AN ACCOUNTING METHOD-BASED COST-BENEFIT ANALYSIS OF CONFORMITY TO CERTIFIED ORGANIC STANDARDS FOR SPICES IN TANZANIA

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DIIS Working Paper no 2008/30

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Cover Design: Carsten Schiøler
Printed in Denmark by Vesterkopi as
ISBN: 978-87-7605-299-7
Price: DKK 25.00 (VAT included)
DIIS publications can be downloaded
free of charge from www.diis.dk

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DIIS Working Paper sub-series on Standards and Agro-Food Exports (SAFE)

This working paper sub-series includes papers generated in relation to the research and capacity building programme 'Standards and Agro-Food Exports: Identifying Challenges and Outcomes for Developing Countries' (SAFE). The project, running from 2005 to 2010, is funded by the Danish Development Research Council and is carried out jointly by the Danish Institute for International Studies (DIIS) and the Department of Agricultural Economics and Agri-business at Sokoine University, Tanzania.

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Contents

Abstract

Certified organic farming has emerged as a market channel providing participating African smallholders with access to high value markets in the EU. The benefits may include not only a guaranteed produce market, but also premium prices, and higher net revenues. Where training in organic farming techniques is provided there may be also benefits in terms of increased yield. The major cost challenges are those for certification, although in many cases donor support to exporters is available to cover these.

This study 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. It is based on survey data from 2006-07 based on samples of scheme members and control groups. In both cases none of the potential benefit listed above were realized. This is the result of absent price premiums and, in the case of at least one scheme, wider contract failure. Adoption of recommended organic practices by members of the schemes was also low.

Learning from more successful schemes, recruitment of larger and better organized exporters and design of more effective contracts are some of the changes recommended for future schemes in Tanzania.

1.0 Introduction

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 et al., 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 sector 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 following hypotheses will be 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 incomes amongst farmers

These hypotheses will be justified in section 3.3.1 below.

2.0 Methodology

The study entailed carrying out surveys of producers (farmers) and traders / exporters. Black pepper farmers in Muheza district, Tanga and chilli farmers in Unguja North 'A' district in Zanzibar were selected for the study. Respondents were drawn from three villages in Muheza and two wards in Unguja North 'A'. Selection of the above spices in the study was based on the fact that they are the target spice crops for the two leading local organic export companies (see below). For the same reason these two organic spice export companies were selected for the trader part of the study. To allow comparative analysis, two conventional spice exporter comanies (one from each side of the United Republic) and one Kariakoo bulking market broker were also interviewed. The conventional traders interviewed were M/s Zanzibar State Trading Corporation, M/s Fidahussein Co. Ltd, and Babu Ali respectively[1].

The discussion below presents a brief description of the study area in terms of its geography, the prevailing land tenure system, the farming system for the selected crops, and the general infra-

[1] Due to lack of a suitable control case (i.e. conventional spice exporters concentrating on black pepper and chilli), the obtained data was not used for a separate cost- benefit analysis for the organic export companies. However, part of the data is used in the producer study.

structure. It also presents the methods used for sampling, data collection, quantification of field data, and data analysis.

2.1 DESCRIPTION OF THE RESEARCH AREA AND THE ORGANIC SCHEMES

The study area includes both Tanzania mainland and Zanzibar isles. The leading organic schemes for the two spice crops considered 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) farm at Bambi in Central Unguja district. The farm was/is owned by the Zanzibar State Government. The organic spice scheme studied here came into being in the 1994/95 season with smallholder producers in Unguja, Pemba and Tanga. The following years saw the scheme being extended to other areas including Morogoro and Kigoma. M/s TAZOP is a splinter company from M/S ZANGERM which came into being in 1999. Its organic spice scheme started in the same year with smallholders in Unguja, Pemba, Tanga, Morogoro and Kigoma.

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. Other organic spice export companies operating in Tanzania include M/s Kimango Farm Ltd (a large scale producer-exporter in Morogoro) and M/s Golden African Ltd (a newcomer organic spices and herbs export company in Arusha).

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.

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. 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[2].

Plate 1: According to farmers, all the three crops came from same seed planted on soils of differing fertility levels. However, organic export companies prefer the ultra small bird's eye chilli (picture III)

I **II** **III**

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 dif-

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

ferences 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 (see 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 have now ceased to do so.

The cause 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.

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. However the TAZOP-led extension service in Muheza is deficient in that it is manned by an untrained agricultural field officer. This is in sharp contrast with the situation during the heyday of EPOPA[3]. The generally close cooperation between the company-led and the government-led extension staff could have filled the gap but the latter are also not full conversant with the specific technical aspects of spice crops husbandry[4]. Furthermore, 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.

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[5]. However, the larger part of the black pepper produce is still procured 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

[3] 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 be able to provide support on extension services as its predecessor.

[4] This is a national problem as most agricultural colleges' curricular do not put emphasis on matters related to spices as they have since been categorized as supplementary / minor crops.

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

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 bring back the knowledge to their fellows.

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[6] during certification (this is done annually).

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).

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.,* (2009) 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 (see 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

[6] Lately inspectors from the local certification body –TANCERT- are contracted and used by IMO instead of always bringing them from Europe as the case was previously.

exporter can purchase has to be sold as conventional, this is an impediment to the development of domestic organic markets in the region[7].

M/s TAZOP participated fully in the export market for black pepper (and other spices) during 2005/06 season. M/s ZANGERM Enterprises however could not participate in the market on its own account due to lack of adequate crop finance. All of what it purchased was sold on to other organic companies. The actual and average exports of the two companies over the five years ending 2006 are shown in Tables 1 and 2 below.

Table 1: 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	2945	589
Cloves	1,374	13,590	7,175	14,680	2,169	38,988	7,798
Ginger	11,000	18,160	4,905	17,342.00	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	1,247.50	772	0	2,460.00	1,648.00	6,127.50	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)

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 1 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

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

(Akyoo and Lazaro, 2007). The annual average performance for M/s ZANGERM is as shown in Table 2 below.

Table 2: 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 (see 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. Accessing working capital, which is the major deficiency currently, "should not be difficult" with the presence of these investments.

2.1.1 Location, geography and crop production

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 1,974 sq. 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 areas[8] and average output of the spice crops for 2005/06 season are summarized in Table 3 below.

Table 3: 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 (2.06%)	676

Source: Muheza district profile report (2008).

Zanzibar is made up of the two major islands of Unguja and Pemba[9]. 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 50km 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.

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[10].

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

[9] 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.

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

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. 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.

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*)[11]. The leading five of the above mentioned wards, in descending order, are Kijini, Kandwi, Kidoti, Tazari, and Gamba. Chilli farmers from Kijini and Gamba 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.

2.1.2 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[12], 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

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

[12] 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.

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.

2.1.3 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 are intensive intercropping cultivation methods and multiple plot ownership by farmers. The crops grown in the mixed cropping system observe no definite pattern with regard to the type and number of intercrops involved. Spice intercrops range from tree crops, cereals, fruits, and legumes, to vegetables. Trees and tree crops are the most important intercrops for black pepper in Muheza whereas pawpaw and legumes are for chilli in Unguja.

Generally, farmers in the research area are involved in growing multiple spice crops (either intercropped or in pure stands). The other spice crops being cultivated by black pepper farmers in Muheza include cinnamon, turmeric, cardamom, ginger, vanilla, and lemon grass (a herb). The non-spice crops grown are citrus, mango, coconut, banana, palm oil, jackfruit, cassava, maize, cocoyam, and cocoa. In both areas, with the exception of lemon grass in Muheza, intercrops on certified fields are not certified. Lemon grass is included in the organic contract agreement.

Turmeric is the only other spice crop that is cultivated in significant quantities by chilli farmers in the study area in Unguja. The non-spice crops grown include egg plant, pigeon peas, sweet potato, pawpaw, millet, rice, and vegetables. Neither black pepper nor chilli is amongst the two most widely cultivated crops for farmers in their respective areas. Black pepper is secondary to maize and citrus in Muheza whereas chilli is subsidiary to maize and legume in Kijini and by egg plant, maize, and banana in Gamba in Unguja. Farmers' overriding objective is to meet household food needs prior to engaging in commercial cropping. The current shift of many chilli farmers into egg plant and pigeon pea farming (see below) further suggests a change of farmers' priority between cash crops in Unguja North 'A' district. The situation for black pepper farmers in Muheza is different as rather than changing from one crop to another, farmers are farming the two major cash crops – black pepper and citrus – in tandem.

Plate 2: A backyard turmeric *(manjano)* plot in Gamba ward, Unguja. Both the isles and mainland crops suffer from a lack of market outlet. Kariakoo brokers seemed unaware of its presence in Unguja.

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.

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.

2.1.4 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.

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 human 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 (see Plate 3).

Plate 3: A farm bicycle in Gamba ward. See the straight sickle mounted at the front for easing its handling during farm trips.

Black pepper producing villages lie within the wettest zones of Muheza district (bimodal rainfall of about 1,000mm per annum). Availability of drinking water for labour and household members while working the farms is guaranteed. By contrast, 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.

2.2 SAMPLING FOR FARMER INTERVIEWS

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

The organic black pepper farmers were picked 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 farmers). Respondents in Kwamhosi village were systematically picked from the list at a uniform sampling interval while, since there were limited number of organic farmers in Tongwe and Bombani villages, all those listed were interviewed.

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[13] whose names did not appear on the organic list in the respective villages. All conventional farmers in Kwamhosi village were interviewed as there was less than 30 conventional farmers in all in this village. Conventional farmers in Bombani village were picked using systematic random sampling method from the prepared list.

[13] Mr Juma Mbwambo is Nkumba ward agricultural officer in Bwembera division (Muheza).

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[14]. ZANGERM has a total of 150 registered farmers in the whole of Zanzibar. The 100 registered chilli farmers in North Unguja region are 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 3 presents a summary of the geographical distribution of respondents by district and village / ward.

Table 3: 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

2.3 DATA COLLECTION

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. The data for producers and traders were collected using a structured questionnaire (Annex 1) and a checklist question guide (Annex 2) respectively. The 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, 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 3). The important variables for which data were collected are summarized in Table 4 below.

[14] Messrs Nada and Omari are the respective agricultural officers for Kijini and Gamba wards.

Table 4: 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

2.4 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.

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.

Plate 4: A Chilli farm in *Bayani* area, Kijini ward. The nature of the coral rag terrain is seen in the foreground.

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 (see Plate 4). 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

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 Plate 5 and 6 below)

Plate 5: A pick axe pictured from Gamba ward

Plate 6: A straight sickle

(c) Weeding cost

In most cases, black pepper was intercropped with citrus, banana, mango, coconut, etc. Chilli too was intercropped with other crops like pawpaw, maize, pigeon peas, cassava, legumes, etc. 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. 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.

(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 0.5kg[15] of the dried crop. Chilli farmers can have up to four harvests in a year depending on frequency of weeding.

Plate 7: A well managed black pepper farm in Tongwe village, Muheza district. Note the extensive branching of the stake tree tops which is due for pruning.

[15] 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.

Plate 8: A farmer tending a black pepper plant in Tongwe village, Muheza district, in Tanga region. The black pepper vine is staked on a *Glyricidia sepium* tree.

(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 make-shift on-farm hut for drying the crop on the farm. The hut also provides temporary protection for farmers against scorching sun or rains while working on the farm.

Plate 9: An on-farm makeshift hut for chilli drying at *Bayani* area, Kijini ward. Note the drying mats being inspected by the farmer inside the hut.

Plate 10: The side view of the on-farm makeshift hut.

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.

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.

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 11: A chilli harvest from Gamba ward stored in an uncharacteristic plastic bagging. Normally, polypropylene bags used are those of emptied sugar, salt, and cement packaging materials (*polo*) in shops rather than wrapping material plastic bags (*'rambo'*) like this.

2.5 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, actual reported costs incurred during the 2005/2006 season (which actually mean all equipment that was bought between late 2004 to early 2006) are used in the analysis.

2.6 FARMER REVENUE

Individual farmer revenue is taken as the horizontal summation of all black pepper / chilli sales made to different buyers in 2005/06 season. Home consumption of black pepper is insignificant (occurs only during Ramadan fasting month for Muslim households) and nil for chilli. Rejects at the producer level are also insignificant. No allowances are therefore given for household consumption and crop rejects during revenue calculation.

2.7 CONSIDERATION OF ORGANIC FARMING METHODS

Selection of organic farming methods examined in the study was derived from the requirements of the ICSs (see section 2.1 on the description of the schemes).

2.8 DATA ANALYSIS[16]

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 and Pearson chi – square). 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 to be considered were farm area, spice crop area and number of spice plants. The production and post-harvest costs to be considered are described in the next section. Data was also collected on farming methods, producer prices, and farmer revenue (data for the schemes is presented separately). The point of these comparisons would be to test for selection bias (selection into the scheme) and participation effect.

[16] All costs are given on a per hectare basis so as to conform to the System International (SI) units of measurement and enhancing their comparability. The adjustment factor used is 1ha = 2.4709 acres.

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. However, in the absence of a finding of significant participation effects, except a counter-intuitive one for chilli in a case of contract failure (see below), it was not considered meaningful to proceed to the second stage of analysis.

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 suggests that there was little probability of selection bias anyway.

3.0 Results and Interpretation

3.1 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.

3.1.1 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.

3.1.2 Total cultivated area

Total cultivated areas are statistically greater for organic than conventional farmers (Table 5). This apparently supports a hypothesis of positive selection by scheme owners, although it should be noted that in principle the coral rag is available for farming for all types of farmers in Unguja.

Table 5: Total cultivated area by farming practice type

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of difference
Black pepper	Average cultivated total black pepper + non-black pepper area	ha	2.763	1.768	***	t-test
Chilli	Average cultivated total chilli + non-chilli area	ha	0.897	0.693	***	t-test

Key: * = p ≥ 0.1, *** = p ≥ 0.01

3.1.3 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 6). Generally, areas under black pepper are bigger than those for chilli in Unguja for both organic and conventional farmers.

Table 6: Land area under spice crop by farming practice type

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of difference
Black pepper	Average actual area under black pepper	ha	0.98	0.41	***	t-test
Chilli	Average actual area under chilli	ha	0.41	0.34	*	t-test

Key: * = p ≥ 0.1, *** = p ≥ 0.01

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

3.1.4 Number of spice crop plants

The spice plant population position for the two groups is in Table 7 below.

Table 7: Plant population of spice crop by farming practice type

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Significan ce	Test of difference
Black pepper	Average number of black pepper plants per hectare	Num ber/ ha	865	812	ns	t-value
Chilli	Average number of chilli plants per hectare	Num ber/ ha	4,399.7	5,916.15	**	t-value

Key: ns = not significant, ** = p ≥ 0.05

Plant numbers per hectare did not differ significantly between organic and conventional black pepper farmers. The difference in plant number per hectare was significant ($p \geq 0.05$ level) for Unguja chilli with conventional farmers owning more plants. The observed population in the case of both crops is only around 50 percent of the potential rate. According to the Zanzibar Cash Crop farming system Project (ZCCFSP) (reports number CFS/1 & 2-1995), the recommend spacing for black pepper is 2x3m with chilli having a range from 1x1.5m to 1.3 x 0.6m 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 performance (observed vs. recommended) 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.

3.1.5 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 8 below.

Table 8: Average distance of spice farms from homestead by farming practice type

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of difference
Black pepper	Average distance of farms from homestead	km	1.87	1.40	**	t-test
Chilli	Average distance of farms from homestead	km	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.

3.2 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.

3.2.1 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 9).

Table 9: 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	95.5	80.0	100.0	90.3	91.8
	Female	4.5	20.0	0.0	9.7	8.2
	Total	100.0	100.0	100.0	100.0	100.0
Conventional	Male	93.3	80.0	96.8	60.0	93.1
	Female	6.7	20.0	3.2	40.0	6.9
	Total	100.0	100.0	100.0	100.0	100.0

Source: Survey data 2006 - 07.

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 corag rag (b*ayani)* terrain which is publicly owned and is thus accessible to any interested farmer. 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.

3.2.2 Age of household head

The average ages of household heads for organic and conventional black pepper and chilli farmers do not differ statistically (Table 10).

Table 10: Mean age of household head by farming practice

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

Key: ns = not significant

3.2.3 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 11 where it is reported that over 50 percent of all chilli farmers are completely lacking in 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. The observed difference between Muheza and Unguja is not surprising as despite of the government policy of Universal Primary Education (UPE), many people in Unguja, especially in the past, preferred religious education to secular formal education. On the other hand, preference for formal education has always been high on the mainland.

Table 11: Education level of household head by farming practice

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

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

3.2.4 Household size

Organic farmers have statistically larger household sizes than their counterparts for both black pepper and chilli (Table 12). 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 for Muheza and North Unguja 'A' respectively (URT, 2003).

Table 12: Average household size by farming practice

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of difference
Black pepper	Mean family size	Number	6.295	5.000	***	t-test
Chilli	Mean family size	Number	7.951	6.475	***	t-test

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

3.2.4 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 13 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.

Table 13: Household adult labour capacity by farming practice

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of difference
Black pepper	Mean number of household adult members aged between 18-50 years	Number	1.98	1.89	ns	t-test
Chilli	Mean number of household adult members aged between 18-50 years	Number	3.54	4.81	***	t-test

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

3.3 COSTS, FARMING METHODS, AND BENEFITS

3.3.1 Introduction

Generally, food standard compliance is associated with an 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 section 1.0 are therefore based and justified on the theoretical facts discussed above. Table 14 summarizes the expected test results of these hypotheses.

Table 14: Summary of the study hypotheses

Hypothesis	Test of significance	Expected sign
1. Certified organic black pepper / chilli farmers incur higher production costs than conventional farmers	t-test	+
2. Certified organic black pepper / chilli farmers realize higher prices for their produce than conventional farmers	t-test	+
3. Certified organic black pepper / chilli farmers have higher yield levels than conventional farmers	t-test	+
4. Conformity with certified organic standard leads to higher incomes amongst black pepper / chilli farmers	t-test	+

3.3.2 Farming methods

A description of the tailored extension services that are provided by the schemes was given in section 2.1 of this report. Notwithstanding these services, certified organic and conventional farmers in the study area generally practice identical cultivation methods for the respective spice crops. Evidence from the author's survey shows that almost all farmers neither use manure, nor mulch, nor use fertilizer, nor use pesticides, nor use agro-chemicals or irrigation (Table 15)[17]. This observation suggests that spice production in the study area is 'organic- by- default' for both organic and conventional farmers.

Table 15: Cultivation methods by crop type and farming practice

Crop	n	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of difference
Black pepper	132	Used farm yard manure in 2005/06	Number of farmers	2	0	-	-
Chilli	120	Used farm yard manure in 2005/06	Number of farmers	0	0	-	-
Black pepper	132	Used fertilizer in 2005/06	Number of farmers	0	0	-	-
Chilli	120	Used fertilizer in 2005/06	Number of farmers	0	0	-	-
Black pepper	1	Used mulching material in 2005/06	Number of farmers	1	0	-	-
Chilli	1	Used mulching material in 2005/06	Number of farmers	0	1	-	-
Black pepper	132	Used irrigation in 2005/06	Number of farmers	0	0	-	-
Chilli	120	Used irrigation in 2005/06	Number of farmers	0	0	-	-
Black pepper	132	Used pesticides in 2005/06	Number of farmers	0	0	-	-
Chilli	120	Used pesticides in 2005/06	Number of farmers	0	0	-	-
Black pepper	2	Land clearing[18] by hoe / pick-axe	Number of farmers	1	1	-	-
Chilli	13	Land clearing by hoe / pick-axe	Number of farmers	13	0	-	-
Black pepper	92	Post-harvest processing (drying)	Number of farmers	38	54		
Chilli	120	Post-harvest processing (drying)	Number of farmers	61	59	-	-

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

[18] 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).

Organic contracts require farmers to desist from seed-bed burning in clearing fields during land preparation (see section 2.1 above). 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[19]. 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 abundance like Muheza. The use of farm yard manure from drug-treated livestock is forbidden 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. 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.

3.3.2 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 16 below. This position underscores the close similarity that exists in Africa between certified organic and organic-by-default (traditional) agricultural production systems. It follows therefore that the changes in pro-

[19] 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.

duction 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 16: Itemized variable costs for black pepper and chilli by farming practice type

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signi-fic-ance	Test of differ-ence
Black pepper	Ploughing cost	Tsh/ha	0.00	0.00	-	-
Chilli	Ploughing cost	Tsh/ha	7,182.30	680.30	*	t-test
Black pepper	Planting material purchases	Tsh/ha	442.31	437.18	ns	t-test
Chilli	Planting material purchases	Tsh/ha	0.00	0.00	-	-
Black pepper	Planting cost	Tsh/ha	42.67	139.15	ns	t-test
Chilli	Planting cost	Tsh/ha	1,700.66	753.56	ns	t-test
Black pepper	Weeding cost	Tsh/ha	7,795.71	7,361.35	ns	t-test
Chilli	Weeding cost	Tsh/ha	2,375.25	1,045.98	ns	t-test
Black pepper	Spice crop pruning cost	Tsh/ha	418.42	1,113.24	ns	t-test
Chilli	Spice crop pruning	Tsh/ha	-	-	-	-
Black pepper	Stake tree pruning cost	Tsh/ha	12,642.82	14,254.68	ns	t-test
Chilli	Stake tree pruning cost	Tsh/ha	-	-	-	-
Black pepper	Harvesting cost	Tsh/ha	13,959.71	10,489.96	ns	t-test
Chilli	Harvesting cost	Tsh/ha	30,503.83	11,303.39	ns	t-test
Black pepper	Post-harvest handling cost	Tsh/ha	7,216.99	11, 277.35	ns	t-test
Chilli	Post-harvest handling cost	Tsh/ha	0.00	0.0	-	-
Black pepper	Transport cost to storage and market	Tsh/ha	5,340.82	3,657.47	ns	t-test
Chilli	Transport cost to storage and market	Tsh/ha	202.46	0.00	-	-
Black pepper	Input transportation cost	Tsh/ha	0.00	0.00	-	-
Chilli	Input transportation cost	Tsh/ha	0.00	0.00	-	-
Black pepper	Watchman expenses	Tsh/ha	506.15	3,258.54	ns	t-test
Chilli	Watchman expenses	Tsh/ha	0.00	0.00	-	-
Black pepper	Agro-chemicals cost (pesticides + fertilizers)	Tsh/ha	0.00	0.00	-	-
Chilli	Agro-chemicals cost (pesticides + fertilizers)	Tsh/ha	0.00	0.00	0.00	-
Black pepper	Total variable cost	Tsh/ha	47,923.28	51,551.74	ns	t-test
Chilli	Total Variable cost	Tsh/ha	41,964.49	13,783.23	**	t-test

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

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 do not differ statistically between organic and conventional farmers.

The magnitude of each labour cost item in Table 16 was lower than expected because almost all farmers augment hired with family labour[20] 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.

3.3.3 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 17 below.

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.

[20]If family labour were to be valued at the same rate as hired labour, then the position of the itemized variable costs in Table 16 would change and assume the position in Annex 4(a) and 4(b).

Table 17: Farm investment costs by farming practice

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

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

3.3.4 Total production cost

Total production cost is the sum of all variable and non-recurrent costs incurred by farmers. Table 18 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 18: Total production cost by farming practice

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of difference
Black pepper	Total production cost per hectare	Tsh	81,368.08	91,753.23	ns	t-test
Chilli	Total production cost per hectare	Tsh	88,946.66	72,124.91	ns	t-test

Key: ns = not significant.

3.3.5 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.

3.3.5.1 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). 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 19. There is no significant difference in output per hectare between organic and conventional black pepper farmers in Muheza. The difference is however highly significant ($p \geq 0.01$) for chilli farmers in Unguja North 'A' with conventional farmers having higher yields.

Table 19 (a): Yield of spice crop by farming practice type

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of difference
Black pepper	Total dry weight equivalent yield per hectare	kg/ha	365.3	344.1	ns	t-test
Chilli	Total dry weight equivalent yield per hectare	kg/ha	597.9	763.2	***	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 0.5kg – 4kg dry weight per small and large black pepper vines respectively. Chilli yield is typically 400 – 700kg dry weight produce per hectare (ZMALNR, 1995). The realized chilli yields (597.9kg and 763.2kg for organics and conventional crop respectively) approximated the anticipated yield range of 400-700 kg/ha above.

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 (see plate 12) 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[21].

Plate 12: Abandoned organic chilli farm at *Mwambani* area in Gamba ward. Only the intercrops (pawpaw) are easily visible. Egg plant and pigeon peas cultivation has taken over from chilli farming in this area.

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

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 19(b)). 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 earlier.

Table 19(b): Yield level versus organic participation correlation results

Crop	Exact description of indicator	n	Unit	Organic farmers	Signific-ance	Test of difference
Black pepper	Total dry weight equivalent yield per hectare * length of time participating in organic scheme	61	Correlation coefficient	-0.056	ns	Pearson correlation
Chilli	Total dry weight equivalent yield per hectare * length of time participating in organic scheme	59	Correlation coefficient	-0.159	ns	Pearson correlation

3.3.5.2 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 20 below.

Table 20: Descriptive statistics on prices for fresh and dried produce by spice crop type

Crop	Exact description of indicator	Organic farmers		Conventional farmers	
		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 20 shows that, generally, fresh organic black pepper crop seemed to be 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 (Table 21).

Table 21: Disaggregated average producer prices for fresh and dried black pepper and chilli

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

Black pepper and chilli farmers sold their fresh and dried produce into both organic and conventional supply chains (Table 21). 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 21). Generally, organic black pepper farmers received a premium price for their fresh produce during the 2005/06 season. 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 (Tables 21 and 22). 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[22] (see reasons below).

Table 22: Producer prices for 2005/06 season by spice crop type

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of difference
Black pepper	Mean maximum producer price received for fresh produce	Tsh	258.33	235.00	**	t-test
Chilli	Mean maximum producer price received for fresh produce	Tsh	-	-	-	-
Black pepper	Mean maximum producer price received for dried produce	Tsh	1,321.25	1,307.27	ns	t-test
Chilli	Mean maximum producer price received for dried produce	Tsh	2,000.05	1,993.22	ns	t-test
Black pepper	Mean minimum producer price received for fresh produce	Tsh	215.00	185.45	**	
Chilli	Mean minimum producer price received for fresh produce	Tsh	-	-	-	-
Black pepper	Mean minimum producer price received for dried produce	Tsh	998.72	940.74	ns	t-test
Chilli	Mean minimum producer price received for dried produce	Tsh	1,940.74	1,977.97	ns	t-test

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

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.

The organic chilli crop did not command a premium during the 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. This again suggests that organic farmers are likely to realize premium only when they sell to the company that registered them.

[22] 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.

3.3.5.3 Producer prices and buyer categories

During 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[23]. The profile of prices paid by each buyer category is shown in Table 23. According to this table, all buyer categories bought both conventional and organic spice produce. The producer prices paid by each of the buyer categories do not differ statistically between conventional and organic black pepper and chilli produce.

Table 23: Average producer prices for fresh and dried spice crop for 2005/06 season by buyer category

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Signific-ance	Test of differ-ence
Black pepper	Producer price paid by conventional company for dried produce	Tsh	-	-	-	-
Chilli	Producer price paid by conventional company for dried produce	Tsh	1,950.00	1,986.67	ns	t-test
Black pepper	Producer price paid by village traders for fresh produce	Tsh	225.00	229.41	ns	t-test
Chilli	Producer price paid by village traders for fresh produce	Tsh	-	-	-	-
Black pepper	Producer price paid by village traders for dry produce	Tsh	1,268.75	1,104.76	ns	t-test
Chilli	Producer price paid by village traders for dry produce	Tsh	1,500.00	-	-	-
Black pepper	Producer price paid by distant traders for fresh produce	Tsh	366.66	221.53	ns	t-test
Chilli	Producer price paid by distant traders for fresh produce	Tsh	-	-	-	-
Black pepper	Producer price paid by distant traders for dried produce	Tsh	1,207.69	1,154.84	ns	t-test
Chilli	Producer price paid by distant traders for dried produce	Tsh	1,912.50	1,972.73	ns	t-tes
Black pepper	Producer price paid by organic company for dried produce	Tsh	1,190.48	1,225.00	ns	t-test
Chilli	Producer price paid by organic company for dried produce	Tsh	2,000.00	2,000.00	ns	t-test
Black pepper	Producer price paid by organic company for fresh produce	Tsh	248.00	233.33	ns	t-test
Chilli	Producer price paid by organic company for fresh produce	Tsh	-	-	-	-

Key: ns = not significant.

[23]See Akyoo and Lazaro (2007) 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 reselling 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. However, premiums accruing to the organic company will not be passed on in this case.

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 22 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[24].

3.3.5.4 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, 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. Table 22 provides empirical evidence of leakage of output from the organic into the conventional chain and vice versa.

Table 24: Output flows between organic and conventional supply chains

Crop	Total output (dry wt. equiv.) (kg)	Total organic output (dry wt. equiv.) sold as conventional (kg)	Total conventional output (dry wt. equiv.) sold as organic (kg)	Share of organic crop sold as conventional to total output (%)	Share of conventional crop sold as organic to total output (%)
Black pepper	20,424.8 (132)	2,034.00 (30)	245.8 (10)	10.0	1.2
Chilli	27,401.0 (120)	745.0 (17)	3,030.0 (15)	2.7	11.1

NB: The number of cases for each variable is shown in the parentheses

[24] 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.

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).

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[25]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[26].

3.3.7.6 Net revenue

The discussion here is based on farmer revenue from black pepper and chilli spice crops only. 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 (Table 18). The position of net revenues is shown in Table 25 below.

Table 25: Net revenue from spice crop by farming practice

Crop	Exact description of indicator	Unit	Organic farmers	Convent. farmers	Significance	Test of difference
Black pepper	Average net revenue per hectare	Tsh	252,024.37	271,699.73	ns	t-test
Chilli	Average net revenue per hectare	Tsh	1,064,694.55	1,446,548.31	***	t-test

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

[25] 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).

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

Net revenues do not differ statistically between organic and conventional black pepper farmers. They however do for chilli farmers, in the direction of conventional farmers. 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 19) which is also a key factor in farmer revenue.

4.0 Overall Discussion of 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.

4.1 SUMMING UP ON SCHEME SELECTION

- 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.

4.2 SUMMING UP ON PRODUCER COSTS

- 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 both groups.

- 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 their counterpart conventional farmers as a direct or indirect effect of complying with the standard.

4.3 SUMMING UP ON NET REVENUE

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

4.4 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 lack of crop finance on the part of the scheme owner and buyer collusion. 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 below), where the written contracts stated explicitly that the buyers would pay an unspecified premium. The low level of adoption of recommended organic farming practices by participant farmers meant that little change had occurred to the original traditional production system. This reflected poorly functioning extension work within schemes. Thus little change in yield levels, or increases in revenue as a result of increased yields, could be anticipated.

5.0 Concluding Remarks

The findings of this 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 farmer revenue and adoption of organic farming practices. The authors report positive effect from scheme participation (and also, more modestly, organic practices) on farmer revenue. The authors of the Ugandan papers attribute their finding mainly to the presence of price premiums. In both cases, the results are explained in terms of the incentive

effects of price premiums. The organic farmers in the Tanzanian organic spice schemes reported in this study 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.

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 multi-national 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 are more likely guaranteed to Tanzania scheme producers if larger established companies are 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 or both to include other crops (both spices and non-spices) and 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 personnel. 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.

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 ever decreasing EPOPA support and have seen both declining performance by the export companies (with apparent disappearance of others 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 now manage to operate successfully without donor support and thus provide an important lesson for Tanzanian schemes to learn from.

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Annex 1

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: SUPPLY CHAIN ANALYSIS IN 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

……
……
……
…..ank your crops according to the order of importance

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 (specify)…….	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 2

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: SUPPLY CHAIN ANALYSIS IN 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 3

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 4(a)

Production costs for black pepper by farming practice

Cost item / ha	Farming practice	N	Mean (TZS/ha)	Std. Deviation	Std. Error Mean	df	t-value
Ploughing/clearing	organic	1	9725.6250	.	.	0	-
	conventional	1	46927.5300	.	.		
Weeding	organic	57	24720.8238	23676.46346	3136.02420	111.033	-0.085ns
	conventional	67	25062.4043	20283.17118	2477.98375		
Planting	organic	30	9541.2731	12823.64253	2341.26609	50	-0.219ns
	conventional	22	10403.1909	15529.35251	3310.86908		
Mulching	organic	1	3890.2500	.	.	-	-
	conventional	1	24700.0000	.	.		
Manure application	organic	2	1662.6188	792.49876	560.38125	-	-
	conventional	0(a)	.	.	.	-	-
Spice crop pruning	organic	17	20927.1961	17047.15681	4134.54283	33.278	0.389ns
	conventional	25	18887.2667	16178.39525	3235.67905		
Stake tree pruning	organic	47	31072.4190	25502.04645	3719.85579	98	-2.162**
	conventional	53	51441.5560	59946.80423	8234.32684		
Staking and training	organic	8	12657.0347	13857.49940	4899.36590	16.924	-1.300ns
	conventional	11	22207.5455	18158.33961	5474.94539		
Harvesting	organic	61	32855.9970	30790.49753	3942.31924	130	-2.731***
	conventional	71	54462.2244	54780.69928	6501.27291		
Post-harvest handling	organic	31	26407.0887	40498.86300	7273.81052	58.793	-0.686ns
	conventional	39	32652.5556	34241.39311	5483.01106		
Transport to storage & market	organic	49	11252.3062	9943.23861	1420.46266	91	-1.798*
	conventional	44	18849.4682	27661.48625	4170.12596		
Watch person expenses	organic	0(a)	.	.	.	-	-
	conventional	4	57839.1667	39315.78313	19657.89156		
	conventional	27	7791.1728	9673.32842	1861.63292		
Planting material purchases	organic	4	6745.1583	9079.77379	4539.88690	5	-0.383ns
	conventional	3	10346.5556	15996.06219	9235.33081		
	conventional	69	7073.6862	5228.95435	629.49213		
	conventional	63	11384.2169	8913.69064	1123.01946		

(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

Annex 4(b)

Variable production costs for chilli by farming practice

Variable	Farming practice	n	Mean (TZS/ha)	Std. Deviation	Std. Error Mean	df	t-value
Ploughing / clearing	organic	59	81730.6952	52084.01215	6780.76082	116	3.54***
	conventional	59	53921.5792	30463.72833	3966.03962		
Weeding	organic	58	60400.2834	39991.66988	5251.16352	115	1.323***
	conventional	59	52129.3779	26380.72406	3434.47774		
Planting	organic	59	87828.0367	46112.24712	6003.30324	116	0.90ns
	conventional	59	87094.7119	42015.04367	5469.89278		
Mulching	organic	0(a)	.	.	.	-	-
	conventional	1	59280.0000	.	.		
Harvesting	organic	59	429713.0169	191414.83489	24920.08890	116	-4.319***
	conventional	59	599372.7119	233206.01830	30360.83756		
Transport to storage & market	organic	60	69135.3000	27733.41820	3580.36889	116	-1.114ns
	conventional	58	74731.6954	26841.72733	3524.49147		
	conventional	59	5505.1695	2224.81089	289.64571		
	conventional	58	22800.6552	17399.25965	2284.63472		
	conventional	11	10448.8485	4566.41399	1376.82562		

(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