bacillus Cereus	Absent in 25g	Danger values similar to those of Germany.
Escherichia Coli	Absent in 25g	
Clostridum perfringens	Absent in 25g	
Staphylococus aureus	Absent in 25g	
Salmonella	Absent in 25g	
Total Aerobic Bacteria	$1\times10^{6}/_g$	
Yeast and Mould	$1\times10^{3}/_g$	
Coliform	$1\times10^{2}/_g$	

*Total aerobic bacteria parameter in Table 6 is the same parameter as Mesophilic aerobic bacteria in Table 8.
Source: Kithu (2001).

(i) Cleanliness

The major concern here is the existence of extraneous material and mould in spices. Tolerance limits are set on the assumption that it is not economically practical to grow, harvest, or process food raw materials that are totally defect free. Maximum levels of natural or unavoidable defects are thus established instead.

The cleanliness standards given in Annex 9 are actually the unified American Spice Trade Association/US Food and Drug Administration (ASTA/FDA) established limits. This is due to the fact that European Spice Association (ESA) specifications are yet to become uniform despite their inception in the 1990s. However, ASTA/FDA standards were adopted by EU countries even before introduction of the ESA standards. Moreover, there seems to be a fair degree of compatibility between the two.

(ii) Aflatoxins

The limits shown in Annex 9 were established as a result of the 2001 amendment of the EU Commission's 1997 specific regulation on Aflatoxin contamination in spices. In the amendment, aflatoxins were described as potent liver carcinogens in animals and hence probable human carcinogens. Aflatoxin B1, in particular, was branded a genotoxic carcinogen for which there is no lower threshold triggering harmful effects and therefore no admissible daily intake could be set (CEC, 2001). The EU Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) held that aflatoxin contamination in spices should be reduced to the lowest level that is technologically possible. Individual EU member states have more stringent limits for aflatoxin B1 (Annex 10).

(iii)Minimum Residue Levels (MRLs)

There are no dedicated MRLs for spices at the EU level. However, individual member states have set dedicated spice MRLs, particularly Germany and Spain which between them have about 30-40 official MRLs for spices. In Spain for example, the limit for Ethion (an insecticide used in chillies) is set at 0.1 ppm (parts per million), and for Carbaryl in fresh pepper at 5 mg/kg (Annexes 1, 9 and 11 for details). However, the requirement to use only chemicals that are registered as acceptable pesticides is akin to a standard at the EU level.

Two complications in relation to MRLs for spices from the developing world have surfaced. A first complication relates to the absence of Extraneous Maximum Residue Limits (EMRLs) for persistent pesticides which are still found in soil and water though they are no longer in use. This complication becomes more serious when the list of accepted pesticides for use is frequently updated whilst their presence in water and soil persists over a longer period. A second complication concerns the magnification effect of pesticide residues in dried chillies due to dehydration. Proposals by some spice exporters from developing (especially India) countries and least developed countries to institute an adjustment factor of 10 to correct for this anomaly are yet to receive positive consideration in importing industrial countries (Jaffee, 2004).

(iv)Artificial Colorants and Additives

Attention has so far been on the presence in spices of the prohibited red dye Sudan 1 and chemical dye Para red. They are both believed to be carcinogenic. For instance, Sudan 1 dye presence in Indian spice consignments was posted on the EU's Rapid Alert System of Food and Feed in May 2003 (Jaffee, 2004). A Para red dye alert was raised on April 21, 2005 following its detection in some spice seasonings in the UK (*Guardian Unlimited*, 3.5.2005). Both cases resulted in product recalls and withdrawal from supermarkets.

(v) Pathogens

The major concern is with the presence of *Salmonella* bacteria contamination in spices. Individual member EU countries have specific concerns on this front (Table 8(b)). For example, whilst Netherlands observes zero tolerance to both *Bacillus cereus* and *Staphylococcus aureus* in general foodstuffs, tolerance limits for the same hazards in Germany are $1x10^4$ per gram and $1x10^2$ per gram, respectively.

(vi) Heavy Metals

Reference is sometimes made to spice contamination with Mercury, Lead, and Cadmium (Henson, 2003; Jaffee, 2004). All EU countries appear to have specified MRLs for Lead as well as for Arsenic, Copper, and Zinc as shown in Annex 9.

4.3.5 Capacity for Conformity Assessment in Tanzania

4.3.5.1 Food Hazards Testing

Summarizing Annex 9, food safety-related standards conformity assessment for the EU market would necessitate investment in:

(a) Detection of Aflatoxins - here, investment in high performance liquid chromatograph equipment is entailed.

(b) Detection of heavy metals - the presence of atomic absorption spectrophotometer equipment is required.

(c) Detection of pesticide residues - gas chromatograph equipment is required.

(d) Detection of microbial pathogen - and specifically for contamination with *Salmonella* bacteria – diverse laboratory equipment is required as shown in Table 10 (TFDA

Laboratory Services Directorate, referring to a testing laboratory that handles less than 10 samples per day).

Table 10: Requisite laboratory equipment for Salmonella testing

Name of equipment	Capacity of the equipment (cc)	Number of units required	Unit cost (USD)	Total investment cost (USD)
Incubator	400	3	6,000	18,000
Water bath	300	1	2,000	2,000
Autoclave	600	1	10,000	10,000
Oven	400	1	4,500	4,500
Stomatcher	--	1	3,000	3,000
Biological safety cabinet	--	1	15,000	15,000
Glassware	variable	variable	variable	30/piece
Total				52,530

Source: Survey data 2007-08 (Laboratory Services Directorate, TFDA).

If testing for anaerobic bacteria like *Bacillus cereus* and *Clostridium perfrigens*, such a laboratory would be required to make additional investments to acquire special incubators, special growth media, and an anaerobic jar. This could amount to an extra USD 10,000 worth of investment capital.

Learning from the example of India (the largest spice producer and consumer globally, (see http://www.caudilweb.com/triplestandards/en/Topic5aspx), the above safety-related investments are possible when both industry and government collaborate effectively (Jaffee, 2004). For instance, over the period 1991 – 2003, total safety-related investment in the Indian spice industry amounted to USD 14.5 million with three quarters of this being undertaken by the industry itself and one quarter by the public Spice Board. Investment in laboratories alone amounted to USD 540,000. 45 percent of these costs were met through technical assistance from UNDP and ITC. The rest was from the industry and government (via the Spice Board). Meeting such challenges in the Tanzanian context, with a very weak institutional set up and minimal public involvement in the industry, is bound to be difficult.

4.3.5.2 Testing Capacity in Tanzania

No dedicated investment onto laboratory testing equipment for safety-related risks for spices has been undertaken by either the private or public sectors in Tanzania. This is explained by the small size of the industry itself, the small size of individual smallholder spice farmers' and traders' scales of operation, and the change of direction of destination markets for spices, especially for clove which is the major spice crop. If Tanzanian clove had continued to be traded in high value markets [as was the case before the turn to the Asian market (Akyoo and Lazaro, 2007), the position might be different today. Given its value, the volume traded, and the significant (Zanzibar) government involvement in its marketing, it was probably the only spice crop that could justify the involved capital expenditure. The prevalence of markets that demand no strict adherence to safety standards is, inversely, a significant disincentive for the sub-sector to engage in such costly investments.

Nonetheless, there are investments by the public sector that can potentially serve a variety of agro-food export industries, including spices. The author's survey revealed that TBS, TFDA, TIRDO, and GCLA have all undertaken investments in this regard. These organizations however prioritize testing of locally processed products and imports. The capacities of each of these organizations are summarised in Tables 8 and 9 below and then discussed in turn. Table 11 summarises physical capacity in terms of available equipment whereas Table 12 summarises personnel capacity in respect of professional staff for each laboratory.

Table 11: Summary of physical capacity for food safety testing by institution (2008)

Hazard	Test	Equipment necessary	Institutions having the equipment	Accreditation status
Salmonella	Laboratory test	Incubator, water bath, autoclave, oven, stomacher, biological safety cabinet	TBS, TFDA, TIRDO, GCLA, NFQCL	NFQCL[49] only
Aflatoxins	High performance liquid chromato-graphy (HPLC)	High performance liquid chromatograph	TBS, TFDA, TIRDO, GCLA	None
Pesticide residues	Gas chromatography (GC)	Gas chromatograph	TFDA, GCLA	None
Heavy metals	Atomic absorption spectrophotometry (AAS)	Atomic absorption spectrophotometer	TBS, TFDA, TIRDO, GCLA	None
Artificial colorants and chemical dyes[50]	High performance liquid chromatography (HPLC)	High performance liquid chromatograph (different certified reference material from those for aflatoxins)	TBS, TFDA, TIRDO, GCLA	None

(i) Tanzania Food and Drugs Authority (TFDA)

TFDA operates under the Ministry of Health and Social Welfare and is responsible for overseeing the quality/safety of food, drugs, and related products. It was established under the Food and Drugs Act No. 1 of 2003 and started operations in July 2003. It issues certificates of registration subject to laboratory tests.

[49] NFQCL is yet to set fees for services rendered to outside customers

[50] In addition to lacking accreditation, no laboratory was testing for Artificial colorants and chemical dyes in Tanzania at the time of the suvey.

Table 12: Summary of professional capacity for food safety testing by institution (2008)

Institution	Type of laboratory	Professional capacity		Remarks
		Education level	Discipline	
TFDA	Chemistry	1 MSc 1 MSc 1 MSc 1 Diploma	Food scientist. Engineer. Chemist. Technician.	2 additional BSc level food scientists required.
	Food microbiology	1 BSc 1 Diploma	Food scientist. Technician.	No additional personnel required
TBS	Chemistry	1 MSc 3 BSc 2 diplomas	Chemist. Food scientist. Technicians.	No additional workforce required.
	Microbiology	1 MSc 2 BSc 1 diploma	Microbiologist. Food scientist. Technician.	No additional personnel required
GCLA	Food	1 MSc 1 BSc 4 Diplomas	Food scientist. Food scientist. Technicians.	2 additional BSc level food scientists required.
	Microbiology	1 MSc* 2 BSc 2 Diplomas	Microbiologist. Microbiologists. Technicians.	2 additional BSc level microbiologist required
TIRDO	Food microbiology	1 BSc 1 BSc 4 Diplomas	Microbiologist. Food scientist. Technicians.	No additional personnel requirement in the short run.
NFQCL	Fish quality assurance	2 MSc + 1BSc 2 BSc 3 Diplomas + 2 certificates	Microbiologists. Food scientists. Technologists / Technicians.	Unspecified staff deficit reported
TPRI	Pesticide residue	1 PhD 1 PhD* 1 BSc 3 Diplomas	Chemist. Chemist. Engineer. Technicians.	4 additional PhD chemists + 4 technicians.
	Quality assurance	2 MSc 1 MSc* 1 BSc 2 Diplomas	Chemists. Chemist. Chemist. Technicians.	2 additional PhD chemists, 1 MSc or BSc chemist + 6 technicians required.

* On-going programme.

Certification is provided on a consignment basis and the focus has mainly been on packed processed foodstuffs. Spices have not been among the products that have been certified by TFDA. The argument is that, for a product to qualify for registration, its quality should remain unchanged over time and spices do not qualify on this basis, hence their exclusion.

The TFDA laboratory, as of June 2007, was under major renovation. The available equipment could only test for microbial pathogen contamination in food. However, customers requiring other tests for their samples were accepted and the samples were taken to the GCLA. The TFDA fee structure for various tests is summarised in Table 13.

Table 13: TFDA laboratory toll fee structure

Type of food hazard	Fees chargeable (USD) per sample	Remarks
Mycotoxins/aflatoxins*	30	Contracted out to GCLA
Microbial pathogens	50	Undertaken by TFDA
Heavy metals***	20 @ metal	Contracted out to GCLA
Pesticide residues**	45 @ pesticide	Contracted out to GCLA

* As of November 2007, TFDA had already procured one High Performance liquid Chromatograph set (estimated cost over USD 90,000), reportedly already working.
** In November, 2007 the presence of a Gas Chromatograph I (estimated cost over USD 66,000) was reported but it was yet to be used.
*** Procurement of an Atomic Absorption Spectrophotometer[51] (estimated cost over USD 110,000) was confirmed during the February 2008 survey.

A problem is that TFDA currently lacks accreditation[52] to register the results of its tests. TFDA was looking forward to applying for accreditation during 2008 after completion of the new laboratory building. Preparation of quality manuals (as per ISO/IEC 17025) was reported to have been completed.

[51] Procurement of lab equipment by TFDA has so far been financed separately by WHO, Global Fund, Clinton 4x4 Initiative, UNICEF, and the International Atomic Energy Agency.

[52] Accreditation involves a multi-stage process that include; documentation → application → documents review→ feedback → pre-assessment → initial assessment → recommendation → accreditation. In this regard, TBS's metrology (scientific measurement) and microbiology laboratories are currently SANAS accredited (although the latter is not yet accredited for *Salmonella*). SANAS (South Africa National Accreditation Service) is a member of both the International Laboratory Accreditation Cooperation and the International Accreditation Forum and it is recognized by the EU. TBS's food and chemistry laboratory is at the pre-assessment stage; and TIRDO's microbiology and chemistry lab is at the pre-assessment stage. DANIDA is financing the on-going accreditation applications for all five laboratories.

Levels of professional capacity at TFDA sufficed its current operations[53]. The personnel profile in the chemistry laboratory was made up of three MSc holders (a food scientist, an engineer and a chemist) and one Diploma holder (a technician). Recruitment of two BSc holders (both food technologists) was required to improve the capacity but was reported to be limited by budgetary allocations. The food microbiology laboratory was staffed with only one BSc holder (a food technologist/scientist) and one Diploma holder (a technologist/technician). An additional two food technologists and one laboratory technologist/technician were required to improve the capacity.

(ii) Tanzania Bureau of Standards (TBS)

TBS is the sole standards body in Tanzania and was established under the Standards Act No. 3 of 1975, subsequently amended by Act No.1 of 1977. Being a national standards body, TBS is a member of ISO. It is the national enquiry point for all matters pertaining to standardization and ISO. In the process of formulating standards, technical committees are established for which TBS forms the secretariat. Currently, there are 30 technical committees each comprising 12 members. Committee members are key stakeholders in the respective industries for which standards are to be formulated. Spices and Condiments is one of the technical committees of TBS and the national standards on spices are a result of its work.

TBS's Laboratory can only handle tests for microbial pathogen presence and some aspects of heavy metal contamination. In the latter case, detection is only for Lead contamination whereas Mercury testing is hampered by lack of requisite kits. Capacity to test for

[53] Following procurement of HPLC and GCMS, TFDA laboratory staffs were trained in Germany for 3 months to enhance their ability to operate the equipment.

Cadmium and other heavy metals is doubtful as it was reported that such tests have not been attempted.

High Performance Liquid Chromatograph (HPLC) equipment to test for mycotoxins/aflatoxins was procured in October, 2007. Gas Chromatograph equipment for pesticide residue (MRLs) testing was completely lacking. TBS laboratory's incapacity was reported to be more in regard to lack of necessary equipment than lack of trained human resource.

TBS's microbiology laboratory was staffed with one MSc holder (a food microbiologist), two BSc holders (food technologists/scientists) and one Diploma holder laboratory technician. No personnel deficit was reported at the time of survey. The chemistry laboratory had one MSc holder (a chemist), three BSc holders (food technologists/scientists), and two Diploma holder technicians. Likewise, this workforce was considered sufficient at the time of survey. Estimated toll fees for various tests at the TBS laboratory are shown in Table 14.

Table 14: Estimated toll fee structure for TBS laboratory

Hazard type	Toll fees (Tsh) (Exchange rate 1 100Tsh ≡ 1USD)	Remarks
Mycotoxins/aflatoxins	60 000 (USD 54.5)	Not yet undertaken. Testing to start following procurement of HPCL
Microbial pathogens	12 000 (USD 10.9) @ parameter*	Currently undertaken
Heavy metals	20 000-25 000 (USD 18.18-22.72)	Partly undertaken
Pesticides	-	Not yet undertaken

*There are normally 5 parameters in food testing (Table 5).

TBS' microbiological laboratory became accredited by SANAS in December 2007 for E. coli, total plate count, and Coliform tests. *Salmonella* testing was not then accredited due to the absence of a biological safety cabinet. The cabinet has been procured, thus an application for accreditation with respect to *Salmonella* testing is now imminent.

(iii) Tanzania Industrial Research and Development Organization (TIRDO)

TIRDO is a parastatal organization which was established by Act No.5 of 1979 and became operational in April 1979. It was set up for the purpose of conducting industrial research and providing consultancy services to industry. TIRDO has three laboratory facilities covering food microbiology, energy and environment. The microbiology laboratory is capable of testing for *Salmonella, Vibrio cholera*, *Staphylococcus aureus*, *Clostridium spp.*, and *Escherichia coli.*

TIRDO has HPCL equipment for aflatoxin testing but this was not in working order at the time of the survey due to software problems. An AAS for heavy metal testing has been procured but was not yet in use at the time of survey. The GC equipment is lacking so pesticide limits cannot be tested.

TIRDO's microbiology laboratory is planning to apply for SANAS accreditation[54]. All the necessary quality manuals were ready and a pre-assessment had already been done. The laboratory was staffed with one microbiologist, one food technologist, and four technicians. This workforce was reported to be adequate given the number of customers currently being served.

[54] Normally the total cost of completing an accreditation exercise, for any laboratory, amounts to about USD 9000. However, any applicant has to be cautious when applying because non-compliance at any stage will render the whole exercise null and void and thus requiring a fresh start after the anomaly(ies) are corrected. A fresh start attracts the same costs as initially, so many laboratories prefer to go through the pre-assessment stage before actual initial assessment to avoid such possible losses.

(iv) Government Chemist Laboratory Agency (GCLA)

This is the most sophisticated laboratory facility in the country in terms of food hazards testing. It is well equipped to test for all of the four types of hazards of concern, in addition to antibiotic residues. It is also the sole laboratory facility in East and Central Africa that is capable of testing for Polychlorinated biphenyls (PCBs) (Masambu, *pers. comm.*, 2007). However, Tanzanian exporters tend not to use this local facility, first, because of delays in delivery of test results which often translates into loss of sales; and second, the laboratory, like those of TIRDO, TFDA and TBS, is not accredited, so test results would not be recognized in the EU market.

The existence of delays was conceded by GCLA but said to be an inevitable consequence of the necessity of sourcing most of its certified reference material from abroad. For instance, the process of obtaining certified reference material for aflatoxin from Europe may take up to two months. At times, given the toxic nature of aflatoxins, foreign suppliers may even decide to come and verify the need for reference materials on the ground of fear of possible misuse, as aflatoxins are also potent raw materials for biological weaponry. If this occurs, further delays are likely to be encountered.

GLCA had also applied for SANAS accreditation[55] and was then past the first stage, i.e. registration for accreditation. In the first phase of evaluation, the current buildings were disqualified, thus new buildings were under construction. The fee structure for GCLA test services on spices and herbs is as shown in table 15.

[55] Government Chemists in Tanzania and Uganda are applying for SANAS accreditation, whilst that in Kenya has opted for UKAS (United Kingdom Accreditation Service).

Table 15: GCLA fee structure for spices and herbs

Type of Analysis	Cost (USD)	Remarks
Moisture content	8.00	Undertaken
Heavy metals	23.00 @ metal	Undertaken
Microbiological examination	55.00	Mostly sent to TFDA
Aflatoxins	30.00	Undertaken
Extraneous matter	5.00	Undertaken

Source: URT (2003b).

GCLA was staffed with a total of five food technologists/microbiologists (one MSc holder, one undergoing MSc degree training, and 3 BSc holders). Three of the BSc holders were serving in Mwanza branch. There were also a total of six technicians (four in the food laboratory and two in the microbiology laboratory). At the time of survey, there was a deficit of two BSc-holding food technologists and two BSc-holding microbiologists, to serve in the food and microbiology laboratories respectively.

(v) Tropical Pesticide Research Institute (TPRI)

TPRI was established in 1979 by an Act of Parliament. It is under the Ministry of Agriculture, Food Security, and Cooperatives (MAFSC). Currently, it has three departments namely; research, technical services, and administration. It has two laboratories that fall under the analytical section of the technical services department. The laboratories are (i) a pesticide residue laboratory and (ii) a quality assurance and analytical laboratory.

TPRI is yet to start-off on food testing activities due to two major reasons. Firstly, its laboratories are ill-equipped for food hazards testing. The pesticide residue laboratory is deficient in equipment, thus MRLs are not tested as a GC is lacking. The available AAS can only detect Copper, Chromium, Zinc and Manganese but not other heavy metals including Cadmium, Lead, and Mercury.

Secondly, TPRI is specialized in pesticide formulation, so food testing is outside its main agenda. Pesticide formulation activities involve testing pesticides composition against given specifications for ensuring their authenticity, effectiveness, and proper usage. The quality assurance laboratory is thus equipped with working HPLC, AAS, and GCs. These equipments are not however used for food testing for fear of cross contamination of results.

TPRI's personnel profile also reflected the organization's specialisation. The entire staff (Table 7(b)) was made up of chemists and there were no food microbiologists or technologists. However, judging from the long experience with pesticides in general and the available personnel, TPRI could be a strong centre for MRLs testing in future if the proper equipment was available.

On the other hand, according to the analyst in-charge, current recruitment priorities are for more chemists, including four with PhDs (an analytical chemist, an environmental chemist, a natural products chemist, and a toxicologist) and four diploma level technicians for the pesticide residue laboratory, as well as three additional analytical chemists (two of them at PhD level) and four Diploma level technicians for the quality assurance laboratory.

(vi) National Fish Quality Control Laboratory (NFQCL)

The NFQCL is situated at Nyegezi in Mwanza city, north western Tanzania. It is owned by the government and operates under the Ministry of Natural Resources and Tourism. It is the government-designated fish quality control laboratory and caters specifically for the

Lake Victoria Nile Perch industry. Fish quality/safety failures in the past resulted in an EU import ban of Nile Perch from the lake in 1997. Recent government investment in the laboratory is thus a response to that shock.

NFQCL food testing capacity is summarized in Table 16. A notable feature of this capacity is its achievement of SANAS accreditation for *Salmonella* testing. This is the only laboratory in the country that has so far been accredited for testing this parameter. The lab however lacks capacity in testing for other food hazards - pesticide residues, heavy metals, Aflatoxins, and chemical dyes and colorants. NFQCL's personnel profile is summarised in Table 17. Deficits of personnel in each category were conceded, but no precise figures were given. In the short term, NFQCL's objective is to provide laboratory analytical services on fish and fishery products only. In the long run, the laboratory plans to offer such services for other food stuffs plus intensive involvement in research activities.

Table 16: Summary of NFQCL capacity for food safety conformity assessment (2008)

Hazard[56]	**Test**	**Equipment necessary**	**Whether equipment held /not held**	**Accreditation status**
Salmonella	Detection	Safety Cabinet Autoclaves	Held	Already achieved
Aflatoxins	Elisa	HPLC- MS/MS	Not held	Not yet
Pesticide residues	Detection	GC GC-MS/MS	Not held	Not yet
Heavy metals	Detection	AAS	Not held	Not yet
Artificial colorants and chemical dyes	Detection	GC HPLC-MS/MS	Not held	Not yet

[56] Toll fees for testing various food hazards are yet to be established at the NFQCL.

Table 17: NFQCL personnel profile, February 2008

Category	Number of employees with professional qualifications			
	MSc	BSc	Diploma (Tanzania)	Certificate
Food microbiologists	2	1	-	-
Food technologists	-	2	3	-
Laboratory technicians /technologists	-	-	-	2
Other technical staff (Secretary)	-	-	1	-

4.3.5.3 Organic certification

Organic certification for export destined spices is currently carried out by a Swiss company, IMO (Akyoo and Lazaro, 2007). Initially, all work including inspection, was carried out by this agency. Lately, most of the activities (especially inspection) have been externalized to staff from the local certification agency TANCERT[57] (Tanzania Organic Certification Association). This has been the trend in all of the East African countries in matters pertaining to organic certification (Rundgren, 2007). But certification itself is still performed by IMO.

Costs for foreign-based certification are generally considered to be high, with charges per individual farmer ranging from USD 10 to USD 100 for a typical Internal Control System (ICS) of 500 farmers and very small ICS groups respectively (Rundgren, 2007). The average cost of certifying an individual farmer as calculated from Tanzanian exporters' data ranges from USD 9.3 to USD 35.3. Accreditation of local agencies has always been thought of as a feasible way to reduce these costs.

[57] Besides IMO, TANCERT has cooperation agreements with other organic certifying agencies that are operating in Tanzania. These include CERES (Germany) and BIOINSPEKTA (Switzerland). However, IMO is the major player in the spices sub-sector. Other agencies that are operating in Tanzania but are yet to enter into cooperation agreement with TANCERT include ECOCERT (France/Germany) and SKAL (Netherlands).

However, the observed trend is that foreign-based certifying agents establish regional representation and forge even closer cooperation with local bodies, rather than the latter obtaining accreditation in their own right. Conflicts of interest between the two camps (accreditation of a local body for certification purposes possibly means replacing a foreign-based one) may slow down the process.

TANCERT describes itself as a private organization of farmers that was established in 2003. It was founded by NGOs interested in organic related activities and registered under the 1954 Societies Ordinance. It inspects and/or certifies spices as per demand. It is able to inspect for organic standards for almost any market on the globe through its contract/cooperation with IMO. However it plans to fully replace IMO in two years time. Its accreditation application for international organic certification is being audited by IOAS (International Organic Accreditation Services)[58]. TANCERT claims that local exporters are incurring high certification costs due to the absence of an internationally accredited local certifier. TANCERT is currently authorized only to inspect to regional organic standards. IMO and TANCERT fee structures for their different activities are shown in Annex 12.

From the details of Annex 12, marked differences in inspection and certification costs can be observed between the IMO and TANCERT. However, it is difficult to compare the two on account of TANCERT's lack of international accreditation. Arguably, given the fact that TANCERT's jurisdiction is restricted to the domestic and regional markets whereas IMO caters for high value markets, such differences might be expected.

[58] This will not automatically qualify it for recognition by the EU as an authorized certification body however. Under EU regulation 834/07 this is subject to a further assessment by the EU Commission.

However, an ongoing point of contention concerns IMO's different charges for field inspections when these are done by junior or senior inspectors respectively. This was also brought up by spice exporting companies in Zanzibar (Akyoo and Lazaro, 2007). The complaint is that the decision to send a junior or a senior inspector is the prerogative of the certifying agency, a situation which can give rise to rent seeking by the agency. Since both scenarios (use of junior or senior inspector) lead to similar outcomes, the different charges (USD 224 instead of USD 133 per day) can hardly be justified.

4.3.6 General Observations on Local Capacity Assessment

From the foregoing discussion, the following can be observed:

(i) That, while there are no dedicated testing facilities for spices, there are a number of multi-functional testing facilities in Tanzania. However, none of these facilities performed any tests for spices. This is partly because of specialization by some facilities in other commodities, and partly because exporters of spices avoid using these facilities due to inefficiency.

(ii) At the same time, there seems to be a lack of a coordinated approach to capacity for food testing generally. This is reflected in the replication of efforts in equipment acquisition by laboratories under different ministries' ownership and overlapping mandates between the laboratories that are legally established. Many stakeholders attribute this to the absence of a food safety policy in the country. This results in underutilization of sophisticated and often very expensive equipment.

(iii) Some critical equipment is not yet working, out of order, or not accredited for use. This is partly an indication of inadequate technical capacity to operate the equipment. Levels of professionally qualified staff for food safety testing is generally not the main constraint, but specialized training to carry out specific tests, operation and maintenance of equipment is still needed. A major problem would appear to be dispersal of capacity between laboratories.

(iv) For organics, IMO has a *de facto* monopoly in Tanzania although TANCERT may be an alternative in the future.

4.4 Costs and Benefits of Certified Organic Standard to Spice Producers

4.4.1 Theoretical discussion

Standards compliance is associated with both gains and costs. The gains may be in favour of labour, firms, and the environment and include improvement of efficiency and working conditions, raising competitiveness and exploiting market access, and thus provision of a way out of the 'race to the bottom'. The major drawback associated with non-conformity is correspondingly losing access to key markets. Yet compliance costs can be high – in terms of auditing charges, changes to production and management practices, and the potential loss of competitive advantages such as access to cheap labour or inputs (IDS, 2003).

Compliance costs can be significant and vary in magnitude depending on the nature of the standard and enterprise in question. They may be incurred to conform to standards being demanded by the market (Aloui and Kenny, 2004) or in response to a standards-based government regulation (Mitchell, 2003). According to Segerson (1999), the magnitude of compliance costs is always weighed against expected benefits before any enterprise decides to adopt a particular standard. This brings into the picture the underlying importance of quantifying the two variables as, clearly; firms will adopt a standard only when its expected benefits outweigh its compliance costs.

In some developed economies, regulatory cost – benefit analyses precede all imposition of new regulations at a national level. For matters related to food safety, the quantification exercise covers complex scenarios of social costs and benefits in terms of the likely extent of deaths, changes in morbidity, treatment costs etc, that are associated with particular hazards for which an intervention is envisaged. This is the approach that is depicted in the studies by Antle (1995, 1998a, 1998b, 1999, 2000) and Beghin and Bureau (2001) for USA and certain OECD countries respectively.

Regulatory cost-benefit analysis is however outside the scope of this study. Cost - benefit assessment in a sub-sector like spices should only entail quantification of tangible costs and benefits that are directly and/or indirectly incurred and realized by directly involved actors/stakeholders. Thus, social costs and benefits are not addressed here as organic farming of spices in Tanzania, so far, is not mandatory. It is adopted for the purpose of accessing niche markets rather than for enhancing domestic consumption of safe food for health reasons.

Correct quantification of the variables involved depends mostly on proper itemization of all constituent costs and benefits for a particular standard. A review of studies of standards like HACCP in the USA meat processing industry (Jensen and Unnevehr, 1999) and EUREPGAP for citrus and tomato in Morocco, pineapples in Ghana, and shrimp, asparagus, and soybeans in Thailand (Aloui and Kenny, 2004; Gogoe, 2003; and Manarungsan, 2004 respectively) reveals that the relevant items are standard and sector/industry specific. Organic standards for the Tanzanian spice sub-sector are no exception in their specificity.

Costs related to the certified organic standard in the Tanzanian spice industry are expected to be incurred by producers at all stages of production from land clearance to ultimate sale. In addition, direct costs may be incurred by farmers whilst attending organic agriculture seminars/training courses. Exporters on the other hand incur a myriad of compliance costs ranging from farmer registration, record keeping, inspection, certification, field agency operation, farmer training, and premium price payment (Akyoo and Lazaro, 2007).

Generally, the main benefits expected by organic spice farmers include premium prices, better yield from improved agricultural techniques and a guaranteed produce market. Likewise, exporters expect to benefit from enhanced access to high value markets (in this case the EU market) and with consequent increased profits from premium prices.

The agenda for support of organic over conventional agriculture in developed economies rests on its theorized positive environmental effects (on biodiversity, input-output balances, and soil and water resources), high quality products (lower risk of contamination with pesticides), and comparable income generated which establish it as a clear profitable alternative for the latter (Haring *et al.*, 2001). In many developing countries on the other hand, organic agriculture has been promoted by NGOs as an appropriate technology for small scale farmers, emphasizing its low use of inputs, its independence from agro-business, its care for natural resources rather than market potential, its ability to increase incomes in the agriculture sector, and lately, its economic sustainability (UNEP-UNCTAD, 2008). The essence of justification for these activities is that much as organic agriculture is important for environmental conservation, it is also low cost (following from low external input use) and capable of generating comparable or even higher incomes to producers than conventional agriculture system.

The importance of taking into account specific market, ecological and institutional situations when implementing or introducing organic principles in an area is recognized in the literature (LEISA, 2008; UNEP-UNCTAD, 2008). These have direct relevance to the relative values of the main variables like production costs, yield/output, incomes, and prices under different situations. These variables require independent assessment on a case by case basis if their values and interactions are to be captured for a particular organic farming implementing area.

This study attempts to assign values to the costs and benefits for farmers in the Tanzania spice industry in a bid not only to test empirically the extent to which those for certified organic standards in this sector correspond to those described for other sectors in the literature, but to also assess the justification for supporting organic agriculture over conventional practice. In view of these objectives therefore, the hypotheses in section 3.3.3 of this report have been tested. The results and their discussion are presented in turn.

4.4.2.1 Comparative Statistics for Socio-economic Variables

The comparative statistics reported below address two major socio-economic groups of independent variables namely, farmers' factor endowments (farm areas, plant population and distance of farm from homestead) and demographic variables (age of household head, level of education of household age, family size, and household labour capacity). The comparison is between certified organic and conventional production systems for black pepper and chilli. The variables in question are important because they have the status of potential confounding variables in the estimation of organic farming participation effect.

Farm Sizes

Farm size is discussed here under three headings; the total cultivated area, the area under the spice crop, and the number of spice plants.

(a) Total Cultivated Area

Total cultivated areas are statistically greater for organic than conventional farmers (Table 18). This apparently supports a hypothesis of positive selection by scheme owners[59], although it should be noted that in principle the coral rag is available for farming for all types of farmers in Unguja.

Table 18: Total cultivated area by type of farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. farmers n=130	Significance	Test of difference
		ha			
Black pepper	Average cultivated total black pepper + non-black pepper area	2.76	1.77	***	t-test
Chilli	Average cultivated total chilli + non-chilli area	0.90	0.69	***	t-test

Key: * = $p \geq 0.1$, *** = $p \geq 0.01$

(b) Area under Spice Crop

The spice area farmed by both black pepper and chilli farmers are less than a hectare in size irrespective of the type of farming practice (Table 19). Generally, areas under black pepper are bigger than those for chilli in Unguja for both organic and conventional farmers.

[59] Organic scheme operators would normally select farmers with farm plots of at least one acre in size.

Table 19: Land area under spice crop by type of farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. farmers n=130	Significance	Test of difference
		ha			
Black pepper	Average actual area under black pepper	0.98	0.41	***	t-test
Chilli	Average actual area under chilli	0.41	0.34	*	t-test

Key: * = $p \geq 0.1$, *** = $p \geq 0.01$

However, the difference in areas under spices between organic and conventional black pepper farmers is highly significant ($p \geq 0.01$). The difference between the two categories for chilli farmers in Unguja is also statistically significant ($p \geq 0.1$). Normally, organic companies have a threshold lower limit for spice areas for their registered farmers (usually 1 acreis equivalent to 0.4 ha), thus the observed position above was expected.

(c) Number of Spice Crop Plants

Plant population is factor of crop yield/output on a farm. It also shows the extent to which farmers adhere to recommended farming practice. In this study, as explained in section 3.3.7, this variable was even more important in the calculation and partitioning of some shared cost items (e.g. weeding, ploughing and harrowing) under intercropping situations.The spice plant population position for the two groups is in Table 20.

Plant numbers per hectare did not differ significantly between organic and conventional black pepper farmers reflecting further the close similarity between the two farming practices in Muheza. The difference in plant number per hectare was significant ($p \geq 0.05$ level) for Unguja chilli with conventional farmers owning more plants.

Table 20: Plant population of spice crop by type of farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. farmers n=130	Significance	Test of difference
		Number/ha			
Black pepper	Average number of black pepper plants per hectare	865.00	812.00	ns	t-value
Chilli	Average number of chilli plants per hectare	4 399.70	5 916.15	**	t-value

Key: ns = not significant, ** = $p \geq 0.05$

The observed plant population in the case of both crops was only around a half of the recommended rate (ZCCFSP, 1995). According to the latter's reports number CFS/1 & CFS/2 of 1995, the recommended spacing for black pepper is 2x3 metres with chilli having a range from 1x1.5 metres to 1.3 x 0.6 metres depending on soil condition. Arithmetically, these would compute to plant populations of 1 667 and 6,600 – 12 800 plants per hectare for black pepper and chilli respectively. However, given the wider spacing of 1x1.5 metres applied locally for chilli, the actual performance on the ground in terms of plants per hectare came close to 66.7 percent and 89.6 percent for organic and conventional chilli farmers respectively.

4.4.2.2 Average Distance of Farms from Homestead

The average distances of farm areas from homesteads for organic and conventional black pepper and chilli are shown in Table 21.

Table 21: Average distance of spice farms from homestead by type of farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. farmers n=130	Significance	Test of difference
		km			
Black pepper	Average distance of farms from homestead	1.87	1.40	**	t-test
Chilli	Average distance of farms from homestead	3.29	4.05	***	t-test

Key: ** = $p \geq 0.05$, *** = $p \geq 0.01$

The average distance from homestead of spice farm plots are statistically larger for organic black pepper than conventional crop. The average distance for conventional chilli plots is statistically larger than organic crop. The main relevance of distance for organic black pepper crop is to minimize the chances of contamination with household waste (dry cells, plastic materials, and poultry excreta) thus plots located far away from homestead are preferred. Chilli farms are normally far removed from homesteads so the only concern for organic crop is to economize on the transport and marketing costs by registering nearer plots.

Demographic factors

Results in relation to demographic variables are reported under five sub-headings namely, gender of household head, age of household head, level of education of household head, total household size, and household labour capacity.

(i) Gender of household head

Female respondents made up 14.8 and 20.8 percent of the overall organic and conventional farmer samples respectively. This reflects the nature of land ownership in Tanzania where traditional land titles are always passed down to sons rather than to daughters. Rural women thus in most cases do not have access to land ownership except in situations of inheritance from a spouse or private purchase. Moreover, 16 of the female respondents out of 45 in all were farming on behalf of a male head of household (Table 22).

It is important at this stage to note a difference in land availability between the mainland Tanzania area where black pepper is farmed and the area of Unguja where chilli is farmed. Chilli, especially in Kijini ward, is grown on the coral rag (b*ayani)* terrain which is publicly owned and is thus accessible to any interested farmer.

Table 22: Distribution of respondents by gender of household head within villages

Farming practice	Gender of household head	Name of village				
		Tongwe n=52	Kwamhosi n=40	Bombani n=40	Kijini n=60	Gamba n=60
		% of respondents				
Certified organic	Male	95.50	80.00	100.00	90.30	91.80
	Female	4.50	20.00	0.00	9.70	8.20
	Total	100.00	100.00	100.00	100.00	100.00
Conventional	Male	93.30	80.00	96.80	60.00	93.10
	Female	6.70	20.00	3.20	40.00	6.90
	Total	100.00	100.00	100.00	100.00	100.00

As a result, around half of all farmers interviewed in this ward were women. In Gamba village on the other hand, chilli production takes place both on the coral rag (locally known as m*wambani*) area and on arable land. The latter is inherited along family lines, and thus participation in ownership by females in this ward is more limited.

(ii) Age of Household Head

The average ages of household heads for organic and conventional black pepper and chilli farmers do not differ statistically (Table 23).

Table 23: Mean age of household head by type of farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. farmers n=130	Significance	Test of difference
		Years			
Black pepper	Mean age of household head	55.89	52.08	ns	t-test
Chilli	Mean age of household head	45.08	44.16	ns	t-test

Key: ns = not significant

(iii) Education Level of Household Head

The educational level of black pepper farmers in Muheza is generally higher than for chilli farmers in Unguja. This is shown in Table 24 where it is reported that over 50 percent of all chilli farmers lack formal education whereas less than 5 percent of all black pepper farmers have this status. Differences in educational level between organic and conventional chilli farmers are statistically significant but non-significant between organic and conventional black pepper farmers. Interestingly however, it is conventional chilli farmers who are more educated than organic chilli farmers.

Table 24: Education level of household head by farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. farmers n=130	Significance	Test of difference
		Percentage			
Black pepper	Black pepper farmers with no formal education	4.9	1.4	ns	Chi^2
	Black pepper farmers with adult education	1.6	1.4		
	Black pepper farmers with primary education	85.2	90.1		
	Black pepper farmers with secondary education	8.2	7.0		
Chilli	Chilli farmers with no formal education	76.7	50.8	***	Chi^2
	Chilli farmers with adult education	15.0	11.9		
	Chilli farmers with primary education	6.7	32.2		
	Chilli farmers with secondary education	1.7	5.1		

Key: Key: ns = not significant, *** = $p \geq 0.01$

(iv) Household Size

Organic farmers have statistically larger household sizes than their counterparts for both black pepper and chilli (Table 25). The average household sizes for all black pepper and chilli farmers are also well above their respective district averages. According to 2002 population and housing census, the district household size averages stand at 4.5 and 4.9 persons for Muheza and North Unguja 'A' respectively (URT, 2003).

Table 25: Average household size by type of farming practice

Crop	Exact description of indicator	Number of family members		Significance	Test of difference
		Organic farmers n=122	Convent. farmers n=130		
Black pepper	Mean family size	6.00	5.00	***	t-test
Chilli	Mean family size	8.00	6.00	***	t-test

Key: ns = not significant, *** = $p \geq 0.01$

(v) Household Adult Labour Capacity

Data on household size was collected as a basis for calculating household adult labour capacity (operationalized as household members between 18 – 50 yrs). On the basis of this, Table 26 reports that adult labour force capacity does not differ statistically between organic and conventional black pepper producing households.

The difference is however significant between organic and conventional chilli producing households, with conventional farmers having greater access to farm labour. This in part explains the better performance of conventional chilli farmers as compared to their counterpart organic chilli farmers in Unguja.

Table 26: Household adult labour capacity by farming practice

Crop	Exact description of indicator	Number of household members		Significance	Test of difference
		Organic farmers n=122	Convent. farmers n=130		
Black pepper	Mean number of household members aged between 18-50 years	1.98	1.89	ns	t-test
Chilli	Mean number of household members aged between 18-50 years	3.54	4.81	***	t-test

Key: ns = not significant, *** = p ≥ 0.01

4.4.3 Costs, Farming Methods, and Benefits

4.4.3.1 Theoretical Basis for Organic Farming Costs and Benefits

As discussed earlier in chapters 2 and 3, food standard compliance may be associated with increase in production costs for producers (Mitchell, 2003; Antle, 1999; Jensen *et al.*, 1998, Ollinger and Mueller, 2003). This is a result of compliance costs associated with putting in place new infrastructure, changing farming or post-harvest practice as required under the standard in question as well as the costs of conformity assessment. In some cases however adoption of a standard could entail stopping the use of a costly input in favour of a cheaper alternative, which will result in reduction of production costs (Gogoe, 2003).

The discussion of costs and benefits of standard compliance in this study aims at understanding the specifications in this pattern relating to the Tanzanian spice sector and the certified organic standard. In the latter context, conforming farmers are normally assumed to incur a cost related to yield loss which is associated with stopping the use of fertilizers, insecticides, and pesticides - hence the need for a premium price to make conformity economic (Mitchell, 2003). This is the case where the conversion is from an 'industrial' type of conventional production to a certified organic system.

However, black pepper and chilli farmers in Muheza and Unguja North 'A' districts respectively do not and have never used chemical fertilizers and agro-chemicals on their farms. Yield losses should not therefore arise from conversion. Instead, the farmers may become beneficiaries of improved production techniques if tailored extension services are offered by contracting organic export companies. Hence, changes in yield may therefore occur as a benefit rather than as a loss.

Furthermore, the justification for premium prices for organics is also based on the assumption that organic food products are associated with higher production (mainly labour) costs. Producers are thus entitled to premium prices to cover for these extra costs, provided that consumers are willing to pay extra for the products (Dimitri and Oberholtzer, 2005). On the other hand Parsons (2004) observed that premium prices for fresh vegetables are not always guaranteed for Canadian producers. Erosion of premium prices for organic spices in Tanzania is also currently been claimed by producers. Although as is shown elsewhere, local factors are mainly responsible for this, it is clear that in general persistence of premium prices for organics will depend on changes in supply and demand. If supply grows faster than demand then premium prices will decline or disappear (Dimitri and Oberholtzer, 2005). The study's hypotheses in sections 3.3.3 and 4.4.1 are therefore based and justified on the theoretical facts discussed above.

4.4.3.2 Farming Methods

A description of the tailored extension services that are provided by the schemes is given in section 3.3.2.5 of this report. Notwithstanding these services, certified organic and conventional farmers in the study area generally practice more or less similar cultivation methods for the respective spice crops. Evidence from the author's survey shows that, almost all farmers in the study area do not apply manure, mulch, fertilizer, pesticides, agro-chemicals or irrigation in spice farming (Table 27)[60]. This observation suggests that spice production in the area is 'organic- by- default' for both organic and conventional farmers.

Organic contracts require farmers to refrain from seed-bed burning in clearing fields during land preparation. In practice, this provision is violated by most chilli farmers cultivating the coral rag area. The rocky terrain leaves a very restricted economic option for farmers to clear their plots otherwise[61]. Moreover, farmers for both crops also do not make compost for fertilizing the farms. The farm areas are however well endowed with cover from flora that provides plenty of plant residues which are a rich source of nutrients on the fields. The use of farm yard manure is non-existent due to partly its scarcity in Unguja and partly due to restrictions on its use in the areas of relative abundance like

[60] This has been a longstanding trend and not only for 2005/06 season.

[61] Only about 21 percent of organic chilli farmers used hand hoe to clear farm plots during 2005/06 season. Normally, hand hoe clearing is done through hired labour.

Muheza. The use of farm yard manure from drug-treated livestock is prohibited in the organic schemes.

Farmers in the study area are yet to appreciate the inherent difference between organic and conventional spice farming or the possible benefits of improved farming methods. This was underlined by conventional farmers' unwillingness to join the schemes. About 21 percent (14 cases out of 67) and over 63 percent (44 cases out of 69) of conventional black pepper and chilli farmers respectively were not interested in joining existing schemes for various reasons.

Table 27: Cultivation methods by crop type and farming practice

Crop	Exact description of indicator	Number of farmers		Significance	Test of difference
		Organic farmers n=122	Convent. farmers n=130		
Black pepper	Used farm yard manure in 2005/2006	2	0	-	-
Chilli	Used farm yard manure in 2005/06	0	0	-	-
Black pepper	Used fertilizer in 2005/06	0	0	-	-
Chilli	Used fertilizer in 2005/06	0	0	-	-
Black pepper	Used mulching material in 2005/06	1	0	-	-
Chilli	Used mulching material in 2005/06	0	1	-	-
Black pepper	Used irrigation in 2005/06	0	0	-	-
Chilli	Used irrigation in 2005/06	0	0	-	-
Black pepper	Used pesticides in 2005/06	0	0	-	-
Chilli	Used pesticides in 2005/06	0	0	-	-
Black pepper	Land clearing[62] by hoe / pick-axe	1	1	-	-
Chilli	Land clearing by hoe / pick-axe	13	0	-	-
Black pepper	Post-harvest processing (drying)	38	54		
Chilli	Post-harvest processing (drying)	61	59	-	-

[62] Use of fire to clear farms is uncommon in the black pepper producing areas in Muheza. However, the activity was carried out by very few black pepper farmers in the 2005/06 season (see section 2.4).

The major reason given by black pepper farmers is the late season buying of the produce by the organic companies with no appreciable price difference from that for the conventional crop.

Late buying is claimed by black pepper producers to impose extra costs as it leads to late harvesting which always calls for a night watchman on the farm since the crop becomes more prone to theft as season progresses, especially after much of the conventional crop has been sold. A lack of information on organic agriculture was also mentioned as a reason deterring conversion (37 out of 90 black pepper farmers reported this). Chilli farmers complained about the unfavourable market situation which manifests itself in uncompetitive prices alongside high production and transport costs, and unreliable buying of produce by the companies i.e. lack of a guaranteed buyer/market and perceived lack of additional benefits from participation.

4.4.3.3 Variable Costs

The production costs incurred for individual farming activities between organic and conventional black pepper farmers do not differ statistically, as is shown in Table 28. This position underscores the close similarity that exists in Africa (see sections 2.6.4, 3.3.2.3 and 3.3.2.7 of this report) between certified organic and organic-by-default (traditional) agricultural production systems. It follows therefore that the changes in production methods in this 'upgrading' are minor when compared to a situation where an industrial conventional production system is being converted to a certified organic one (Table 27 further attests to this).

However total variable costs per hectare incurred by organic chilli farmers are significantly higher than those incurred by conventional producers. This is attributed to increased use of labour in harvesting (which difference is statistically significant at 11.5%) coupled with higher expenditure on ploughing (statistical significance at 10%). The total variable cost for black pepper producers (just as is the case for individual cost items reported above) do not differ statistically between organic and conventional farmers.

The magnitude of each labour cost item in Table 28 was lower than expected because almost all farmers augment hired with family labour[63] which is not costed here. Family labour was excluded from the analysis due to the following reasons:

(i) Unreliability of subjects' recollections about household labour expenditure,

(ii) Problems of applying valid costings to individual labour effort when labour is purchased conventionally in terms of remuneration for tasks, irrespective of how many individuals participate,

(iii) Problem of applying valid costings to supervision, and

(iv) Lack of alternative employment for family labour besides farming in these areas.

In view of this exclusion, all farm operations that were wholly carried out using family labour during the 2005/06 season register zero cost in Table 28 e.g. post-handling costs on chilli. Others were just not incurred e.g. ploughing cost on black pepper fields, purchase of planting materials by chilli farmers, purchase of agro-chemicals, and input transportation costs to both black pepper and chilli farmers (see section 3.3.7 for details). Stake tree and spice crop pruning costs are not applicable to chilli. The other intriguing observation of these results are the seemingly wide dispersions of some variables between the two groups which do not result in significant differences e.g. ploughing cost on chilli, harvesting cost on chilli and post-harvest handling costs on black pepper.

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[63]If family labour were to be valued at the same rate as hired labour, then the position of the itemized variable costs in Table 25 would change and assume the position in Annex 13 and 14.

This is accounted for by the differences in the observed cases for each particular variable (as'n' influencies the standard error of the difference which is the numerator in the t-value formula). For instance, the comparison of post-handling costs on black pepper involved 12 and 22 observed cases for organic and conventional black pepper groups respectively.

Table 28: Itemized variable costs for black pepper and chilli by type of farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. Farmers n=130	Significance	Test of difference
		Tsh/ha			
Black pepper	Ploughing cost	0.00	0.00	-	-
Chilli	Ploughing cost	7 182.30	680.30	*	t-test
Black pepper	Planting material purchases	442.31	437.18	ns	t-test
Chilli	Planting material purchases	0.00	0.00	-	-
Black pepper	Planting cost	42.67	139.15	ns	t-test
Chilli	Planting cost	1 700.66	753.56	ns	t-test
Black pepper	Weeding cost	7 795.71	7 361.35	ns	t-test
Chilli	Weeding cost	2 375.25	1 045.98	ns	t-test
Black pepper	Spice crop pruning cost	418.42	1 113.24	ns	t-test
Chilli	Spice crop pruning	-	-	-	-
Black pepper	Stake tree pruning cost	12 642.82	14 254.68	ns	t-test
Chilli	Stake tree pruning cost	-	-	-	-
Black pepper	Harvesting cost	13 959.71	10 489.96	ns	t-test
Chilli	Harvesting cost	30 503.83	11 303.39	ns	t-test
Black pepper	Post-harvest handling cost	7 216.99	11 277.35	ns	t-test
Chilli	Post-harvest handling cost	0.00	0.00	-	-
Black pepper	Transport cost to storage and market	5 340.82	3 657.47	ns	t-test
Chilli	Transport cost to storage and market	202.46	0.00	-	-
Black pepper	Input transportation cost	0.00	0.00	-	-
Chilli	Input transportation cost	0.00	0.00	-	-
Black pepper	Watchman expenses	506.15	3 258.54	ns	t-test
Chilli	Watchman expenses	0.00	0.00	-	-
Black pepper	Agro-chemicals cost (pesticides + fertilizers)	0.00	0.00	-	-
Chilli	Agro-chemicals cost (pesticides + fertilizers)	0.00	0.00	0.00	-
Black pepper	Total variable cost	47 923.28	51 551.74	ns	t-test
Chilli	Total Variable cost	41 964.49	13 783.23	**	t-test

Key: ns = not significant, * = $p \geq 0.1$, ** = $p \geq 0.05$

Ploughing cost on chilli likewise involved 10 and 3 observed organic and conventional cases respectively. The less frequent observations are also likely to register very small means as the value is spread over a bigger sample size. This is the case with the watchman cost to black pepper farmers in Muheza (Table 28).

4.4.3.4 Farm Investment Costs

The types and magnitude of farm investment costs incurred by farmers are diverse ranging from farm tools, post-harvest handling materials to farm structures as shown in Table 29 (see also section 3.3.2.8 for land acquisition details). It is again observed that, generally, the involved costs do not statistically differ between organic and conventional black pepper farmers. Similarity in the level of investment costs between the two categories further underlines the previous observations of similarity between the two production systems.

However, farm equipment costs (see section 3.4) and ladder- making costs differ statistically between organic and conventional chilli and black pepper farmers respectively. Moreover, rather unexpectedly, conventional farmers incur higher costs in both cases. By the same token, conventional chilli farmers report statistically higher total farm investments than organic chilli farmers. The case of chilli farmers is explained by the fact that most organic farmers are discontented with the dwindling performance of the scheme owner thus investing minimally into the crop. It seems to be just coincidental that more conventional black pepper farmers (27 cases as against 7 cases for organic farmers) incurred the cost for ladder making. Since ladders are freely loaned from one farmer to another, it is difficult to associate the observed statistical difference with any particular extra incentive toward ladder making within the conventional black pepper farmers' group.

Table 29: Farm investment costs by type of farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. Farmers n=130	Significance	Test of difference
		Tsh/ha			
Black pepper	Bagging material purchase cost	5 649.83	6 874.43	ns	t-test
Chilli	Bagging material purchase cost	7 640.40	5 505.17	ns	t-test
Black pepper	Drying mats and tarpaulins cost	8 605.86	10 101.50	ns	t-test
Chilli	Drying mats and tarpaulins cost	19 618.55	22 414.2	ns	t-test
Black pepper	Building cost for on-farm makeshift hut	0.00	0.00	-	-
Chilli	Building cost for on-farm makeshift hut	2 491.26	1 948.10	ns	t-test
Black pepper	Value of farm equipment (2005/06 season)	18 251.45	19 871.94	ns	t-test
Chilli	Value of farm equipment (2005/06 season)	17 231.96	28 474.22	***	t-test
Black pepper	Other production cost – ladder making	495.35	2 916.46	***	t-test
Chilli	Other production cost – ladder making	0.00	0.00	-	-
Black pepper	Total farm investment cost	33 002.49	39 764.31	ns	t-test
Chilli	Total farm investment cost	46 982.17	58 341.68	*	t-test

Key: ns = not significant, *** = $p \geq 0.01$, * = $p \geq 0.10$

4.4.3.5 Total Production Cost

Total production cost is the sum of all variable and non-recurrent costs incurred by farmers. Table 30 reports the total production cost for black pepper and chilli farmers during the 2005/06 season. Total production cost does not differ statistically between certified organic and conventional black pepper and chilli producers.

Table 30: Total production cost by type of farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. Farmers n=130	Significance	Test of difference
		Tsh/ha			
Black pepper	Total production cost	81 368.08	91 753.23	ns	t-test
Chilli	Total production cost	88 946.66	72 124.91	ns	t-test

Key: ns = not significant.

4.4.3.6 Producer Benefits

Benefits of certified organic farming for black pepper and chilli farmers are discussed below under four sub-headings. The sub-headings include, yield levels, realization of premium price, presence of a ready market, and farmers' revenues.

(i) Yield

As earlier discussed, in the circumstance of conversion from 'organic-by-default' system to certified organic system, farm output might be assumed to increase over time as a direct effect of improved and more sustainable farming techniques (especially from improved soil fertility)[64]. It is thus expected that organic farmers' yield per hectare would be higher than conventional farmers' in the respective areas (providing that there has been some extension in these schemes). This can be expected to quite directly relate to the length of establishment of the schemes.

A comparison of yield levels between organic and conventional farmers is given in Table 31. There is no significant difference in output per hectare between organic and conventional black pepper farmers in Muheza. The difference is however highly

[64] This is in relation to the fact that such conversion does not involve stopping the use of any external inputs that would then lead to a decrease in yield. The only thing is that soil fertility is improved immediately after conversion thus benefits of increased yield are likely to be realized soon. This is in sharp contrast t a situation where the conversion is from an industrial primary production system.

significant ($p \geq 0.01$) for chilli farmers in Unguja North 'A' with conventional farmers having higher yields. This is to do with the lessened investment in the organic farms following a failing scheme. The scheme owner's inability to guarantee expected benefits to farmers has been a disincentive for the latter to continue their serious engagement.

Table 31: Yield of spice crop by type of farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. Farmers n=130	Significance	Test of difference
		kg/ha			
Black pepper	Total dry weight equivalent yield per hectare	365.30	344.10	ns	t-test
Chilli	Total dry weight equivalent yield per hectare	597.90	763.20	***	t-test

Key: ns = not significant, *** = $p \geq 0.01$

According to the Zanzibar Cash Crop farming system Project (ZCCFSP) (Reports number CFS/1 & 2-1995), black pepper yield in Zanzibar is typically 0.5 kg – 4 kg dry weight per small and large black pepper vines respectively (equivalent to 833 – 6668 kg/ha respectively). Chilli yield is typically 400 – 700 kg dry weight produce per hectare (ZMALNR, 1995). The realized chilli yields (597.9 kg and 763.2 kg for organics and conventional crop respectively) approximated the anticipated yield range of 400-700 kg/ha above. Standard yield specification for black pepper in Muheza could not be established.

Organic chilli farmers enjoyed tailored extension service from the buyer from the early to at last late 1990s (especially during 1994 – 1999 period) when ZANGERM operations were in full swing. Recent years have seen growing uncertainty about the company's ability to buy the crop, as well as its ability to offer tailored extension to its registered farmers. This appears to have led to declining standards of husbandry for the crop (Plate 11) and a shift of farmers' attention to other crops. This is reflected in the observed yield level which is lower than that for conventional farmers. On the other hand, the latter have not had such shocks and have thus not only maintained their earlier traditional farming methods but arguably, have also capitalized on 'spill-overs' from extension that was provided during the heyday of the ZANGERM/EPOPA extension to organic farmers[65].

Moreover, there is no statistical evidence to suggest that longer periods of farmers' participation in the organic schemes have had a significant effect on yield for both black pepper and chilli farmers. Correlation results were not only insignificant but also in the reverse direction (Table 32). Loss of yield due to participation was however not expected given the nature of farming practice before and after conversion in these schemes as discussed under section 4.4.3.2..

Table 32: Correlation of yield level and organic participation

Crop	Exact description of indicator	n	Unit	Organic farmers n=122	Significance	Test of difference
Black pepper	Total dry weight equivalent yield per hectare * length of time participating in organic scheme	61	Correlation coefficient	-0.06	ns	Pearson correlation
Chilli	Total dry weight equivalent yield per hectare * length of time participating in organic scheme	59	Correlation coefficient	-0.16	ns	Pearson correlation

[65] This occurred through day-to-day farmer contacts whereby those who received extension could informally pass down the knowledge to their fellows.

Plate 11: Abandoned organic chilli farm at *Mwambani* area in Gamba ward

(ii) Premium Price

The overall average prices for all spice produce sold by organic and conventional farmers across farming practice and buyer type are given in Table 33.

Table 33: Descriptive statistics on prices for fresh and dried produce by type of spice crop

Crop	Exact description of indicator	Organic farmers n=122		Convent. farmers n=130	
		Mean (Tsh/kg)	Standard error	Mean (Tsh/kg	Standard error
Black pepper	Average price for fresh produce	242.94	7.61	238.81	17.60
Chilli	Average price for fresh produce	-	-	-	-
Black pepper	Average price for dried produce	1 140.38	35.52	1 174.16	39.94
Chilli	Average price for dried produce	2 000.00	0.00	1 965.79	13.45

Table 30 shows that, generally, fresh organic black pepper crop is better priced than conventional fresh produce. In contrast, dried conventional black pepper was better priced than dried organic crop. Organic dried chilli was also better priced than conventional crop.

However, disaggregating sales of certified produce from the general results above gives the following picture shown in Table 34.

Table 34: Disaggregated average producer prices for fresh and dried black pepper and chilli -2005/06 season

Crop	Exact description of indicator	Average producer price Tsh/kg		Significance	Test of difference
		Organic produce	Convent. produce		
Fresh black pepper	Average producer price received by organic farmers	242.94 (31)	-	-	-
Fresh chilli	Average producer price received by organic farmers	-	-	-	-
Dried black pepper	Average producer price received by organic farmers	1 145.65 (23)	1 100.00 (3)	ns	t-test
Dried chilli	Average producer price received by organic farmers	2 000.00 (59)	2 000.00 (15)	ns	t-test
Fresh black pepper	Average producer price received by conventional farmers	227.27 (11)	242.90 (31)	ns	t-test
Fresh chilli	Average producer price received by conventional farmers	-	-	-	-
Dried black pepper	Average producer price received by conventional farmers	1 240.00 (15)	1 154.00 (49)	ns	t-test
Dried chilli	Average producer price received by conventional farmers	1 894.74 (19)	1 989.47 (57)	***	t-test

Key: ns = not significant, *** = $p \geq 0.01$.

NB: Number of-cases for each observation is shown in the parentheses. The difference in the number of cases is a result of farmers' buyer preference. Normally farmers would sell to more than one buyer in a season.

Black pepper and chilli farmers sold their fresh and dried produce into both organic and conventional supply chains (Table 34). Nonetheless, it was only organically-sold dried conventional chilli that had statistically lower price than the *de facto* conventional dried chilli. This could perhaps be in a situation of desperate selling where the expected buyer failed to show up. These findings seem to suggest that all organic black pepper and chilli farmers did not receive premium prices for their products.

However, a closer examination of the average minimum and maximum prices for both crops confirms otherwise (Table 35). Both mean maximum and minimum prices received for fresh organic black pepper were significantly higher ($p \geq 0.05$ level) than for fresh conventional produce. This suggests that organic black pepper farmers received a premium price for their fresh produce during the 2005/06 season depending on the timing of the sale. The mean maximum and minimum producer prices for the dried produce in the same season were not statistically different for both black pepper and chilli. Likewise, the two price extremes were not statistically different for both dried and fresh organic and conventional chilli. This suggests that chilli organic farmers did not receive premium prices[66] during the same reason.

The organic export companies preferred to buy fresh rather than dried black pepper and the observed pricing was in line with provision of incentives to this end. The exporters are in favour of handling all post-harvest processing activities to ensure full compliance to certified organic standard. The concern is that the standard is more likely compromised at this stage thus a need for exporters' intervention.

[66] Nonetheless organic standard seems to have had a substantial positive effect on producer price for chilli. This is a valid inference considering that the main conventional buyer (The Zanzibar State Trading Company – ZSTC) could only offer a price of Tsh 600/kg during the same season. ZSTC has an Asian market for conventional chilli.

Table 35: Producer prices for 2005/06 season by type of spice crop

Crop	Exact description of indicator	Organic farmers n=122	Convent. farmers n=130	Significance	Test of difference
		Tsh/kg			
Black pepper	Mean maximum producer price for fresh produce	258.33	235.00	**	t-test
Chilli	Mean maximum producer price for fresh produce	-	-	-	-
Black pepper	Mean maximum producer price for dried produce	1 321.25	1 307.27	ns	t-test
Chilli	Mean maximum producer price for dried produce	2 000.05	1 993.22	ns	t-test
Black pepper	Mean minimum producer price for fresh produce	215.00	185.45	**	t-test
Chilli	Mean minimum producer price for fresh produce	-	-	-	-
Black pepper	Mean minimum producer price for dried produce	998.72	940.74	ns	t-test
Chilli	Mean minimum producer price for dried produce	1 940.74	1 977.97	ns	t-test

Key: ns = not significant, ** = $p \geq 0.05$

The organic chilli crop did not command a premium during the 2005/06 season. The failure of the organic company to buy the crop meant that farmers were left with the option to sell to conventional buyers. These would not normally pay premium prices, especially when the bulk of the organic crop was now at their disposal too. It was reported that a rival organic company came in to buy from the farmers but then at a non-premium price.

(iii) Producer Prices and Buyer Categories

Dur ing the 2005/06 season, spices in the study area were bought by various categories of buyers. The types of buyer categories involved include conventional companies/firms, village traders, distant traders, and organic companies[67]. The profile of prices paid by each buyer category is shown in Table 36. According to this table, all buyer categories bought both conventional and organic farmers (i.e. there is produce leakage from both directions). The producer prices paid by the various buyer categories do not differ statistically between conventional and organic produce for both black pepper and chilli crops.

[67]See section 4.2.2 for more details on the various types of spice buyers in Tanzania.

Non-organic buyers do not intentionally buy organic produce for the purpose of re-selling it as organic. If organic produce is sold to conventional buyers, it will be re-sold as conventional product. In essence, these buyers operate in the conventional supply chain. On the other hand, if conventional produce is for some reason sold as organic, it will henceforth be resold as organic product. This is so because the only buyer here would the organic company which is solely selling its products in the organic chain. It follows therefore that premiums accruing to the organic company will not be passed on in this case as farmers can realize premium only when they sell to the company/buyer to which they are registered.

It is worth noting here that when the average producer price paid by different buyer categories is compared, the premium price for organic black pepper shown in Table 35 is again not discernible. This suggests that the timing of the sale is important for the realization of the premium. Prices generally tend to increase during the course of season so organic farmers who sell their fresh crop late in the season are likely to command a high price while those the majority selling mid season are likely to miss out on it. Conventional farmers get lower minimum prices than organic ones because the conventional season starts long before the organic one[68].

[68] One of the characteristic features of organic black pepper farmers is that they sell their crop from December through February and occasionally up to March when the crop is fully matured. Conventional farmers start their selling season in early September.Organic farmers are bound by their contract terms to start the season late when the crop is fully matured.

Table 36: Average producer prices for fresh and dried spice crop for 2005/06 season by buyer category

Crop	Exact description of indicator	Organic farmers n=122	Convent. Farmers n=130	Significance	Test of difference
		Tsh/kg			
Black pepper	Price paid by conventional company for dried produce	-	-	-	-
Chilli	Price paid by conventional company for dried produce	1 950.00	1 986.67	ns	t-test
Black pepper	Price paid by village traders for fresh produce	225.00	229.41	ns	t-test
Chilli	Price paid by village traders for fresh produce	-	-	-	-
Black pepper	Price paid by village traders for dry produce	1 268.75	1 104.76	ns	t-test
Chilli	Price paid by village traders for dry produce	1 500.00	-	-	-
Black pepper	Price paid by distant traders for fresh produce	366.66	221.53	ns	t-test
Chilli	Price paid by distant traders for fresh produce	-	-	-	-
Black pepper	Price paid by distant traders for dried produce	1 207.69	1 154.84	ns	t-test
Chilli	Price paid by distant traders for dried produce	1 912.50	1 972.73	ns	t-tes
Black pepper	Price paid by organic company for dried produce	1 190.48	1 225.00	ns	t-test
Chilli	Price paid by organic company for dried produce	2 000.00	2 000.00	ns	t-test
Black pepper	Price paid by organic company for fresh produce	248.00	233.33	ns	t-test
Chilli	Price paid by organic company for fresh produce	-	-	-	-

Key: ns = not significant.

(iv) Guaranteed market

One of the strongly emphasized benefits of certified organic agriculture is the presence of a ready market for the participating producers' crop. Under certified organic farming in tropical Africa (Bolwig *et al.*, 2008; Gibbon *et al.*, 2010), farmers and buyers are involved in a contractual arrangement (closely coordinated chain). The principal (trader) offers to buy the entire crop of the farmer under the scheme whereas the agent (farmer) offers to produce according to the specifications of the principal. The case with Tanzanian spices has unveiled a deviation from this general trend. Table 37 provides empirical evidence of leakage of output from the organic into the conventional chain and vice versa.

These observations show that while the great majority of organic and conventional production is segregated further down the supply chain, there is leakage in both directions. More organic black pepper than organic chilli was sold as conventional crop (about 10 percent of the total black pepper output) whilst more conventional chilli than conventional black pepper was sold as organic crop (about 11 per cent of chilli output).

Table 37: Output flows between organic and conventional supply chains

Crop	Total output (dry wt. equivalent)	Organic output sold as conventional	Conventional Output sold as organic	Share of organic crop sold as conventional	Share of conventional crop sold as organic
	kg	kg	kg	%	%
Black pepper	20 424.8 (130)	2 034.00 (30)	245.8 (10)	10.0	1.2
Chilli	27 401.0 (122)	745.0 (17)	3 030.0 (15)	2.7	11.1

NB: The number of cases for each variable is shown in the parentheses. The total output is for the entire conventional and organic samples.

The relatively low proportion of organic chilli sold as conventional crop, even in a situation where the scheme owner was unable to buy on his own account was due to entry of the competitor organic[69]buyer. Nonetheless, there was lack of competition from both further organic buyers and buyers of the organic chilli thus farmers were only price takers with very little room available for bargaining. Premium prices were thus unlikely in such a situation.

The circumstances of having an unreliable scheme owner coupled with absent competition for both organic and conventional buyers has since led to withdrawal of farmers not only from the scheme but from the crop. This in turn created supply shortages to the extent that some of the organic produce finally marketed actually came from conventional sources hence the observed overlapping supply chains. These observations make it difficult to concur with the assertion that organic farming, for Tanzania spices in this case, provides farmers with a guaranteed market for their produce[70].

(v) Net Revenue

The discussion here is based on farmer revenue from black pepper and chilli spice crops only (see section 3.5). Farmer revenues from their other enterprises are not considered. Net revenue for each category is taken as the difference between gross crop sales and total production cost. The position of net revenues is shown in Table 38.

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[69] Much of organic chilli produce was not bought by the principal company but its competitor organic company. Producers could not however realize the anticipated benefits (e.g. premium).

[70] The case with turmeric market in Unguja North 'A' district is even more serious.

Table 38: Net revenue from spice crop by farming practice

Crop	Exact description of indicator	Organic farmers n=122	Convent. Farmers n=130	Significance	Test of difference
		Tsh/ha			
Black pepper	Average net revenue	252 024.37	271 699.73	ns	t-test
Chilli	Average net revenue	1 064 694.55	1 446 548.31	***	t-test

Key: ns = not significant, *** = p ≥ 0.01

Net revenues do not differ statistically between organic and conventional black pepper farmers. They however do for chilli farmers, with conventional farmers holding the upper hand. The possible reasons for these unexpected results are specific to each production area. It is likely that most organic black pepper farmers are unlikely to be able to afford to retain their entire crop until the point of the season where it can be sold as organic. This is the reason for the relatively high proportion that is sold as conventional produce.

The poor performance of the troubled organic scheme owner in Unguja is likely to account for the lackluster performance of organic chilli farmers with regard to net revenue. The failure of M/s ZANGERM Enterprises to participate in the export market on its own account meant that the benefits of participation in the scheme could not be realized fully by farmers. The failing system is also likely to underlie the yield data reported above (Table 31) which is also a key factor in farmer revenue.

4.4.4 Overall discussion of cost-benefit quantification results

This overall discussion provides a summary and interpretation of the results in relation to the hypotheses tested in the study. The first part sums up the results on scheme selection issues, producer benefits and costs; and the second makes inferences in relation to the hypotheses tested, given the results.

4.4.4.1 General Observations on the Costs and Benefits of organic farming for spices

(a) Organic Scheme Participant Selection and Producer Costs and Benefits

(i) Factor endowments and demographics do not systematically differ between organic and conventional farmers. While there has been some preferred selection by organic scheme operators (e.g. in relation to spice plot distance from homestead), this does not seem to have concerned factor endowments. In other words this is to say that the results do not portray a clear evidence to suggest that selection of farmers into the organic schemes is biased towards some specific qualities. Whilst there are some evidence of a biased selection (as also portrayed in relation to farm size), such biases have not been shown to apply consistently/systematimally to the other factor endowment attributess like, for example, household adult labour capacity. This trend is also observed for the demographic factors such that it is not justified to hold that participating farmers in the schemes are systematically superior over the non-participants.

(ii) Family labour predominates in all farming activities from ploughing to post-harvest handling for both crops with only a handful of farmers using hired labour on selected activities. Furthermore the results show low investment levels for organic and conventional farmers.

(iii) Certified organic and conventional spice farmers incur more or less the same level of production costs per hectare. In spite of some isolated statistical differences on individual cost items, there is no credible evidence to suggest that certified organic farmers incur higher costs, or gain any cost advantage over conventional farmers as a direct or indirect effect of complying with the standard.

(iv) There has not been any significant positive effect on producer benefits induced by participation in the organic schemes, as attested by farmers' revenue results.

(b) Interpretation of the Results

Realization of benefits from participation in certified organic schemes depends on their incentive structures, and more directly on whether the buyer-farmer contract works or fails. Contract failure in the black pepper and chilli schemes was respectively caused by buyer collusion and lack of crop finance on the part of the scheme owner. The major issue however is the exclusion of any obligation for the scheme owner to pay a price premium from the organic farming contracts. This exclusion is in sharp contrast with Ugandan schemes reported in other recent research (see chapter 5), where the written contracts stated explicitly that the buyers would pay premium though the rate/amount is not specified.

The low level of adoption of recommended organic farming practices by participant farmers (see section 4.4.4.2) meant that little change had occurred to the original traditional production system. This reflected poorly functioning extension work within schemes (see section 3.3.2.5). Thus little change in yield levels, or increases in revenue as a result of increased yields, could be anticipated.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This chapter presents the study's conclusions on its three main objectives. It proceeds to make policy recommendation(s) that follow from each conclusion.

5.2 The Profile of theTanzanian Spice Industry

The sector profile study has uncovered some important details in respect of the Tanzanian spice industry which are worth considering in improving the subsector's performance. These findings include the following:

(i) Spice production is mostly smallholder-based with very few medium/large scale producers. This is a trend which is not expected to change in the short run given the special requirements in relation to soil types and climate for their growth, and the existing pattern of land ownership and the prevailing land pressure in the already producing areas. This observation suggests that improvement strategies for the sub-sector should largely target small producers, and that the potential of available geographical niches for production of particular spices (e.g. coral rag for Zanzibar chillies) should be fully exploited.

(ii) Since independence the government's involvement in the promotion of the industry has been minimal. This is reflected in the nature of the institutional environment in the sub-sector. The consequences of this include low productivity reflecting neglet by government-led extension and other services, and a complete lack of relevant data at the national level.

(iii) Two types of supply chain structure exist in the spice industry. Firstly, a closely coordinated chain that caters for certified organic production, and secondly a loosely coordinated chain for conventional produce. There are however some overlaps between the two, since there are produce leakages in both directions. The coordinated chain is destined for EU (high value market) market whereas its counterpart serves domestic, regional and Asian markets (low value markets).

(iv) Contract-based certified organic production in the sub-sector has been largely confined to operations coordinated by two Zanzibar-based spice export companies with foreign affiliations – M/s TAZOP Ltd and M/s ZANGERM Entreprises Ltd. Donor projects like the Swedish EPOPA, Belgium TRIAS and American DAIPESA have played a major role in supporting development of organic farming including in the spice industry.

(v) The major challenges in supplying available export markets relate to the requirements for meeting critical volumes (to enable economic shipping) and for safety standards compliance (for high value market). Backward and forward vertical coordination have been attempted in the sub-sector to address the two challenges [see sections 3.3.2.3 and 4.2.4(i)].

From the industry profile presented, it is apparent that a belated recognition has occurred by the Tanzanian government of spices export potential. This has been accompanied by some efforts towards promotion of these crops (see section 1.2). On the mainland, there have been campaigns to introduce high value vanilla and paprika in the spice producing districts. However, such production campaigns should go hand in hand with identification of reliable markets for the would-be new production to avoid frustrations and losses such as those suffered by paprika farmers in Muheza in the 2003/04 season.

In the Isles, donor recommendations dating from the 1990s to further promote chillies and turmeric have been shelved. This is a serious shortcoming especially for a monocrop economy like Zanzibar's. The coral rag area provides an environmental niche for chillies in Unguja (Zanzibar). Moreover, it is the only crop, even amongst all spices, that is suited to this type of terrain - which covers over half of the island.

Most spice exports in the non-organic chain go unrecorded not only due to absence of government monitoring but also because transactions are carried out informally. The absence of monitoring -even though this would be difficult- has arguably negative effects. Prospective investors may be attracted if the industry's potential could be demonstrated more clearly.

Turning to the formally-coordinated chain generally speaking, conformity with the volume and food safety/quality requirements of the EU market has been deficient (see sections 4.2.1(vi), 4.2.3 and 4.2.3.1). The findings point to a need for a stronger regulation in the area of compliance with safety/quality standards in the industry at the production and distribution levels.

District-level and village-level institutions should be able to enforce by-laws that would prohibit harvesting of immature crop. This should be accompanied by introducing an officially announced buying season start date. Arguably, the same institutions should ensure conformity to contracts between farmers and organic companies. The latter often approach farmers through village and district local government, meaning that the latter should be under an obligation to protect farmers' interests in event of contracts being broken. Moreover, by-laws that ensure proper implementation of contract farming agreements will curb the incessant problem of extra-contractual marketing. This will enhance exporters' ability to meet critical volume requirements. If this happens, more exporters will be encouraged to join in much to the advantage of farmers.

Finally, what farmers are saying is also important and should be carefully listened to. To brand farmer opinions as mere complaints with little content as has happened in the past will only exacerbate the industry's supply side problems. Spice farmers deserve protection from unscrupulous buyers just as it is happening now with cashew farmers in southern Tanzania. Ground / basic rules (both formal and informal) governing production, exchange and distribution are part of the institutional strengthening that is badly needed in the industry. Exploitative marketing should be discouraged by helping farmers to form associations and cooperatives to enhance their collective bargaining position.

There is a strong need to differentiate between control and regulation. The sub-sector should be properly regulated to safeguard interests of all stakeholders especially the vulnerable groups like farmers. Failure to enforce contracts is an institutional weakness and should be addressed as already discussed above.

5.3 Local Capacity for Standards Conformity Assessment on Spice Exports

It has been shown in this study that despite the existence of multi-functional testing facilities in Tanzania, local exporters of spices to the EU are not among the users of these facilities. Tests/certification are invariably carried out abroad or by foreign actors, usually through the assistance of exporters' sister/partner companies. This trend can be explained to be caused by the following:

(i) Delays in local service delivery due to inefficiencies in the procurement of necessary laboratory reference materials for various tests, or to laboratory equipment being unusable.[71]

(ii) Existence of testing facilities abroad which are more efficient and convenient to local exporters (as they are not made to pay for tests directly upfront and in some cases appear to pay only for dispatch of samples)[72].

(iii) Most surveyed laboratories are struggling to acquire SANAS accreditation. Others have only recently acquired it. However, since accreditation is given on a test by test basis, the recent achievements have not so far created significant benefits for the spices sub-sector. For instance, while the NFQCL laboratory is the only facility in the country that has acquired accreditation for *salmonella* testing due to the importance of the hazard for the Nile Perch industry, the laboratory is not only far removed from spices production and marketing sites, but is also - at least for the time being - specifically reserved for the Nile Perch sub-sector. Moreover, there is no laboratory in the country which is accredited to test for aflatoxins, pesticide residues, heavy metals, or artificial chemical dyes.

(iv) In the case of organic certification, TANCERT efforts to be accredited and be recognized as an international organic certification agency are far from being achieved. It is one thing to be IOAS accredited and quite another to gain recognition from the European Union.

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[71] Major breakdowns are frequent due to erratic power and water supply. Exorbitant repair and maintenance costs for laboratory equipments are also significant challenges for the national laboratories. According to the local laboratories, manufacturers/suppliers do not disclose all technical details in regard to laboratory equipment supplied. This necessitates that laboratories obtain technicians from source to fix and repair. This proves very expensive. Donour funded equipment is more prone to this problem as each financer normally has its own preferred suppliers, a situation which leads to a large number of diverse suppliers / manufacturers per laboratory.

[72] Efforts to obtain data on costs of testing in Europe proved unsuccessful.

According to the Tanzania's National Trade Policy (2003), the general approach in export promotion is to align local standards with those of the major importers. Local capacity for conformity assessment is important for Tanzania, both in relation to the potential reduction in turn-round time for exporters and the possibility for more detailed informal technical interaction between actors. A major challenge is better coordination between, and greater efficiency of, Tanzanian institutions. Another challenge is completing the necessary investments and gaining international accreditation.

Theoretically, meeting local standards should prepare operators for participation in international markets. However, the documented local standards are not enforced, either in the domestic market or in regional markets within Africa and in low value markets in Asia. It is only if an exporter wishes to export to the EU that he/she has to meet either local or international standards. Because exports to high value markets like the EU are still quite low, both enhanced conformity and improved conformity assessment for spices are distant prospects (except in the case of organic certification). The small number of exporters, the current *modus operandi* in production and marketing, and the demanding nature of conformity assessment techniques and accreditation requirements are not positive ingredients for investment in domestic conformity assessment, whether it is dedicated to spices or indeed if it is for agro-food exports in general. However, if all potential export industries that require such food safety assessment are factored in, such an endeavour could become feasible and economical.

Incomes in the developing Asian countries are increasing (Athukorala, 2003). These are the countries that form the major market for conventional spices from Tanzania. Since demand for food safety is a function of income levels (Mitchell, 2003), it is intuitively likely that these countries will also demand higher levels of food safety in the very near future. In this sense, safety-related investments in Tanzania also have a long term justification.

Organic certification is currently the most demanding type of food safety-related conformity that the Tanzanian spice industry engages with. Lack of international accreditation of the local certification body is making compliance costs high (see section 4.3.5.3). Again since TANCERT will certify for all export crops and the organic market is growing worldwide, there is a case for public support for its achievement not only of international accreditation but also subsequent efforts to secure practical recognition.

Formulation of a National Food Safety Policy that defines the role of the private and public sectors as well as each individual institution would go a long way towards harnessing the currently scattered efforts for building a stronger national conformity assessment capacity in Tanzania. A single institutional ownership of all public testing laboratories would as a first step enhance a common approach to building capacity. This is however unlikely given the different purposes for which the laboratories are/were meant to serve. A second stage of such changes could be encouragement of private participation in testing laboratories. This also can only be considered as a likely long term solution as the current situation (in terms of demand for such services to make the venture economic) can hardly attract private investment. In short, consolidating conformity assessment capacity efforts in the country is a huge challenge that requires extensive consultations and further comprehensive studies. This study has at least uncovered the inherent challenges to attaining it as a stimulant for further studies to that end[73].

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[73]Suggestion from some stakeholders is to establish a brand new 'national food safety laboratory'. Further studies will inform on the viability of the idea.

5.4 Costs and Benefits of Organic Farming for Spices

The findings of this part of the study are entirely different from those obtained by Bolwig, Gibbon and Jones (2009) and Gibbon, Jones and Lin (2008) on coffee and cocoa and vanilla schemes in Uganda especially as regards both changes in farmer revenue and adoption of organic farming practices. The authors cited report positive effect from scheme participation (and also, more modestly, from adoption of organic practices) on farmer revenue. They go on to attribute their finding mainly to the incentive effects of price predictable premiums. However, the organic farmers in the Tanzanian organic spice schemes reported in this thesis either failed completely to obtain premiums or received them in an unsystematic way. Produce price, which is arguably the most contentious issue in farming, is not among the provisions that are negotiated *ex-ante* in these contracts. The organic scheme owners are exploiting the legislation vacuum on contract farming that exists in the country at the moment at the expense of participating smallholder farmers.

Furthermore, the chilli scheme suffered from contract failure, with the buyer unable to purchase the organic crop on his own account. The Ugandan schemes reported above are owned by multinational trading companies with sound financial bases to handle large volumes of the crops. Being multinationals, they have diversified sources of crop finance to meet their produce buying obligations. The Tanzania schemes are owned by small private export-companies. They are thus highly susceptible to shocks even relatively small ones, emanating from price changes. It seems from this observation that both a guaranteed market and a premium would more likely be guaranteed to Tanzania scheme producers if larger established companies were involved. The major concern is whether current level of production will be able to attract larger trading companies. In the current situation, a new large company would be compelled either to expand its product base by including other crops (both spices and non-spices) in its export offering, or register considerably more farmers into the schemes to make export from Tanzania commercially interesting.

Spices are high value non-traditional export crops that are different from the bulky traditional export crops like coffee and cocoa in their husbandry, post-harvest processing and marketing. They require some specialized training for farmers (regardless of whether they are organic or conventional) for which there is no capacity currently. In the absence of properly trained personnel in the government-led extension agency, organic spice scheme owners would be required to themselves train extension workers. Hence, if the goal of diversifying Tanzanian exports into high value products like spices (which have relatively stable prices due to growing global demand and low substitutability) is taken seriously, either attracting larger companies with the resources to finance extension, or more government involvement in improving the situation looks imperative. More government involvement in the industry will enhance solving most critical institutional problems facing the industry currently. For instance, recategorizing spices as one of the priority non-traditional export crop (as a government policy measure) will enhance their integration into the mainstream national agriculture development plan. Such integration will go a long way to solving the incessant problems of poor extension services and informality of operations in the industry. Moreover, a further government action to legislate on contract farming in the country will be a rescue to all outgrower smallholder farmers in the country, organic spice farmers inclusive. The government is also the major player in building local conformity assessment capacity (in terms of ivestments in laboratories) though such a move will not only benefit the spice industry but also many other agro-allied industries.

The black pepper and chilli organic schemes were able to attract many farmers during the early days of EPOPA support (mid 1990s to early 2000s) as at this time there was an assured produce market and premiums. Later years (especially from 2003 -2006) were characterized by decreasing EPOPA support and have seen both declining performance by the export companies (as well as the apparent disappearance of some competitors from the scene) and increased numbers of farmers dropping out of the schemes. This raises the question of the sustainability of these schemes in future. The Ugandan schemes referred to above now manage to operate successfully without donor support and thus provide an important lesson for Tanzanian schemes to learn from.

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ANNEXES

Annex 1: EU-MRLs and Codex CXLs for some selected product/pesticide combinations

Product	Pesticide	Codex CXL	EU-MRL	Remarks (situation before 2000/42/EC
Bananas	Fenbutatinoxide	10	3	Open situation**
	Diazinon	-	0.02*	The EU-MRL was 0.5 mg/kg
Citrus fruit	Thiabendazole	10	5	The EU-MRL was 6 mg/kg
	Mecarbam	2	0.05*	The EU-MRL was 2 mg/kg
	Triazofos	-	0.02*	Open position
Grapes	Ethephon	1	0.05*	Open position
	Methidathion	1	0.5	The EU-MRL was 0.5 mg/kg
	Aldicarb	0.2	0.05*	The EU-MRL was already on the LOD
	Diazinon	-	0.02*	The EU-MRL was 0.5 mg/kg
	Chloormequat	-	0.05*	The EU-MRL was 1 mg/kg
	Amitraz	-	0.05*	Open position
Pome fruit	Triazofos	0.2	0.02*	Open position
(apple + pear	Thiabendazole	10	5	The EU-MRL was 5 mg/kg
	Cyhalothrin	0.2	0.1	The EU-MRL was 0.1 mg/kg
	Cyfluthrin	0.5	0.2	The EU-MRL was 0.2 mg/kg
	Diazinon	2 (0.3)	0.3	The EU-MRL was 0.5 mg/kg
	Methidathion	0.5	0.3	The EU-MRL was 0.3 mg/kg
	Dicofol	-	0.02*	The EU-MRL was 1 mg/kg
Pineapple	Diazinon	0.1	0.02*	The EU-MRL was already on LOD
	Ethephon	2	0.5 (2)	Open position
	Disulfoton	0.1	0.02*	Open position
	Carbendazim	5	0.1*	The EU-MRL was already on LOD
Rice	Endosulfan	0.1	0.05*	The EU-MRL was already on LOD
	Carbofuran	0.2	0.1*	Open position
	Diazinon	-	0.02*	The EU-MRL was 0.05 mg/kg
Beans	Diazinon	0.2	0.02*	The EU-MRL was 0.5 mg/kg
Tomatoes	Cyfluthrin	0.5	0.05*	The EU-MRL was 0.05 mg/kg
Maize	Triazofos	-	0.02*	Open position

*LOD (Limit of determination). A default limit of 0.01mg/kg is now applicable following 396/2005/EC.

** The MRL for the pesticide/product combination was not EU-harmonized before Directive 2000/42/EC came into force. National legislation of individual EU member states was applicable.

Source: Buurma et al., 2001

Annex 2: Question Quide for Preliminary Surveys

A. Traders/exporters

1. What main spice commodity are you trading?
2. Where do you sell the commodities (destination)?
3. How do you contact/communicate with the importers of the commodities?
4. What kind of contractual arrangements exist between exporters/traders and importers?
5. How do you ensure that you meet the contractual arrangements with the importers? For volume, time, and standard.
6. From where do you acquire the commodities that you are exporting?
7. How do you contact/communicate with the suppliers of the commodities? (Source of information and flow of information).
8. What kind of contractual arrangements exist between exporters/traders and producers?
9. How do you ensure that your suppliers meet the contractual arrangements for volume, time, and standard/quality?
10. What are the main constraints to spice export trade? (Prioritize).

B. Producers

1. What main spice commodities do you produce?
2. Where do you sell the commodities (destination)?
3. How do you contact/communicate with the traders of the commodities?
4. What kind of contractual arrangements exist between you and traders in terms of volume, time, and standard / quality?
5. How do you ensure that you meet the contractual arrangements for volume, time, and standard/quality?
6. What kind of costs do you incur to ensure you meet the required standards?
7. What kind of benefits do you get after ensuring that you meet the required standards?
8. From where do you acquire the knowledge with regard to standards for the products that you are producing?
9. How do you contact/communicate with the traders of the commodities? (Source of information and flow of information)
10. What are the main constraints to spice export trade? (Prioritize)

C. Institutions

1. Name of the institution
2. How is the spice export trade organized?
3. What regulations that exporters abide by in spice exportation?
4. What kind of enforcement mechanism exists?
5. Is there anything that the institution does that result into an extra benefit to spice exporters?
6. Is there anything that the institution does that result into an extra cost to spice exporters?
7. What other institutions that you know are involved in spice industry?

Annex 3: Smallholder Farmers' Questionnaire

SOKOINE UNIVERSITY OF AGRICULTURE & DANISH INSTITUTE FOR INTERNATIONAL STUDIES STANDARDS AND AGRO-FOOD EXPORTS (SAFE PROJECT)

SPICES SUB-PROJECT

ECONOMICS OF COMPLIANCE WITH INTERNATIONAL FOOD SAFETY STANDARDS IN TANZANIA: THE CASE OF ORGANIC SPICES

Smallholder farmers' questionnaire

A. General information

A1. Identification variables

Item	Response
Date of interview	
Name of interviewer	
District	
Village	
Name of respondent	
Gender of respondent; 1= Male 2= Female	
Relationship to household head (if not the respondent);	
1= spouse 2= son/daughter	
Type of spice crop: 1= black pepper 2= Chilli	
Farming practice: 1= Certified organic 2= Conventional	
Questionnaire number	

A2. Besides black pepper/chilli, what other three major crops do you grow?

....

....

A3. Rank all the crops you grow in order of amount of income generated

....

....

B. Household identification variables

B1. Gender of household head ....; 1= Male 2= Female

B2. Age of household head.......................... years

B3. Level of education of household head

1= None

2= Adult education

3= Primary education

4= Secondary education

5= Others (specify)..

B4. Household composition

Number of people in the household:

Age category (yrs)	Number of family members
Below 18	
Between 18 and 50	
Over 50	

C. Household Resources

Resources	Unit	Quantity

C1. Indicate land resources owned by the household

Number of plots	Number	
Size of each plot	Acres	
Number of black pepper/chilli plots	Number	
Number of black pepper/chilli plants (all plots)		
Total area of land under black pepper/chilli and intercrops with black pepper/chilli	Acres	
Which crops is black pepper/chilli intercropped with?	Names	
Total area of land under other crops	Acres	
Total area of fallow land	Acres	

C2. Indicate number of livestock owned by household

Cattle	Number	

D. Land ownership status

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. Black pepper/chilli production costs in 2005/06 season (all plots)

E1. Labour costs

Activity	N of family members worked on the plots last week (Number)	Days spent (days)	Number of hours worked each day (labour hours/day)	Total hours worked (hrs)	Rate per labour hr (Tshs)	Total family labour value (Tshs)	Payment for Hired labour (Tsh)	Total labour cost (Tsh)
Land clearance								
Ploughing								
Harrowing								
Planting								
Weeding								
Mulching								
Manure application								
Fertilizer application								
Pruning/thinning								
Staking and training								
Pesticide application								
Harvesting								
Post harvest handling -dehusking -drying								
Watchperson expenses (on-farm)								
Other costs								

E2. Material costs

Type	Units purchased (number, quantity)	Purchase cost @ unit (Tsh)	Total purchase cost (Tshs)	Units hired (Number, quantity)	Hire cost @ unit (Tsh)	Total hire cost (Tsh)
Seedlings/cuttings						
Mulching material						
Manure						
Fertilizer						
Pesticides						
Input transport						
Bagging materials						
Drying mats/ tarpaulins						
Sprayers						
Wheelbarrows						
Harvesting ladder						
		Total materials cost				

F. Crop sales during 2005/06 season

F1. (a) State the form in which black pepper/chilli crop was sold to buyers

1. Dried whole form 2. Ground/processed form 3. Fresh whole form

F1. (b) Why did you have to sell produce in the form indicated under F1(a) above?

1. Requirement by buyer 2. Easy to handle and transport 3. Fetch higher price

4. Others (specify)

....

....

F2. Sales of black pepper/chilli

Form	Unit (e.g. kg)	Number of units sold (kg)	Price per unit (Tsh)	Total value(Tsh)	Where was the crop sold? 1. Buying post 2. On-farm 3. Village market 4. urban market 5.Others (speify)	Cost of transport to home and/or selling centre (TSh)	Net sales (Tsh)
Fresh (Organic)							
Dried (Organic)							
Fresh (Conventional)							
Dried (Conventional)							

F3. Other revenue

Source	Unit (e.g.. kg)	Number of units sold (kg)	Price per unit (Tsh)	Total value(Tsh)	Cost of transport (TSh)	Net sales (Tsh)
Sale of Cuttings/ seedlings						
Commission on hired processing services						

F4. What other crops did you sell during 2005/06 season?

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

G. Farm equipments and implements purchased during last 12 months

Type of equipment/implement	Number of units	Purchase cost @ unit (Tsh)	Total cost (Tsh)
Sprayer(s)			
Plough			
Tractor			
Wheelbarrow			
Hoes			
Spades			
Slashers			
Machettes			
Knives			
Other ………..			

H. Miscellaneous questions

H1. Planting materials	
What is your source of planting materials? 1= From own nursery/plantation 2= purchased from nursery farmers 3= Supplied by crop buyer	
H2. Farmer associations information	
H2 (a). Is anyone in the household a member of a SACCOS? 1= Yes 2= No	
H2 (b). Does anyone in the household belong to association or farmers' cooperative? 1= Yes 2= No	
H2 (c) What was spent on fees/subscriptions to associations in 2006? (Tshs)	
H3. Credit access information	
H3 (a). Have you ever (or anyone in the household) received credit from a bank or any other source last 12 months? 1= Yes 2= No	
H3 (b). If 'YES', indicate credit amount (Sh):	
H3 (c). Source of credit:	
H3 (d). If in kind what did you get?	
H3 (e). If in kind what was the value of credit? (Sh)…………………………………….	
H3 (f). Purpose of credit: to purchase; 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)…………………………………………….	
H3 (g). Interest paid in 2006 (Tsh)	
H5. Farmer training information	
H5 (a). Has any member of the household received farm training during 2005/06 season? 1= yes 2= No	
H5 (b). Who was this received from?	

H5 (c). How long did the course last?..days	
H5 (d). What type of training did you get? 1= Pest and disease control 2= Post-harvest processing 3= General training 4= other (specify).....	
H5 (e). How often are you visited by an extension worker? 1= Once per week 2= Once per month 3= Every time I demand his/her services 4= Never visited	
H6. Certified organic farming information	
How long have you participated in organic farming for black pepper/ chilli? ....years	

I. What farming practices are recommended by the organic scheme and how often do you implement them?

Recommended practice	Implementation frequency 1. Always, 2. On opening a new farm, 3= never implemented, 4= other (specify)...

Annex 4: Checklist/Question Guide for Traders/Companies In-Depth Interviews

SOKOINE UNIVERSITY OF AGRICULTURE & DANISH INSTITUTE FOR INTERNATIONAL STUDIES STANDARDS AND AGRO-FOOD EXPORTS (SAFE PROJECT)

SPICES SUB-PROJECT

ECONOMICS OF COMPLIANCE WITH INTERNATIONAL FOOD SAFETY STANDARDS IN TANZANIA: THE CASE OF ORGANIC SPICES

Checklist/question guide for traders/companies in-depth interviews

Objective: The purpose of this survey is to improve our understanding of international food safety compliance costs that are borne by traders/exporters of black pepper/chilli in Tanzania, and, particularly, their impact on the supply chain organization in accessing international, regional, and local markets for spices.

Use of data: Data collected as part of this survey are for research purposes ONLY. Company/trader-level data will not be shared with non-research organizations. Only summary results will be included in published report.

A: General information

A1. Name of interviewee ________________ Position __________________

A2. Company/business name ____

A4. Date to start operation ____

A5. Area of operation ____

A6. In terms of black pepper/chilli, indicate type of company/business:

1= Organic

2= Conventional

3= Both organic & conventional

A7. Shareholding structure: 1. Local _____________% 2. Foreign _________%

B: Trading activities

B1. Indicate type of crops dealt in

Crop name	Source 1= Zanzibar 2= Tanga 3= Morogoro 4= Kigoma 4= Others (specify)______	Average volume handled per annum (tons)	Average value per annum (Tsh)	Average share of crop (by volume) to total purchases (%)	Destination market 1= European Union 2= United States 3= Japan 4= Other Asian markets 5= Regional markets 6= Local market 7= Other (specify)____	% applied to certified organic production
Chilli						
Black pepper						
Green pepper						
White pepper						
Ginger						
Cardamom						
Cinnamon						
Turmeric						
Nutmeg						
Clove						
Galgant						
Lemongrass						
Citrus peels						
Paprika						
Bay leaves						
Other 1______						
Other 2...............						
Other 3						

B2: In what form is black pepper/chilli traded?

Ground =1

Whole =2

Ground and whole =3

B3. Explain the reason behind your answer in B2 above____________________________________

____

____

B4. Indicate cropping season for black pepper/chilli? ___________to ________months

B5. Indicate maximum and minimum prices paid to farmers during 2005/06 season:

Maximum price (Tsh). ___________ Month _____________ Minimum price (Tsh).____________

Month___________

C. Contact with farmers

C1. How do you contact black pepper/chilli farmers in different locations?

Farmer location	Contact	Reason
Zanzibar		
Tanga		
Morogoro		
Kigoma		

Key for contact: 1=Physical visits by company staff

2= Contact through an agent

3=Direct contact through mobile telephone

4=Others (specify) ____________________

C2. What is the nature of relationship with black pepper/chilli farmers?

1=Contractual

2=Long term business ties

4=Open market purchases

5=Others (specify) ________

C3. If contractual relationship, what are the basic terms that are agreed onto between the parties?

____

____

____

C4. Why do you have a contract?

____

____

____

C5. What are procurement procedures for black pepper/chilli?

1=Collected at farm gate by special company transport under field representative's supervision

2=Brought by farmers into company collecting centres at the villages

3=Delivered by distant traders commissioned by company for collection of produce from villages

4= Open market purchases from independent traders

5= Bought from other companies

4=Others (specify) ______________

C6. What salient characteristic features do you look at before registering an organic black pepper/chilli farmer?

____

____

____

____

D: Contact with importers/ buyers

D1: What type of importer(s) do you sell to:

1. Shareholder/partner in exporting company
2. Independent trader/distributor
3. Independent processing company
4. Other (specify)...

D2. On what terms do the sales take place?

1. Internal company transaction
2. Cash
3. Consignment
4. Other (specify)...

D3. What assistance, if any, does the importer provide you with?

1. Crop finance
2. Investment capital
3. Technical assistance
4. Finance of farmer registration, certification, etc

E: Food safety standards in black pepper/chilli

(E1) Does your importer expect you to test for or otherwise assure conformity with any of the following standards?	*1= yes 2= No*	*(E2) If yes, how and where is this test performed?*
(a). Microbial contamination limits		
(b) Mould/aflatoxin contamination		
(c) Extraneous matter/filth levels		
(d) Pesticide residues limits		
(e) Heavy metal residues limits		
(f) Compliance to certified organic farming practices		
(g) Carrying out all post-harvest processing activities like drying, cleaning, transportation, and packaging		
(h) Monitoring farmers' activities on the field from planting to harvesting		
(i) Providing training and extension services to farmers		
(j)Subsidizing safety-related inputs and equipments to farmers		
(k) Meeting certification fees for farmers to indulge in organic farming ·		
(l) Testing produce for various unwanted hazards that make them unsafe		
(m) Proper moisture levels for the produce		
(n) Proper crop maturity before harvesting		
(o) Other (specify)		

E3. Are you required to send samples abroad? 1= Yes 2= No

E5. If yes in E3 above, indicate the following:

For which crops ____

Frequency of sending samples____________________________________

Are the reasons for sending samples explained to you? 1=Yes, 2=No

E6. What feedback, if any, do you receive from the tests

____

____

E7. (i) Is your export operation certified to any standard? 1= Yes 2= No

(ii) If so, to which standard ____________________________, by what certification agency?____

(iii) How much did this cost? ________________________________(Tshs) and who paid for this certification______________________________________

E8. Is there any relationship between organic certifying agency and destination market?

1=Yes

2=No

E9. If yes in E8 above, explain the type and nature of the relationship:

____

F. Costs of operation

F1. Fixed costs for post harvest processing

Asset/equipment	2003 (Tsh)	2004 (Tsh)	2005 (Tshs)	2006 (Tshs)	Annual depreciation rate	% to which equip./asset is used in organic production
Warehouse						
Office start-up costs						
Vehicle for crop transportation						
Motorcycles for field staff						
Bicycles for field staff						
Laboratory + equipment						
Sterilizer						
Mechanical washer, dryer and packaging machine						
Weighing scales						
Cutting machine						
Knives						
Pressure washer						
Vacuum sealer						
Needles						
Manual winnowers						
Electric dryers						
Rakes						
Masks						
Tarpaulins						
Computer for record keeping						
Communication equipment e.g. radio call						
Storage materials						
Interest for investment loans made to meet any of the one-off costs						

F2. Recurring operational costs

Notes: Final costs to be calculated on the basis of the share of chilli / black pepper in total purchases.

Cost item	2003 (Tsh)	2004 (Tsh)	2005 (Tsh)	2006 (Tsh)	% to which equip./asset is used for certified organic production
Office rent					
Warehouse rent					
Annual warehouse renovation costs to ensure segregated storage and handling					
Annual warehouse inspection fees					
Warehouse fumigation fees					
Black pepper/chilli fumigation costs					
Third party (foreign agency) certification fees					
Polypropylene bags purchases (specially marked sacks)					
Purchase of labels					
Purchase of marker pens					
Purchase of buckets					
Subsidy costs for planting materials to contract farmers					
Premium paid to farmers (Organic price-conventional price)					
Toll fees for hired laboratory services for testing pesticide residue, aflatoxins and heavy metal contamination limits					
Stationery + consumables for record keeping					
Training costs for farmers- transport, accommodation, allowances					
International organic trade fairs costs (bioFatch) - transport, accommodation, allowances					
Consultancy fees (annual salary for managing Director if no external consultants hired)					
Maintenance and fuel costs for vehicles					
Electricity and water rates					
Export process documentation costs					
Wages for field and warehouse staff					
Costs of communication to farmers and buyers					
Staff training					
Management time (cost of employing someone to do the same job as the manager, owner)					
Maintenance costs for warehouse, stores, and offices					
Inspection and certification					
Interest on working capital loans made out to finance recurring costs					
Other (specify)					

F3. Procurement costs (Tsh)

Cost item	2003	2004	2005	2006	% applied to certified organic production
Quantity of black pepper/ chilli purchased					
Price per kg (Tsh)					
Total purchase cost for black pepper/chilli					
Transport cost from farmer to warehouse/market place					
Loading and off-loading of black pepper/chilli produce					
Village levy					
Rent of buying posts					
Commission paid to agents					
Taxes paid					
Other (specify)					

G. Benefits (reference crop is black pepper/chilli)

Item	2003	2004	2005	2006	% applied to certified organic production
Average export price received for black pepper/chilli (Tsh)					
Average price received for local sales of black pepper/chilli (Tsh)					
Quantity of black pepper/chilli exported (kg)					
Total revenue from black pepper/chilli (Tshs)					
Total revenue from all spice crops sold (Tshs)					
Quantity of rejects at warehouse stage (all spice crops)					
Quantity of rejects at export stage (all spice crops)					
Total rejects (warehouse + export stage) – all spice crops					
Quantity of conventional crop sold as certified organic (all spices)					
Quantity of organic crop sold as conventional (all spices)					
Saving on not having to dry the crop (all spice crops)					
Others (specify)………………					

Annex 5: Kariakoo Market Checklist

1. Volumes of different types of spices supplied to the market over years

Crop name	Supply volume received (tons)						Average prices per kg (Tshs)					
Year	2002	2003	2004	2005	2006	2007	2002	2003	2004	2005	2006	2007
Chilli												
Black pepper												
Green pepper												
White pepper												
Ginger												
Cardamom												
Cinnamon												
Turmeric												
Nutmeg												
Clove												
Galgant												
Lemongrass												
Citrus peels												
Paprika												
Bay leaves												
Other 1......												
Other 2......												
Other 3......												

2. Supply sources and respective spice crop volumes

Spice Crop name	Source 1= Zanzibar 2= Tanga 3= Morogoro 4= Kigoma 4= Others (specify)____	Average volume handled per annum (tons)			Destination market and volumes sold				
Year		2004	2005	2006	% sold locally	% sold to EU	% sold to US	% sold to Asian mkts	% sold to regional mkts-Africa
Chilli									
Black pepper									
Green pepper									
White pepper									
Ginger									
Cardamom									
Cinnamon									
Turmeric									
Nutmeg									
Clove									
Galgant									
Lemongrass									
Citrus peels									
Paprika									
Bay leaves									
Other 1									
Other 2......									
Other 3									

3. Could the volumes be segregated according to their respective supply destinations?

Type of spice	Morogoro (tons)	Tanga (tons)	Kigoma (tons)	Zanzibar (tons)
Black pepper				
Chilli				
Ginger				
Turmeric				

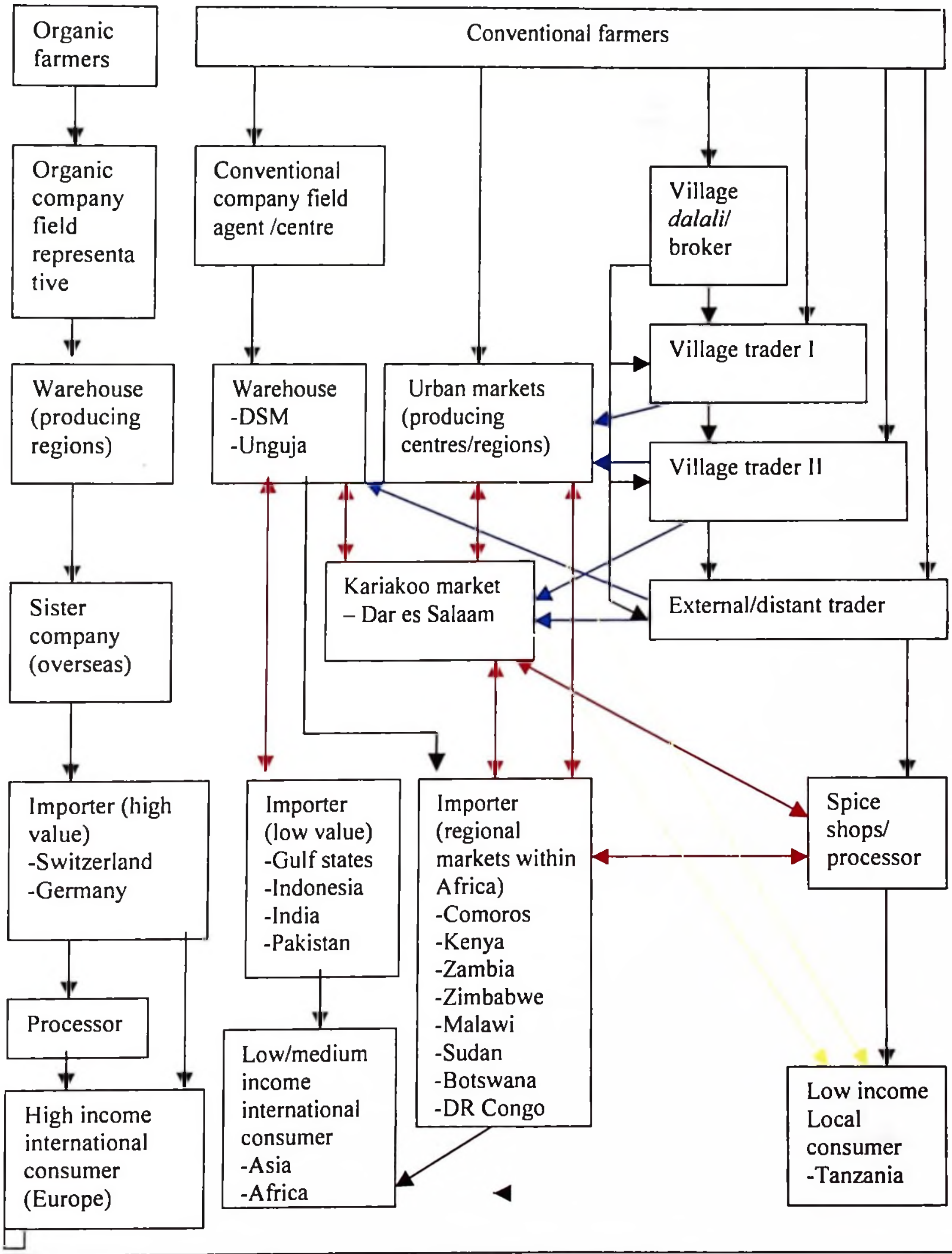
4. Export market prices (Tshs)

Crop name	EU mkt		US mkt		Asian mkts		Japanese mkt		Local mkt	
Year	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Chilli										
Black pepper										
Green pepper										
White pepper										
Ginger										
Cardamom										
Cinnamon										
Turmeric										
Nutmeg										
Clove										
Galgant										
Lemongrass										
Citrus peels										
Paprika										
Bay leaves										
Other 1______										
Other 2.........										
Other 3										

Annex 6: Variables for Data Collection

Variable	Values
1. Organic scheme participation	
- Type of farming practice	1= Certified organic; 2 = Conventional
- Length of time in the organic scheme	Years
2. Factor endowments	
-Total farm size	Total hectares owned (ha)
- Area under black pepper/chilli	Hectares (ha)
- Number of black pepper/chilli plants	Total number owned
- Distance from homestead	Average distance of nearest and furthest plots (km)
- Number of bicycles/vehicles owned	Total number owned
3. Demographics	
-Age of household head	Years of age
-Level of education of household head	Categories (0 = none; 1 = adult education; 2 = primary school education; 3= secondary school education)
-Household size	Total number of family members
-Household labour capacity	Total number of household members < 18, 18 – 50, and > 50 year age categories
- Gender of household head	1 = Male; 2 = Female
4. Diversification activities	
- Livestock keeping	Number of individual types of livestock
-Non-farm revenue	Average annual revenue from each individual enterprise
-Other agricultural revenue	Average annual revenue from other agriculture-related enterprises
5. Farming methods	
- Agrochemical use	Extent to which fertilizers and pesticides are used
-Compliance with recommended pre-harvest practice	Extent to which green yard manure, mulch, hand hoe clearing and irrigation are used
- Compliance with recommended post-harvest practice	Methods of post-harvest processing used
6. Costs and benefits	
- Variable costs	Labour costs for individual farming activities during 2005/06 season
-Investment costs	Purchase costs for farming and post-harvest processing tools and equipment incurred during 2005/06 season
- Yield	Total black pepper/chilli yield in kg per farmer in 2005/06
- Produce sales	Total black pepper/chilli sales to different produce buyers
- Producer prices	Producer prices paid by different buyers in 2005/06 season

Annex 7: The supply chain(s) for Tanzanian spices



Source: Author's survey data 2005-06

Annex 8: Tanzania Standard Physical and Chemical Requirements for Black/White Pepper, Chillies and Capsicum

S/No.	Characteristics		Requirements for black / white pepper	Requirements for chillies an d capsicums
1	Colour and shape of mature crop	Grey or black + wrinkled surface	Orange red – yellowish green, oblong, conical pods	
2	Odour and flavour	Fresh and pungent, free from foreign odour or flavour including rancidity and mustiness	Characteristic odour causing sneezing but not disagreeable and free from mustiness. For chillies -acrid flavour, very strong, very pungent, and very persistent. For capsicum – acrid flavour, moderately strong, moderately pungent, and moderately persistent.	
3	Freedom from fungi, insects etc	Free from insect infestation, fungi, dead insects, insect fragments, and rodent contamination visible to the naked eye.	Free from insect infestation, fungi, dead insects, insect fragments, and rodent contamination visible to the naked eye (for both whole and ground).	
4	Extraneous matter	Not more than 15% m/m for b/pepper and not more than 0.8% m/m for white pepper. Not more than 1.0% m/m of foreign matter not coming from the plant for whole b/pepper, or 0.5% m/m in whole w/pepper. Light berries less than 10% m/m, and pinheads ≤ 4% m/m. Total defects (pinheads + light berries ≤ 15% m/m.	Non-conforming berries to be less than less tan 5%.	
5	Fineness	Ground pepper to pass through a sieve of 1.00 mm aperture size.	Ground chillies and capsicum to pass through a 0.5mm sieve.	
6	Chemical requirements			
	(i) Moisture % (m/m) max.	12.0	10.0	
	(ii) Total ash % (m/m) max.	8.0 (whole b/pepper) 4.0 (whole w/pepper)	8.0	
	(iii) Acid insoluble ash in HCL % (m/m) max.	1.4 (ground b/pepper) 0.2 (ground w/pepper)	1.25	
	(iv) Crude fibre % (m/m) max.	17.5 (ground b/pepper) 6.0 (ground w/pepper)	30.0	
	(v) Non-volatile ether extract % min.	6.8	12.0	

Source: TBS (1979a; 1979b)

Annex 9: EU Food Safety Standards on Spices

Hazard type	Spice type	EU std/limit	Required conformity assessment investment	Indicative cost* per unit (USD)
Microbial Pathogens (*Salmonella* bacteria)	Black pepper, paprika, etc.	(i) zero tolerance to Salmonella contamination (ii) Non-use of ETO (ethyl oxide) sterilization (iii) Non-use of irradiation procedures	(i) Autoclave (ii) Incubator (iii) Biological safety cabinet (iv) Water bath (v) Oven (vi) Stomacher -- --	10,000 6,000 15,000 2,000 4,500 3,000 -- --
Aflatoxins**	Chillies, Paprika, Ginger, Nutmeg, etc	(i) 10 ppb (parts per billion) for aflatoxin (B1+B2+G1+G2) (ii) 5ppb for aflatoxin B1. (iii) See annex 10 for individual country limits	High performance liquid chromatograph equipment (HPLC)	Modern HPLC model costs USD 100,000
Pesticide residues • Cartap • Inorganic bromide • Hydrogen phosphide	Ginger All spices All spices	No MRLs set for spices at EU level (only individual country MRLs especially Germany and Spain) - See annex 11.	Gas chromatograph equipment (GC) or Gas chromatograph mass spectrophotometer equipment (GCMS)	GSMS equipment model costs USD 76,126
Heavy metals - Mercury - Cadmium - Arsenic - Copper - Lead - Zinc	-- -- All All All All	Unspecified Unspecified 5 mg/kg 20 mg/kg 10 mg/kg 50 mg/kg	Atomic absorption spectrophotometer (AAS) equipment	AAS set costs USD 120,000
Prohibited food additives Para red Sudan 1	• Turmeric, Chilli, Paprika, Cayenne Pepper • Ground chillies, Chili, and Curry powder	Zero tolerance to both additives	HPLC equipment (as for aflatoxins). The difference will only be on the certified reference materials needed for the detection.	As above

* Figures for equipment costs were obtained from TBS and TFDA purchase records for 2007.

** Tracking of Ochratoxin levels in spices has also started in EU

Source: Jaffee (2004) and Kithu (2001).

Annex 10: Summary of Legislation on Aflatoxins in EU Member States

Country	Permitted Levels	For which products	Comments
Austria	B1<Ippb	All Food stuffs (except mechanically prepared cereals in the case of B1)	
Belgium	<5 ppb for Peanuts EU legislation is expected		In Belgian law Aflatoxins (and toxins in general) may not present in foodstuffs ie not detectable.
Germany	B1+B2+G1+G2<4ppb	All foodstuffs	
Denmark	B1<2ppb		
Netherlands	B1<5ppb	All foodstuffs	No controls on B2
Switzerland	B1<Ippb	All foodstuffs (except maize)	
	B2+G1+G2<5ppb	All foodstuffs	
United Kingdom	<50ppb advisory level for chilly		Only Aflatoxin Regulations on Nuts/Nut products Dried Figs/Dried Fig products, which when sold to the consumer must contain <4ppb total Alfatoxin. No regulations on Spices/herbs.
Spain	B1<5ppb B1+B2+G1+G2<10ppb	All Foodstuffs	
Sweden	B1+B2+G1+G2<5ppb	All Foodstuffs	
Finland	B1+B2+G1+G2<5ppb	All Foodstuffs	
Italy + France	< 10 pbb for B1		No Regulations
U.S.A	<20 ppb	All Foodstuffs	Guideline FDA

Source: EU Draft Legislation as quoted from Kithu, C. J. (2001)

Annex 11: Maximum Pesticides Residues Limits in Germany, Netherlands & United Kindgom

Active Substance	Limiting Values in ppm		
	Gemany	Netherlands	United Kingdom
HCH without Lindane	0.20	0.02	0.02
Lindane	0.01	0.02	----
Hexachlorobenzene	0.10	----	0.01
Aldrin & Dieldrin	0.10	0.03	0.01
Sum of DDT	1.00	0.15	0.05
Malathion	0.05	0.05	8.00
Dicofol	0.05	0.05	0.50
Chlorpyrifos	0.05	0.01	----
Ethion	0.05	0.01	----
Chlordan	0.05	0.01	0.02
Parathion	----	0.10	1.00
Parathion methyl	0.10	0.10	0.20
Mevinphos	0.05	0.05	----
Sum of Endosulfan	0.10	0.02	0.10
Phosalon	0.05	1.00	0.10
Vinclozolin	0.05	----	0.10
Dimethoat	0.05	0.01	0.05
Quintozen	0.01	----	1.00
Metacriphos	0.01	----	----
Heptachlor & -epoxid	0.10	0.21	0.01
Methidathion	0.02	----	----
Diazinon	0.05	0.05	0.05
Fenithrothion	0.05	0.05	0.05
Bromophos	0.10	----	----
Mecarbam	0.01	----	----
Methoxychlor	0.01	0.05	----
Omethoat	0.40	----	0.20
Dichlorvos	0.10	0.05	----
Phosmet	----	0.01	----
Methylbromide	----	----	0.10
Tetradifon	0.05	----	----

Source: Kithu (2001)

Annex 12: IMO and TANCERT fees schedules (regrouped for comparison)

(a): Application fees

Category	Level in USD or equivalent (TANCERT)	Level in USD or equivalent (IMO)	Explanations (TANCERT)	Explanations (IMO)
Small individual farms	30	--	The fees are paid in a lump sum when applicants submit the forms to TANCERT. The application fee is not refundable.	No application fee. Prepayment of inspection costs required before start of inspection.
Society/Association/Farm group	30	--		
Operator with contracted farmers	25	--		
Processor at small scale	30	--		
Processor at factory level	50	--		
Big farms	50	--		

(b): Inspection fees

Daily fees

Category	Level in USD or equivalent domestic market (TANCERT)	Level in USD or equivalent domestic market (IMO)	Explanations (TANCERT)	Explanations (IMO)
Small individual farms	100	€ 250 ($350)	All levels are rated per day of inspection work.	Depending on the task, field re-inspection €95 ($133) conducted by junior inspector, €160 ($224) conducted by senior inspector, €370 ($518) for evaluation of ICS.
Society/Association/ Farm group	120	€95 to €370 ($133 - $518)		
Operator with contracted farmers	150	€95 to €377 ($133 - $527.8)		
Processor at small scale	100	€250 ($350)		
Processor at factory level	150	€250 ($350)		
Big farms	150	€250 ($350)		

(c): Certification fees

Category	Domestic and regional market in USD or equivalent (TANCERT)	Domestic and regional market in USD or equivalent (IMO)	Description (TANCERT)	Description (IMO)
Small individual farms	50	€160 to €830 ($224 - $1 162)	Per working day	Certification fee (lump sum payment) according to standard, to be paid for each standard certified against.
Society/ Associa-tion/Farm group	80	€160 to €830 ($224 - $1 162)		
Operator with contracted farmers	100	€160 to €830 ($224 - $1 162)		
Processor at small scale	60	€160 to €830 ($224 - $1 162)		
Processor at factory level	100	€160 to €830 ($224 - $1 62)		
Big farms	100	€160 to €830 ($224 - $1 162)		

*IMO inspection and certification fees in Africa

Source: TANCERT, 2008; IMO, 2008, personal communications with respective country representatives.

Notes:

Other fees: The operator will meet transport and accommodation costs for the inspector including the overhead costs during inspection like photocopying, printing. This will be worked out and agreed with TANCERT before an inspector is assigned to the inspection work. For IMO, travel costs and accommodation during inspection have to be reimbursed based on actual expenditure.

(€1 = USD 1.4)

Annex 13: Production costs for black pepper by farming practice (family + hired labour)[74]

Cost item/ha	Farming practice	n	Mean (TZS/ha)	Std. Deviation	Std. Error Mean	df	t-value
Ploughing/clearing	organic	1	9 725.62	.	.	0	-
	conventional	1	46 927.53	.	.		
Weeding	organic	57	24 720.82	23 676.46	3136.02	111.03	-0.085ns
	conventional	67	25 062.40	20 283.17	2477.98		
Planting	organic	30	9 541.27	12 823.64	2341.27	50	-0.219ns
	conventional	22	10 403.19	15 529.35	3310.87		
Mulching	organic	1	3 890.25	.	.	-	-
	conventional	1	24 700.00	.	.		
Manure application	organic	2	1 662.62	792.50	560.38	-	-
	conventional	0(a)	.	.	.	-	-
Spice crop pruning	organic	17	20 927.19	17 047.16	4134.54	33.28	0.389ns
	conventional	25	18 887.27	16 178.39	3235.68		
Stake tree pruning	organic	47	31 072.42	25 502.05	3719.85	98	-2.162**
	conventional	53	51 441.56	59 946.80423	8234.33		
Staking and training	organic	8	12 657.03	13 857.50	4899.36	16.92	-1.300ns
	conventional	11	22 207.54	18 158.34	5474.94		
Harvesting	organic	61	32 855.99	30 790.50	3942.32	130	- 2.731***
	conventional	71	54 462.22	54 780.70	6501.27		
Post-harvest handling	organic	31	26 407.09	40 498.86	7273.81	58.79	-0.686ns
	conventional	39	32 652.55	34 241.39	5483.01		
Transport to storage & market	organic	49	11 252.31	9 943.24	1420.46	91	-1.798*
	conventional	44	18 849.47	27 661.49	4170.12		
Watch person expenses	organic	0(a)	.	.	.	-	-
	conventional	4	57 839.17	39 315.78	19657.89		
	conventional	27	7 791.17	9 673.33	1861.63		
Planting material purchases	organic	4	6 745.16	9 079.77	4539.89	5	-0.383ns
	conventional	3	10 346.55	15 996.06	9235.33		

(a) - t could not be computed because at least one of the groups was empty.

* Significant at $p \geq 0.1$ level; ** Significant at $p \geq 0.05$ level; *** Significant at $p \geq 0.001$; ns - Non significant

Source: Survey data 2006 - 07

[74] Assuming equal wage rate for both family and hired labour

Annex 14[75]: Variable production costs for chilli by farming practice (family + hired labour)

Variable	Farming practice	n	Mean (TZS/ha)	Std. Deviation	Std. Error Mean	df	t-value
Ploughing/clearing	organic	59	81 730.69	52 084.01	6 780.76	116	3.54***
	conventional	59	53 921.58	30 463.73	3 966.04		
Weeding	organic	58	60 400.28	39 991.67	5 251.16	115	1.323***
	conventional	59	52 129.38	26 380.72	3 434.48		
Planting	organic	59	87 828.04	46 112.25	6 003.30	116	0.90ns
	conventional	59	87 094.71	42 015.04	5 469.89		
Mulching	organic	0(a)	.	.	.	-	-
	conventional	1	59 280.00	.	.		
Harvesting	organic	59	429 713.02	191 414.83	24 920.09	116	-
	conventional	59	599 372.71	233 206.018	30 360.83		4.319***
Transport to storage & market	organic	60	69 135.30	27 733.42	3 580.37	116	-1.114ns
	conventional	58	74 731.69	26 841.73	3 524.50		

(a) - t could not be computed because at least one of the groups was empty.

* Significant at p ≥ 0.1 level; ** Significant at p ≥ 0.05 level; *** Significant at p ≥ 0.001; ns - Non significant

Source: Survey Data 2006 - 07

75 Assuming equal wage rate for both family and hired labour