Explorative Study on Citrus Farming systems

A case of Tanga Region - Tanzania

Research Project Submitted to Van Hall Larenstein

University of Applied Sciences

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Master in Agricultural Production Chain Management,

Specialization: Horticulture Production Chains

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ACKNOWLEDGEMENT

DEDICATION

To my beloved family

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LIST OF ABBREVIATIONS

E.C.I   : Ebonny Consulting International

F.A.O   : Food and Agriculture Organization

F.F.T.C: : Food and Fertiliser Technology Center

MINAFSEC: Ministry of Agriculture Food Security and Cooperatives

PADEP: Participatory Agricultural Development and Empowerment Project

TRCO   : Tanga Region Commissioner Office

USAID: United State Agency for International Development

ABSTRACT

An exploratory survey has been conducted on orange farming systems in Tanga region. Data collection has been based on questionnaire and interviews as well as secondary sources.

The objective of this consisted in developing an efficient farming system for the supply of citrus and pineapple in Tanga. Specifically, the work aimed to describe the current farming system, design alternative farming and explore its feasibility and determine the better product mix. Data collection has been based on survey and case studies. Data were collected within three district of Tanga region, reputed to have great potential in orange.

The study revealed that, the current farming system is characterized by four production systems: Mixed orange varieties with food crops for long time (17%); mixed orange varieties with food crops for 10 years (66%); orange varieties in pure stand with food crops for 10 years (10%) and oranges varieties mixed with cash crops and then food crops for long time (7%). Oranges are grown under rain fed conditions. The study also found that, use of manure and pesticides were limited. The seedlings are of poor quality with individual farmers propagating their own seedlings which are susceptible to diseases.

The study proposes an alternative farming system, which will counter the seasonality in production and ensure good quality fruits.

CHAPTER 1 INTRODUCTION

Background of the study

Recently, an international juice and fruit trader company visited Tanzania to investigate the possibility of investing into the citrus sector related business. Initial consultations with the various stakeholders resulted in a reinforced idea that a major development in fruits production, citrus and pineapple especially, is feasible within Tanga Region area they visited. However the information that was gained at this initial stage was limited with regards to the existing farming systems and value chain, the possible changes for further improvements, the investment opportunities and investment policy as well as the domestic influences of different stakeholders on the orange sector in Tanga. Therefore, the international juice and fruit trader company realised it was important to carry out an explorative study on citrus farming systems in Tanga in regards to obtaining a clear understanding on how to get quality product for supply and how the orange produce can evolve better, towards the value chain.

For that; two professional master's students from Van Hal Larenstein University of Applied Sciences were engaged to conduct explorative research on the citrus sector of Tanga Region. Two separate but complementary studies related to citrus production system and value chain were conducted in order to gain detailed information concerning the fruit business within Tanga region. This study was conducted on one particular part related to citrus farming system in Tanga region.

Problem statement

In Tanzania, the Region of Tanga is famous for its high potential in Citrus fruits production, especially oranges. Oranges are marketed through two main channels the domestic and export chains. Represented by 60% of the production, export market is growing and at the same time requires quality and stable product supply. With regards to the high potential of orange production and rapid development of international fruit trade business towards Tanga; an international company is interested in investing in orange fruits business in Tanga. However, insufficient information is available with regards to the current situation of citrus farming system, the possibility for improvement so that the business can rely on a stable basis.

Objective

The objective of this study is to develop an efficient farming system for the supply of citrus and pineapple from the cultivated area of about 25000 ha.

Research Questions

1) What are the main characteristics of existing citrus farming systems in Tanga?

   i.   What are the citrus cropping patterns in Tanga?

  ii.   What are the main citrus farms structures in Tanga and how do they function?

 iii.   Are there some industrial scale orange farms in Tanga

 iv.   What are the currents constraints related to the citrus production process and what are the possible solutions for further development.

  v.   Who are the main stakeholders involved and how do they collaborate?

2) What would be the alternative farming system in Tanga?

   i.   What will be the better farm design?

  ii.   What will be the better product mix?

 iii.   What are the main investments and the cost price?

 iv.   To what extent is this farming system feasible?

  v.   What are the current investment opportunities, investment policy in Tanzania and how it applies in practice?

1.5. Report structure

This report is organized into five main chapters. The chapter I offers the background of the study and describes the problem statement. Its further includes the formulated research questions that guided the study. The chapter II consist in literature related to Tanga region, orange sector and essentials of farming system. The chapter III consists in research methodology: area, research strategy, tools used. The chapter IV presents the empirical findings of the field research. Results are discussed under chapter V. The report ends with chapter VI that includes the conclusion and recommendations.

CHAPTER 2 LITERATURE REVIEW

2.1. United Republic of Tanzania

Tanzania, officially the United Republic of Tanzania (*Jamhuri ya Muungano wa Tanzania*), is located in Eastern part of Africa. It borders Indian Ocean in the East and Rwanda, Burundi and Lake Tanganyika in the West. In the North, it borders Kenya, Lake Victoria and Uganda and in south it shares borders with Zambia, Malawi and Mozambique. According to the 2002 National Population Census, Tanzania has a population estimated to 34.443.000 inhabitant per km^2 (Nathan Associates Inc., 2005).It covers an area of 945,200 km^{2}and counts 8 regions.

Map1: Geographical localization of Tanzania

Agriculture is the mainstay of Tanzanian economy. Agriculture has a large share (45%) of total GDP in the country and accounts for around 80% of total employment (Nathan Associates Inc., 2005). Agriculture in Tanzania is dominated by smallholder farmers cultivating an average farm size of between 1 hectare and 3.0 hectares. About 70% percent of Tanzania's crop area is cultivated by hand hoe, 20% percent by ox plough and 10% percent by tractor. It is rain fed agriculture (PADEP, 2003).

Of the total 43 million hectares suitable for agricultural production in Tanzania only about 6.3 million ha (14%) are under cultivation. In addition, out of the cultivated land only 150,000 ha are under irrigation despite the irrigation potential estimated at a minimum of 1 million ha (Ministry of Agriculture, cooperative and Food Security,2004). According to the same source, Tanzania's climatic growing conditions can accommodate the production of a wide range of flowers, fruits and vegetables. Vegetables include tomatoes, spinach cabbages, okra etc. The most important fruits include tropical fruits (citrus, mangoes, pineapples, etc) and fruits

suitable to more temperate climates (the highlands) such as apples, pears, blackberries and strawberries (Verschoor and Nyambo, 2005). Although citrus fruits is grown in most part of Tanzania (SCF, 2008), Tanga region is famous for its variety of citrus fruits (oranges, limes, grapefruits etc.), where oranges represent the third most fruits basket after mangoes and pineapples (Verschoor and Nyambo, 2005).

2.2. Tanga Region

Tanga region is located in the North-Easter part of Tanzania between latitudes 4° and 6°south of the equator and between longitudes 37° and 39° East. Tanga region is bordered by the Republic of Kenya in the North, Kilimanjaro Region in the Northwest, Manyara in the West, Morogoro and Coast Region in the South and the Indean Ocean in the East .Tanga region is divided into 7 Districts: Lushoto, Korogwe, Handeni, Muheza, Pangani, Kilindi and Tanga. The region has a total area of 27,342 km^2 out of which 572 km^2 is covered by water.
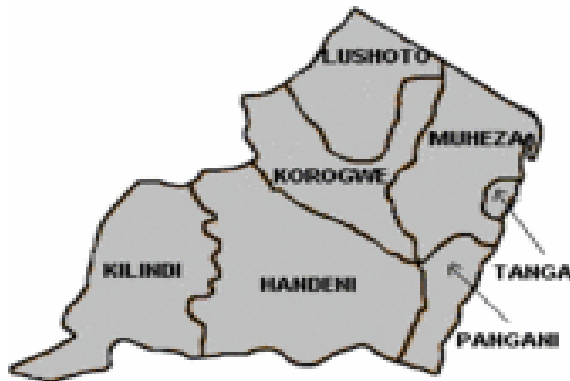
Map2: Tanga region

According to the 2002 Population and Housing census, Tanga region had a total population of 1,636,280 people within 355,713 households of which 793,159 were males and 843,121 were females (Tanga Socioeconomic Profile, 2008).

2.2.1. Climate

Tanga experience a moderate temperature and rainfall climate. The coastal nature of the large part of the Region, characterized by high atmospheric humidity, which lies between 100% maximum and 65 to 70 % minimum, affects the patterns of temperature and rainfall. Average annual temperature varies between 24°C in highlands to 32°C to low lands. Tanga region experiences moderate temperature of around 23°C almost throughout the year (TRCO, 2008).

The average annual rainfall varies between 200mm and 2000mm. However, the average varies from year to year and between ecological zones. The coastal plains in Tanga and Pangani district and part of Muheza District experience moderate high annual rainfall of 800-1400mm, while the dry plains of Handeni, Kilindi and Korogwe districts receive low rainfall

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ranging from 200 to 600 mm annually. High altitude area which include Usambara mountain areas in Lushoto District and Korogwe District, Amani mountains in Muheza District and Nguu mountains in Handeni district, experience high annual rainfall ranging between 800mm and 2000mm. Tanga region has a fairly distributed rainfall (average 1223 mm/year) except for Handeni District (875 mm/year).The rain fall is a bimodal. Tanga Region experiences generally two major rainfall seasons, with the long rains period between March and May and short rains period between October and December. Some variations occur with however a weak amplitude.

2.2.2. Land and Land Use

Being about 2, 9% of the total area of Tanzania which is 942, 784 km^2, Tanga Region has a total area of 27,342 km^2 out of which 572 km^2 are covered by the water. 2% of Tanga territory is covered by water, where out of eight district, Pangani, Tanga and Muheza have significant water bodies. The lion share goes to Pangani district which accounts 70% of the total water body.

Tanga Region depends on agriculture as the main stay of its economy. Land is abundant. There is an arable land of 1,700,000ha, of which only 463,000 ha. (26.4%) are under cultivation. The following table offers estimations of land availability within the districts covered by the study.

Table 1 Useful Land availability in the zone of study

Districts	Total useful land(ha)	Land Used(ha)	Land available(ha)
Handeni *	340,407	102,141 (20%)	238,266 (80%)
Korogwe **	375,603	242,263 (64.5)	133,339 (35.5%)
Muheza ***	916,000	801,000 (70%)	115,000 (30%)

Source: Author

 (*) Estimation from Handeni District Horticulturist

(**) Calculations on the basis of data from Korogwe District Investment Profile (2007: 10)

(***) Calculated on the basis of data from Muheza District Socio-Economic Profile (2007:3)

Suitable land is still available in Handeni District. This constitutes an opportunity for investors for further expansion of the production of a crop of choice, provided however that quality of road network is improved. The land scarcity is evident in Muheza and Korogwe district. This constitutes a limitation to further future expansion.

2.2.3. Topography, soils and drainage

Four major types of soils are closely related to the physiographic and can be identified in Tanga region as follows (TRCO, 2006).

- Well drained, deep to moderately deep, red and yellowish red clays, sandy clays, loams and clays, mainly on Usangara rock within the mountainous

areas.

- Well to medium drained, shallow, moderately deep to deep red and brown sandy loams, loamy sands and clays in the upland areas.

- Well to moderately well drained, light colored sands and yellowish brown to yellowish red loams and clays in the coastal areas.

- Poorly to imperfectly drained, grey to black clays and sands (partly saline) in the alluvial plains as well as minor valleys and depressions.

Well drained and deep soils are more recommended for orange production purpose. Tanga Region is part of the largest Indian Ocean drainage basin (TRCO, 2006). The region's drainage is formed by a small number of rivers and streams that flow from highlands to low lands. The major rivers include Pangani, Mkomazi, Soni, Lwengera, Umba, Zigi, Mwarongo, Mgwisha and Mgombani (TRCO, 2008). Those lake and rivers represent opportunities for irrigation scheme. However, despite the abundance, area under irrigation of lake and rivers is very low.

2.2.4. Agro-ecological zones

Agro-Ecological Zones definitions relies on aspects such as land, climate, soil, topography, crop suitability and crop Productivity (FAO and IIASA, 2000). Using this principle, four Agro-Ecological Zones have been defined for Tanga Region. Those zones include the Coastal Plains, Wet Plains, Dry Plains and Mountainous Areas.

Table 2 Agro ecological zones in Tanga

A – E Zones Altitude District covered	Rainfall Temperature Soils	Main activities	Main crops
Coastal Plains: 0-150m above sea level, Covers Pangani district, Tanga and part of Muheza	800-1,400mm 24°C - 32°C Sand and Sandy-clay	Agriculture, Horticulture and Fisheries, Sea Weeds (Mwani)	Citrus fruits, Sisal, Coconuts, Cashew nuts, Maize, Cassava, Rice and Sea Weeds
Wet Plains: 500-600m. Above sea level. Covers mostly Muheza and Korogwe districts. Topography: low plains	800 – 1,000 mm 24°C - 32°C -	Agriculture and Horticulture	Sisal, Coconuts, Cashew nuts, Cotton, Maize, rice, beans, Cassava and Citrus fruits
Dry Plains: 200-600m. above sea level Handeni, part of Korogwe, Muheza and Pangani	500 – 800 mm 21°C - 24°C -	Beekeeping Agriculture and Livestock (beef cattle)	Timber, Honey, Sisal, Cotton, Tobacco, Maize, Cassava and Beans

| Mountain belt: 1000-2400 m above sea level. Covers areas in Lushoto, (Usambara mts) Muheza (Amani mts) and Handeni (Nguu mts) districts | 800 – 2,000mm 21°C - 24°C Red clay loamy soil | Agriculture, Horticulture and Livestock (Small holder dairy cattle | Tea, Coffee, Cardamon, maize, potatoes, bananas, beans, vegetables and temperate fruits. |

Source: TRCO, 2008, TRCO, 2006

The agro-ecological zones features in Tanga Region offer an evidence of high potential in Horticulture. Indeed, with regards to the table above, temperate fruits are met upland areas while, with great share, tropical fruits such as Citrus fruits experience great potential in low land areas. Citrus fruits experience low potential in dry plains of Tanga and are however feasible provided enough water is supplied trough irrigation.

2.2.5. Orange growing conditions requirements

Citrus trees are grown throughout the world in tropical and subtropical areas, but they achieve the best quality under subtropical conditions. The optimum temperature ranges between 20°C and 28°C. Low rainfall and plenty of sunshine is good for citrus trees as it promotes good flower differentiation, flower and fruits development as well as fruits quality. Citrus is well adapted to deep, well drained soils. Loamy soils are preferred while heavy clays and poorly-drained soils will result in poor growth and production as well as shorter life. Citrus trees can't perform well under light and sandy soil conditions. In General most citrus trees prefer the soil PH to be between 5.5 and 6.5 (FFTC, 2003).

While the orange will often come from seed because of nuclear embryos, the common means of assuring the reproduction of cultivars of known quality is by budding onto appropriate rootstocks. Rough lemon became the dominant rootstock, as it induces more rapid and vigorous growth and earlier bearing (Sauls, 1998). Budded oranges are spaced with a range of 8cmx8cm to 10cmx10cm. In Tanga the plant density is about 100 orange trees per acre i.e. 250 orange trees per ha.

Fertilizer application is necessary for high yield and fruits quality. Chang and Petersen (2003) indicate that a basal application of fertilizer is given after harvest, in order to restore tree vigour after fruits production. It is advisable to improve soil conditions by applying organic manure or liming material. While the fruits are developing, additional doses potassium must be added, since it helps to improve both quality and size of oranges. Nitrogen should be reduced or not used.

Concerning water requirements in orange production, the flowering, fruits set and new flush development period requires optimum soil moisture. Water deficiency means that the leaves are smaller and shortens the flush. Irrigation must be performed to maintain soil moisture, when there is no rain. During the (late) fruit development period, water requirement of orange fruits are high, due to the high transpiration rate especially when temperature are high. Orange trees need greatest amount of water. Finally, during fruits maturing stage soil should be kept fairly dry while the post harvest period requires a small amount of irrigation to restore the growth, increases photosynthesis in leaves, promotes flower differentiation and

avoid water and nutrients stress (Chang and Petersen, 2003).

With regards to training and pruning, three main objectives are followed. The first one is to increase the total effective leaf area and promote photosynthesis by exposing the leaves to the light and air. Secondly, proper training and pruning keep the tree in the right size to ease the management and trend of trees. It increases also the vigour of trees, enhance their tolerance to various stresses and help to maintain the most efficient balance between vegetative and fruiting. Thirdly, a good training and pruning help to control pests and diseases.

2.3. Orange Sector in Tanga

2.3.1. Orange production

In Tanzania, orange trees were planted in Muheza district of Tanga Region in early 1900's by Anglican missionaries at Magila mission and then spread in the neighbourhood with rapid expansion to other village such us Potwe (Potwe ward), Semungano (Kilulu ward) and Tanga town. However, effective propagation of oranges has started during the period 1930 to 1940, through the nursery run by Mlingano Sisal Research Station. Plants of different varieties and other citrus species produced by the station by vegetative propagation were distributed to farmers free of charge (Mbiha and Maerere, 2002).

General opinion considers that the orange production in Tanzania in general and Tanga in particular, grew up to be of a major economical importance during the late 1970's (ECI 2003). Since then, action were taken for further developments in citrus sector, with the establishment of district nurseries all over the country, different Horticultural Extension Project and the creation of National Horticulture Research Institute (19 with aim of evaluating the performance of 20 citrus cultivars introduced from California, in order to alleviate the seasonality of fruits supply in the district by use of varieties with different harvesting time. (Mbiha and Maerere, 2002). It is important that the expansion of orange production resulted in implementation of Tangold Food Products limited at Korogwe in 1980 and Muheza Fruits canning Co. Ltd (MFCC) in 1982. This was destined to alleviate the poor marketing of Oranges but, the project did not succeed due to the lack of working capital. However Tanga region experiences a relatively stable production of oranges, varying between 65,580 tons in agricultural year 2001/2002 and 65680 tons in the year 2003/2004 (TRCO,2008). The land under orange production is 9342.34 ha and Muheza district is leading in orange production within the region, with a relatively stable average growth.

Table 3 Cash crops production (tons) in Muheza district

Crops	Years					
	2002	2003	2004	2005	2006	2007
Coconut	12,350	12,200	12,000	11,238	11,175	11,180
Oranges	60,520	60,800	61,020	65,000	65,200	65,3000
Cashew nut	20	21	20	15	17	18

Cardmon	500	498	494	490	485	480
Tea	3,510	3,610	3,902	3,116	3,990	4,082
Sisal	24,300	24,125	23,928	18,620	17,803	16,126

Source: Muheza District Council, 2006

2.3.2. Orange Value Chain and marketing channels in Tanga

The main actors of orange chain in Tanga include among others the farmers, the, local hawkers, local brokers, the local wholesalers and the Kenyan traders. Howevers, local wholesalers as well as Kenyan traders influence the orange chain more than others. The main orange marketing chain in Tanga consists in three main channels which include the on farm channel, domestic market channel and export market channel which relies more on Kenya channel.
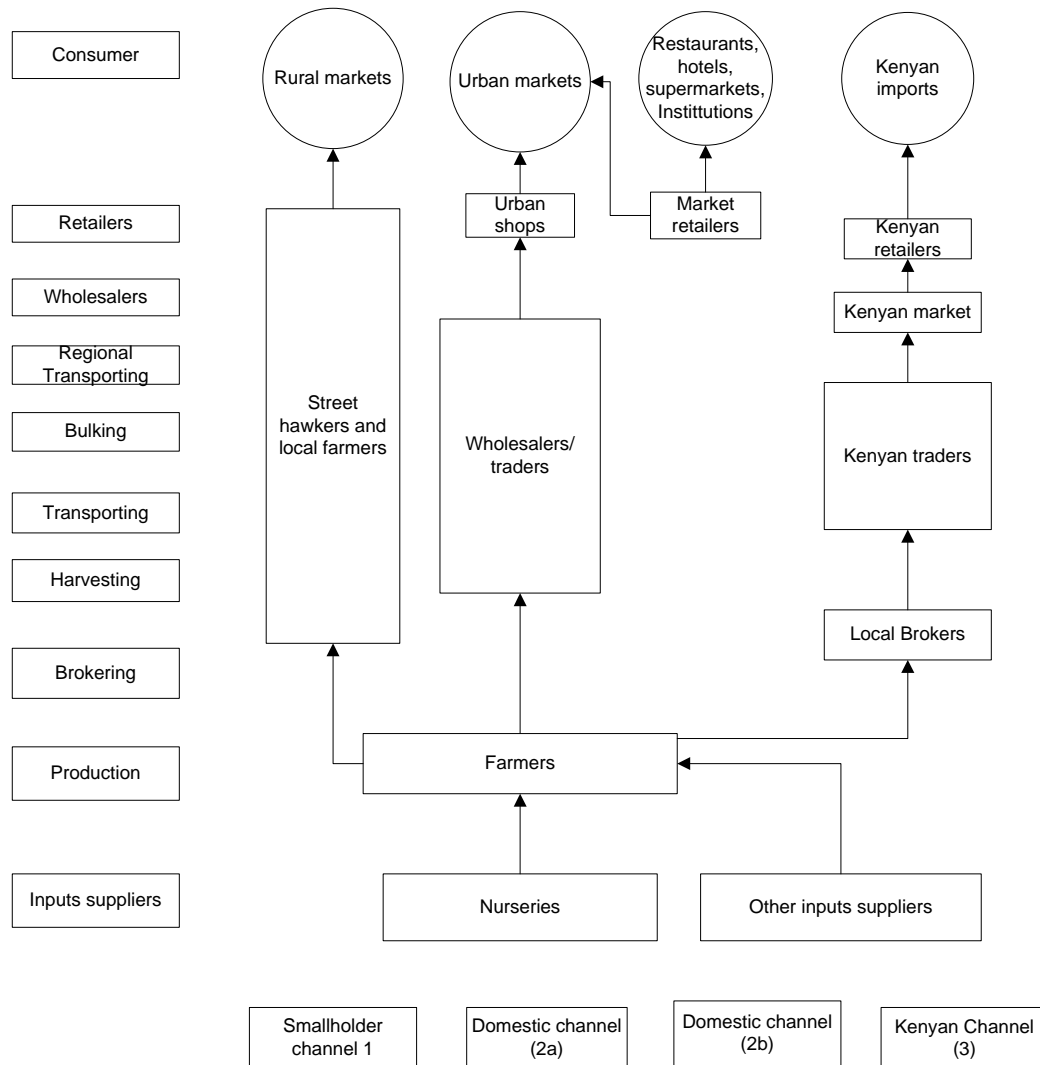
Figure 1: Orange sector map
Source: SCF, 2008

The on farm channel represents that smallest portion of the market which consists of smallholder farmers and hawkers who sell oranges directly to the consumers in the rural areas or to the passengers on different bus stations. Participant in that channel have

vertically integrated the function of harvesting, transporting, wholesaling and retailing.

The domestic market channel could be divided into two channels depending on the harvesting season. The channel (a) is observed during the peak season and is characterized most of the time, by the direct contact between the traders and orange farmers, for product purchase purposes. The product follows its route to wholesale market, retailers, hotels and restaurant and other institutions for consumption. On the other side, the channel (b) takes place during the low season. The chain actors are basically the same. However, the amount of orange product available being limited, the brokers' job becomes of great importance.

The export market for Tanga orange production relies essentially on Kenya. This channel is of great significance as more than 60% of the production is exported to Kenya. Being active during the peak season, this Kenya channel implies the presence of local brokers (whose importance is currently declining) who link orange farmers and Kenyan traders who carry out the transportation to Kenya. Very few local traders have penetrated with success the Kenyan orange market. Indeed, as brokers have tendency to protect their market by hiding information to Kenyan traders, the Kenyan traders are protective of their market and do not easily allow Tanzanian traders direct access to the Kenyan market.
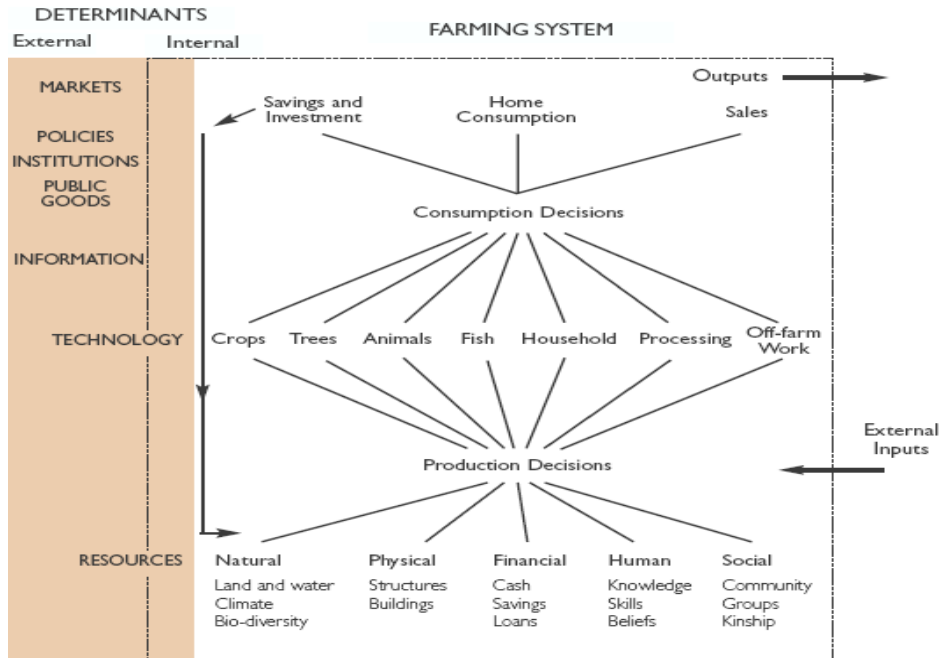
2.4. Farming systems

A farming system as a population of individual farm systems that have broadly similar resource bases, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions would be appropriate. Depending on the scale of the analysis, a farming system can encompass a few dozen or many millions of households (Dixon and Gulliver, 2001). In fact, in each farm unit, there is a system which transforms inputs into agricultural outputs and which undergoes changes over the time. During the process of adapting cropping patterns and farming techniques to the natural, economic and socio-political conditions of each location and the aims of the farmers, more or less distinct farms producing under similar natural, economic and socio-institutional conditions tends to be similarly structured. Therefore, the functioning of individual farm system is strongly influenced by the external environment, including policies and institutions, markets and information linkages. A farm is characterized by goals and decisions, their boundaries, their activities and their relations, the internal and external relations as well as their structure which is function of internal and external relations (Rothenberg, 1980).

The main criteria for farming system categorization as noticed by Dixon and Gulliver (2001) consist in available natural resources base (water, land, grazing area and forest; climate, altitude and landscape; farm size, land tenure and organization) on one hand and on the other side, the dominant patterns of farm activities and household livelihoods (field crops, livestock, trees, aquaculture, (…) taking into account the technology used which determine the intensity of production, integration livelihood pattern, livestock and other activities. Rothenberg (1980) adds some other criteria related to cultivation. These include type of rotation (annual, perennial crops, etc), intensity of rotation, water supply, cropping pattern and animal activities, implements used for cultivation and degree of cultivation. Those criteria and broad grouping of farming systems are applied and names given are notably

water source availability (irrigated, rain fed, moist, dry); climate (tropical, temperate, cold); landscape(lowland, upland); farm size(large scale, medium scale, small scale); production intensity (extensive, intensive, etc.), cropping patters (mixed, specialization, etc), etc.

Researchers from FAO have identified five categories of interrelated determinants of farm and by extension farming systems, which represent the major areas in which farming system characteristics, performance and evolution are likely to be significantly affected.

Figure 2: Farming System determinants
Source: Dixon and Gulliver (2001)

Farming systems determinants are external and internal to/or part of farm systems, where others are external. The principle external factors which influence the development of farming systems include among others policies, institutions, public goods, markets and information. The availability of markets and the price on offer influence the farmer's decision on enterprise pattern, on purchase of inputs and on the timing of the produce sale. The availability of social infrastructure in rural area determines the transport cost. The availability of information and educational services affect the household strategies and decisions. Technologies which determine the nature of production and processing and natural resources are largely endogenous and are basically depicted as lying within boundary of farming system.

For this study the main determinant factors to be considered are the cropping pattern, the use of agricultural input, the technology in use, the growing conditions, transport, access to credits, etc.

CHAPTER 3 METHODOLOGICAL APPROACH

3.1. Study Area

The study has been conducted in three districts of Tanga region: Muheza, Korogwe and Handeni. Data gathered from the Tanga Socio Economic Profile 2008 version, show that the area of study covers a total area of 14790 km^2 including 4922 km^2 for Muheza, 6112 km^2 for Handeni and 3756 km^2 for Korogwe.

Agriculture is the main economic activity. Muheza, Korogwe and Handeni districts belong to the same agro-ecological zone. The main crops grown include Sisal, Coconuts, Cashew nuts, Cotton, Maize, rice, beans, Cassava and Citrus fruits. Estimations indicate the availability of 238,266 ha, 133,339 ha, 115,000 ha of land suitable for agriculture i.e. 80%, 35.5% and 30% of the total land for respectively Handeni, Korogwe and Muheza districts. Muheza district is famous for its high potential in orange production.

3.2. Research Strategy

The field work was conducted between 14th July and 13th August 2008. Effective field work started on 17th July 2008, in Muheza with a courtesy visit to Mr Mwezimpya, the director of Agriculture, Livestock and Environment. That first contact yields in an overview of orange subsector in Muheza district. The processes of data collection started with two separate interviews with key informants. Those are Mr MTUMBI Mohamed the Agriculture Officer in Muheza District and his Horticulturist, Mrs Nahida MBWANA who introduced us to Mr Isaya MPULIKIRE, Executive Secretary of Tanga Association of Best Orange Growers Co.Ltd (TABOGO), an apex of 15 associations counting 1200 members.

Talks aimed to understand the current general situation of the fruit industry in Tanga (assets and constraints); different types of fruit crops and area of high potential; the place of citrus and pineapple; the trend of production, the farming system (defects and aspects to improve), the potential commercial scale farmers, etc..The discussions yielded in a clear understanding of the situation of oranges sector and the reformulation of the methodology, especially the definition of study area and crop material of the study. Indeed, it became clear that despite the high potential in orange production in Muheza district, Handeni district is blessed by the availability of the suitable land that represents great opportunity for expansion in the future. It became therefore necessary to understand the farming system in use in the district as well.

Thereafter, a survey and two case studies were carried out. The survey targeted 30 orange growers. The case study targeted officials of department of agriculture, research station and farmer's apex representative on one side and on the other hand, one commercial oriented farmer Mzee Abdalahamani KIROBOTO.

3.3. Surveys

Survey was carried out on 30 farmers, selected randomly from four villages selected within three districts with regards to their potential in Orange production. Most of those farmers are members of TABOGO. The SPSS analysis shows the composition of the sample as here below.

Table 4: Number of Interviewed orange farmers

District	Orange farm size			
	0.4Ha - 2Ha	2Ha - 6Ha	> 6Ha	Total
Muheza	2	4	4	10
Korogwe	2	4	4	10
Handeni	2	4	4	10
Total	**6**	**12**	**12**	**30**

Legend:

0.4ha-2ha: small scale farmers

2ha-6ha: medium scale farmers

>6ha: large scale farmers

The survey questionnaire yielded information related to aspects such as product mix (fruits crops, varieties, harvesting time), farming systems (land, farm size, growing conditions, input in use, cropping patterns, technology, objective, sale, transport, input cost, etc), constraints and possible solutions, etc.

3.4. Case studies

Interviews were conducted on officers with special interest in the orange sub sector. They were purposively selected from the following organizations:

- The responsible of Tanga Association of Best Orange Growers

- Agriculture officers Horticulture within Muheza District

- Agriculture officer within Handeni District

- Officer in charge of production in UNNAT Processing factory

- District Executive Commissioner

- Regional officer in charge of Agriculture

- Researchers from Mlingano Agricultural Research Centre

- Researchers from Tengeru Horticultural Research Institute

Interviews yield in formation related product mix (fruits types, their geography, area under cultivation, production, harvesting time, etc), current situation in farming systems (assets, defects, aspect to be improved), different orange sector stakeholders and how they collaborate, and the existence of large commercial orange farmers; investments policy in Tanzania as well as investment opportunities.

The second case study was carried out on farmers; respective medium scale and commercial farmer were selected for specific interview related to orange farm economics within the context of Tanga.

3.5. Data Collection

Interviews were conducted using a self administered questionnaire. Semi structured questionnaire was developed and pre-tested. Curried out during the exploration time, the pre-test was of great importance as it helped to get familiar with the field, the population to interview and to ensure that the all questions are clear and adapted to the interviewees. The questions were guided by the research objective and had to provide answers to the sub questions of the main research questions in the proposal.

The last methods used while collecting data, consisted in exploiting all documents related to fruits sector, the orange subsector in particular. These documents included different reports documents produced by concerned departments at regional and district level, the Region and District social-economic profile, Regional and District investments profile, etc. This has contributed to get understanding about all those stakeholders with potential influencing role on the dynamics in orange farming system as well as the orange sector and all fruits in general. Exploring those documents provided a clear understanding of investments policy and opportunities.

CHAPTER 4 RESULTS

4.1. Orange farming system

The description of the current orange farming system in Tanga was done with regards to aspects such as the land and land status, growing conditions, the cropping patterns and layout, the farm functioning, the subsector stakeholders and the level of collaboration, crucial problem and their potential solution, etc.

4.1.1. Land and farm structure

In Tanga region, land tenure provides cultivation right over the property which is owned through traditional or modern system of inheritance. All orange growers interviewed are owners of their land inherited (63.3%) or acquired through both inheritance and purchase (32.7%). Variations are however evident within one or another type of farm. Thus, while 85% of small scale orange farmers exploit only inherited land, 36.4% medium scale and 54.6% of large scale farmers purchased additional land as they found interest in orange business.
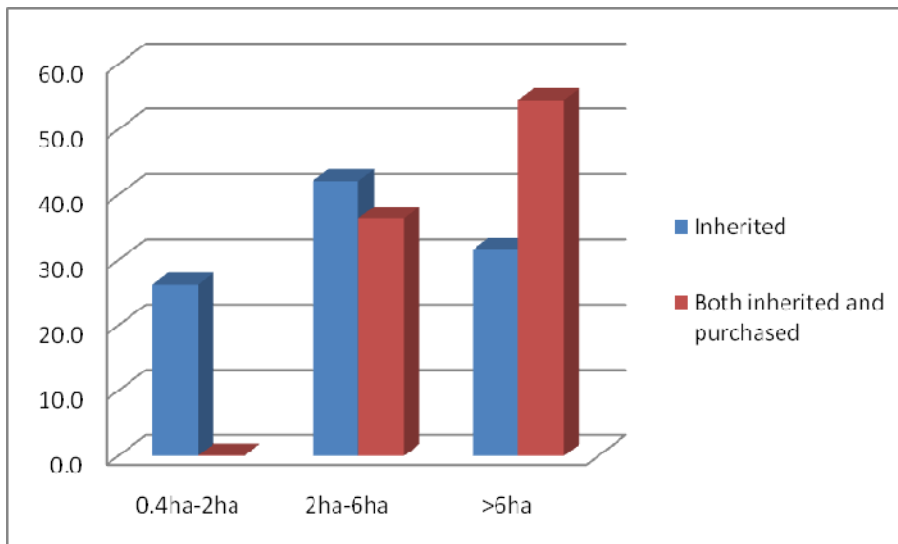
Figure 3. Land status in Tanga (N=30)

The categorization of farmers has followed the existing one which differentiates three main orange farm size: the small farm (0.4ha-2ha); medium size farm (2ha-6ha) and large scale farmers with a farm size of more than 6ha (Mbiha & Maerere, 2002) cropped with orange fruits trees. However this farm typology must be reviewed, as currently, there is increase in orange farm size leading to commercial farms, due to the prosperity of the sector.

Table 5. Characteristics of orange farmers in Tanga

Farmers	Characteristics
Small scale	- Size: 0.4ha-2ha orange orchards - Typically diversified fruits(banana, mangoes, coconuts, and pineapples) and cash crops (paddy, maize, cassava) farmers - Cash crops production take place mainly as intercropping between the orange tree - Their labour is divided between various enterprises - Labour and input are focused on most profitable enterprise - Use family labour and contract labour for trees clearing - Old or diseased trees are not always replaced - Include most of orange farmers
Medium scale	- Size: 4ha-6ha allocated to orange production - Typically diversified fruits and cash crops farmers - Relative importance of orange: - Much attention and resources to orange - Willingness to expand orange production area and shift to large scale producers - Use family labour in low season and contract labour in peak season - No permanent labour
Large scale	- Size: more than 6ha allocated to orange - Less diversified fruits producers - Diversified cash crop producers with additional field - Orange is identified as most profitable enterprise: hence actively expanded their orange orchards - Old trees replacement is often done - Use contract labour - Industrial farmers use permanent labour - Most of them use manure

Source: Adapted from Mbiha and Maerere (2002)

Estimations from TABOGO executive secretary indicate that most of small scale farmers are found in Muheza, while medium scale farmers are mostly found in Korogwe and Handeni districts. Large scale farmers are emerging in Tanga region, as successful medium scale farmers expand their enterprises.

The structure of orange farms relies between entire unit structure and spread plots based farm structure.

Table 6. Distribution of Orange farm structure in Tanga Region (N=30)

Farm Type	Farm structure		
	One entire unit	Spread plots	Total
0.4Ha - 2Ha	4	2	6
2Ha - 6Ha	7	5	12
> 6Ha	9	3	12
Total	20	10	30

Generally, in Tanga region, all size considered, most (66.6%) of the farms are integral units. However in some cases, for medium (41.7%) and large scale farmers (25%), the farms are composed of different wide plots. The existences of integral larger scale farms favour the development of pure stand orange plantations.

4.1.2. Orange farming conditions

In Tanga, oranges are grown under rain fed regime for all orange farmers (100%). Tanga experiences a bimodal rain season. The short rain season covers October and November while the long rain season covers March and April. Therefore, growing oranges depends only to the clemency of the climate.

Table 7: Season Calendar of oranges in Tanga

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept	Oct.	Nov.	Dec.
Dry season		Heavy rain		Dry season					Short rain		Dry
Harvesting		Scarcity		Harvesting						Harvesting.	

Tanga experiences two dry seasons which coincides quite exactly with the harvesting time. It would be possible for farmers to harvest three times a year by performing irrigation and attempt for example to harvest orange in April. However, this is not being done, due to the lack of irrigation equipments as well as related skills. However, if irrigation is not cost effective for small scale farmers (unless with joint efforts) it could be possible for medium scale and large scale farmers.

All orange growing related activities are performed manually. However some large scale farmers state they feel a need of modern equipment (tractors and irrigation equipment), in order to perform well their related activities. One example is Mr KIROBOTO in Muheza District, who has 500ha under orange and 1000 ha purchased for that purpose but not yet exploited.
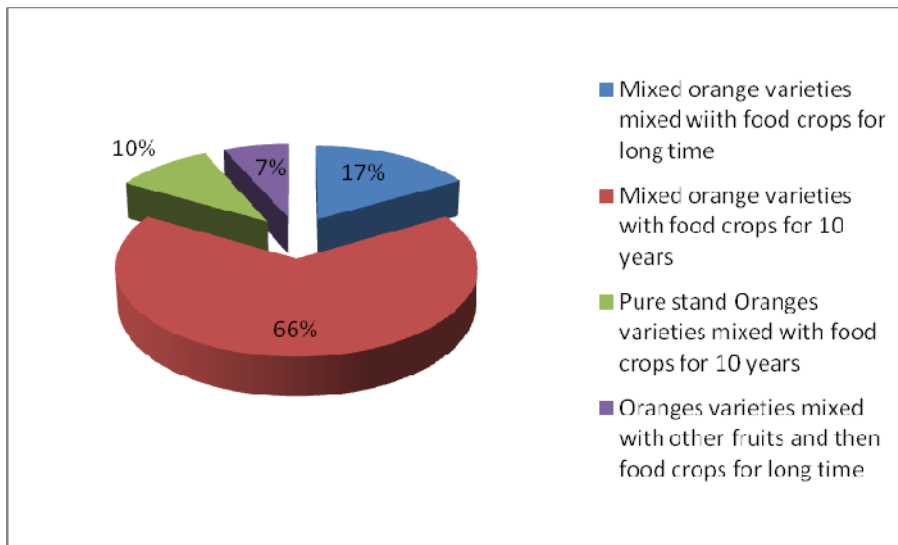
4.1.3. Orange cropping patterns

Cropping systems as well as layout associated depend on the objective of the farmer with regards to the main crops. In orange orchard in Tanga, two major cropping systems are observed. All oranges varieties are mixed together with other food and cash crops (82.3%) on one hand and on the other hand it has been noticed the evolution to pure stand orange varieties within professional large scale farmers (16.7%). It is important to notice however that, mixing orange trees is necessary at least within an interval of 10 years. At this time, orange trees have a shade which does not allow any other crop. Four cropping patterns of oranges are in use within Tanga.

Table 8: Distribution of orange cropping systems in Tanga (N=30)

Cropping systems	Orange farm size			
	0.4Ha - 2Ha	2Ha - 6Ha	> 6Ha	Total
Mixed orange varieties mixed with food crops for long time	4	1	0	5
Mixed orange varieties with food crops for 10 years	1	9	10	20
Pure stand Oranges varieties mixed with food crops for 10 years	0	1	2	3
Oranges varieties mixed with other fruits and then food crops for long time	1	1	0	2
Total	6	12	12	30

The cropping system has evolved over the time, as farmers have got skills and realized importance of orange as a source of income. The table above indicate that, currently, the cropping system is characterized by a mixture of seasonal or annual crops with oranges varieties mixed or in pure and this for 10 years or for long time. Survey revealed that the mixture of annual or seasonal food crops with oranges varieties mixed is the most practiced (66.7%). Pure stands for orange varieties are generally observed with large scale (16.7%) and medium scale (8.3%) farms.

Figure 4.Global view of cropping patterns in Tanga (N=30)

Pure stands for orange varieties are generally observed within large scale (16.7%) and medium scale (8.3%) farms. Handeni and Korogwe district are more advanced with 20% and 10% as proportion of farmers of farmers performing pure stand cropping system

The mixture of food crops within a mixture of orange verities trees and other cash crops (coconuts for example) has been practiced since the introduction of orange in Muheza. Therefore this cropping system is more likely observed in Muheza district within some large, medium and large scale farms. Those farms are basically owned by old farmers.

The second sub system consists in the mixture of orange varieties (mixed too) with food crops such as maize, beans, etc, for long time. This is the case of small scale farmers where the entire farm is cropped with orange trees. Maize or Beans are seasonally grown under oranges. Orange trees benefit from maize or beans crops husbandry practices.

The thirds subsystem and which is currently most practiced consists of the intercropping mixed oranges varieties with seasonal food crops (maize, beans) for only 10 years. Indeed, in Tanga, 10 years is the maximum period for intercropping other crops within orange plantation, because of light competition. During that period, orange trees benefit from husbandry practices to seasonal crops.

Within the fourth cropping subsystem, farmers tend to specialise more than the previous one by adopting the pure stand for individual orange varieties. The layout is well organised so that orange varieties are not mixed. This can help in well designing a cropping plan which could favour a clear orange variety mix.

4.1.4. Farm functioning: Input and Orange Husbandry practices

In Tanga, the use of manure and other inputs such as fertiliser and pesticide is very limited. Only 13.3% of interviewed farmers use manure. Others do use neither manure, nor

chemicals fertilisers.

Table 8: use of manure in orange farm

Use of Manure	Orange farm size			
	0.4Ha - 2Ha	2Ha - 6Ha	> 6Ha	Total
Sufficient	0	0	1	1
Just a little	0	2	1	3
Not use	6	10	10	26
Total	6	12	12	30

Most of the farmers (86.7%) indicated that they do not use manure while growing oranges. Very few people use it effectively (3.3%) while some farmers use just a little. The effective use of manure is being done within large scale and medium scale farms. The non users advance the reasons that the soil has sufficient fertile so that there is no need to manure it. Our observations during the survey have revealed that most of the families do not grow livestock animal, which could help in producing manure for orange fruits as well as other staple food crops. Concerning the use of chemicals including pesticides, it is important to notice the non use. It has been observed during the research that farmer apply minimal crop husbandry practices.

Table 9. Application of orange crop husbandry

Crop husbandry practices	Farms					
	0.4ha-2ha(N=6)		2ha-6ha (N=12)		>6ha (N=12)	
	once	twice	once	twice	once	twice
Weeding	10*(83.3)*	2(1.6%)	4(33.3%)	8(66.6%)	1(8.3%)	11(91.7%)
Pruning and Training	9*(75%)*	3(25%)	7(58.3%)	5(41.7%)	5(41.7%)	7(58.3%)

Pruning and weeding are performed 2 and 3 times a year. Medium scale and large scale farmers perform weeding and pruning more than others. However they are all limited by related knowledge.

4.1.5. Age of orchard

In tropical area, orange tree achieve usually their mature production from year to 20 with peak yield per tree within a period range of 12-15 years. In tanga, most of the varieties a small harvest after 3 years after planting (early Valencia) although some other varieties(late Valencia) bear 5 years after planting. Economical yield ends around 25th year. Evaluating

age orchard helps to get a idea of the extent to what replanting and farm expansion are performed.

Table 9 Age of orange Orchard (N=30)

Age of orchards	Orange farm size			
	0.4Ha - 2Ha	2Ha - 6Ha	> 6Ha	Total
< 5 years	2	3	1	6
5-10 Years	1	4	4	9
10-15 Years	2	1	5	8
20-25 Years	0	0	2	2
25-30 Years	0	4	0	4
> 30 Years	1	0	0	1
Total	6	12	12	30

Survey results revealed that, in Tanga region in general, about 76% of oranges trees range between 5 and 15 years old, where about 50% are younger than 10 years while 40% are between 10 and 15 years old. Relatively old orange trees are between 21-30 years while oldest (over 30 years) represent less than 15%.The high percentage of young orange trees constitutes a clear indicator of orchard expansion as well as the replacement of old or diseased orange trees. The young orange tree generation counts more medium (58%) and large scale (41.3%) farms.

On the other side, survey results revealed a great difference at district level with regards to age of orchard. Actually Muheza district counts more old orchards than younger ones. Survey has indicated that the district counts 30%of orange trees old between 5 and 15 years, while the old generation is for about 70%. In Handeni and Korogwe, most of orange farms are within the young generation category; less than 15 years old.
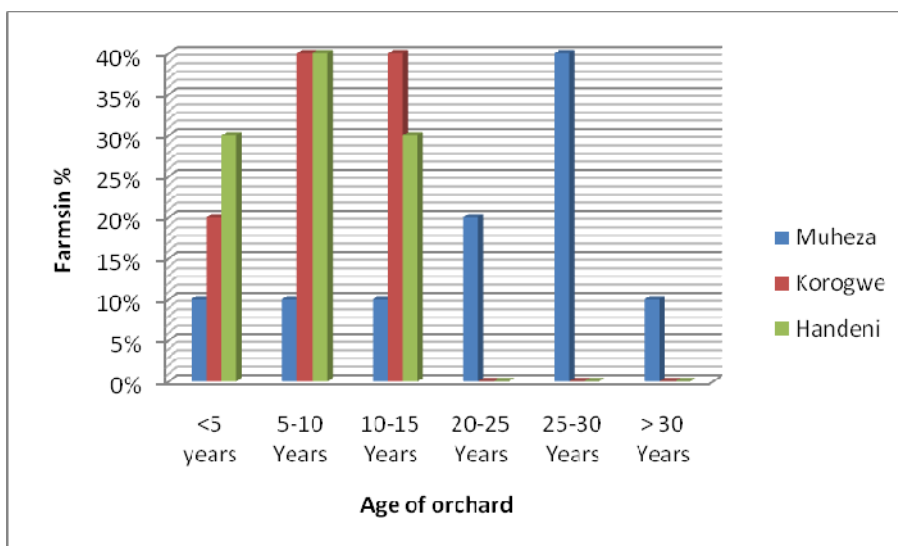
Figure 5: Age of orange orchards by district

4.1.6. Orange varieties in Tanga

Orange sub sector counts seven major varieties Early Valencia, Late Valencia, Jaffa, Washington, Pemba, Nairobi and Zanzibar. Those varieties are described here below as listed in the SUA Horticulture unit collection.

Table 10: Major orange varieties in Tanga and their importance

Variety	Local name(**)	General Characteristics(*)	Rank(**)
Early Valencia	Msasa	High yield, early maturity, medium size, thin and smooth skin, good for long distance transport.	1th
Late Valencia	Valencia	Late maturing, high yield, sweet and juicy when ripe Robust to transport	2 d
Mediterranean	Nairobi	Sweet, medium size, highly flowering, fruits drop down, low yield, last longer on tree	4rth
Washington navel	Kitovu	Poor juice content not sweet, thick skin. Robust to transport, seedless, late maturing	6th
Jaffa	Shamoti	More juicy than others, no sweet, not robust to transport, high yield	3rd
Pineapple	Pamba	Very sweet, soft fruit, late ripening, slow maturing	5th
Zanzibar	-	Sweet, skin slightly thick	7th

Source: *Adapted of Mbiha&Maerere, 2008

     ** Author's initiative (Rank for sale)

Msasa, Valencia and Jaffa are more appreciated by farmers in Tanga region. This contrasts with Mbiha and Maerere results when in 2002; they stated that Nairobi is more appreciated than Jaffa. On the yield front, a survey finding has shown that when well maintained, those preferred varieties can yield 2000 pieces per tree in normal conditions of Tanga. Therefore, the three varieties are considered to be more commercial oriented fruits.

Table 11: Origin of orange seedlings (N=30)

Origin of seedlings	Orange farm size			
	0.4Ha - 2Ha	2Ha - 6Ha	> 6Ha	Total
Own nurseries	1	9	10	20
Neighbours	3	3	2	8
Through wild rootstock	2	0	0	2
Total	6	12	12	30

Young trees used for replacing old or diseased trees as well as trees required for expanding orchards are either produced by farmers themselves(66.7%) or purchased from other farmers that have small home nurseries(23.3%) or obtained through wild rootstock(10%). Currently, there are no specialised companies invested in orange seedlings production. A large proportion of orange farmers are well skilled in budding techniques for the vegetative propagation of oranges. Rough lemon,a vigorous and high yielding rootstock, is always used. However the risk is high with regards to the propagation of disease as rough lemon is prone to *Phytophtora sp* (Gomosis and root rot disease).

4.1.7. Harvesting, Quality and marketing

Harvesting oranges is done six months after the raining period. As Tanga region experiences two rain season, it is obvious that oranges fruits be picked twice a year. Where irrigation is possible, the third harvesting season can be envisaged. In that context, it could be possible to design a cropping calendar which enables the supply of oranges during the scarcity period.

Survey results indicated that for 100% of farmers interviewed, harvesting process related costs are of the responsibility of traders or brokers. Indeed, traders or brokers negotiate the price with the farmers and once negotiation concluded they become trees owner. They engage harvesting contractors that together with the farmer or farmer family member count harvested fruits pack and transport it to the truck. Packing and transport are included in the harvesting contract. Harvesting contractors are mainly the small farmers, neighbours 'family members or local youth. During the survey we noticed that even medium scale farmers and their families fulfil the role of harvesting contractors, as the volume of orange harvested decreases substantially. It has been noticed however that the large scale farmers as well as those who have commercial farms make use of a permanent labour for harvesting but the cost being of the responsibility of the traders. This avoids the loss during the counting operation, as those people are permanent workers and are faithful to their employer than to

the traders.

Some size based selection is evident during harvesting, counting and packing. The oranges that are considered too small are left on the farm. No price differentiation is done with regards to the size or quality or trader level. Different cultivar and quality are mixed with one load. On the quality side, orange varieties are all full of seed; the colour of the skin is not harmonized. In addition there is no real grading and sorting process.

The sale of orange is mainly done at farm gate (95%). However some farmers (5%) exercises willing to achieve the economy of scale, perform themselves the traders' role and transport the product outside of Tanga Region (Kenya and Dar Es salaam).The sale is not done on a contractual basis. Hence most of farmers are ready to sell the product to the better payers.

During the survey we noticed that, the farmers' objective has evolved over the time until the current situation the market oriented. Due to their proximity to the roads, large scale and medium scale farmers are doing better.

Table 12. Farm position vis a vis the roads

Farm position	Orange farm size			
	0.4Ha - 2Ha	2Ha - 6Ha	> 6Ha	Total
Near the roads	0	9	12	21
Far from the road	6	3	0	9
Total	6	12	12	30

Most of large scale and medium scale have easy access to the roads while small scale farmers are located far from the roads. These increase their bargaining power. Therefore while small scale farmers undergo low price, others are paid relatively high.

4.1.8. Margin calculation

The calculation of the margin has been conducted on a gross margin basis. A gross margin consists in the margin available after direct or variable costs have been deducted from the income. A gross margin differs from a profit margin, as it does not take into account overhead, capital investment cost as well as cost of borrowed capital. Gross Margins here are calculated to provide relative margins all farmers types expect during different period in the production season. In addition, for the practical purpose, we preferred to calculate margin with medium size orange farmers.

In calculating we have considered the fact that that10% of oranges are marketed during the

scarcity season (low season), 25% during the medium season and 65% during the peak season. We consider also that orange trees are in their maximum yield period (12-15 years) where an orange tree yields 2000 pieces. All calculation will be done per ha (2.5 a).

Table 13: Margin calculation (Orange medium size farm)

Description	Assumption	Low Season	Medium Season	Peak Season	Total Average
Number of trees per acre	100				
Number of trees per ha	250				
Number of orange per tree	800				
Total number of orange per ha	200000	20000	50000	130000	200000
Price per orange		25	20	15	20
Total income per ha		500000	1000000	1950000	4000000
Pruning	50000	5000	12500	32500	5000
Weeding	100000	10000	25000	65000	10000
Gross margin per ha		485000	962500	1852500	3985000
Gross margin per orange		**24.25**	**19.25**	**14.25**	**19.925**
%		97%	96.25%	95%	

The calculations highlight the fact that farmers make much larger profit on a per orange basis, during the low season while the bulk of income is generated during the high and medium season. Rational producers will therefore endeavour to spread their production season as far as possible into the low season, since profit is there due to the supply driven pricing. The profitability of orange depends to a large extent on the number of orange produced per ha and per tree and the price farmers receive for their crops.

4.1.9. Constraints to orange production

The analysis of orange farm functioning has indicated that orange producers are challenged by numerous technical problems related to orange farming process as well as constraints related to the market and means of production.

The technical problems of farming orange are the following: pest and diseases, insufficiency in soil fertilisation, insufficiency in seedless varieties and insufficiency in skills related to oranges husbandry practices, etc. Those constraints are complex and require the intervention from research department or extension. The problems related to the means of production are basically institutional and require the intervention from the government. Those include among others the unreliable market, low market prices of orange, insufficiency in working capital, insufficiency of access to etc.

During the research, through survey and own observations, different technical and institutional problems have been identified.

Table 14 constraints to orange production

	Constraints	Nature of constraints
Technical constraints	Orange crop husbandry	Insufficiency in knowledge and skills on oranges husbandry practices
	Soil fertility	Low production of manure an low application of manure
		Confusion on the use of mineral fertilizer in oranges or not
	Pests and diseases	Insufficiency in knowledge related to orange pest and diseases
		Rootstock susceptible to propagate diseases and pest
		Emergency of new disease
Institutional constraints	Varieties	Lack of seedless varieties in the region
	Farmers organisation	Insufficiency of viable cooperative susceptible to be active in orange pricing
	Market	Unreliable market
		Low prices for oranges: existence of brokers lead to the low price given to farmers
		Seasonality with low price during the peak season
	Working capital	Poor access to credit facilities
	Chemicals	Not available in rural area
		High cost
		Insufficiency in related knowledge and skills

This being a quite exhaustive list of main challenges that influence orange farming process, farmers themselves have ranked them. The three first include in priority order: unreliable market, low prices of oranges and incidence of pest and diseases.

4.2. Designing alternative orange farming system

The previous section described the features of the current orange farming systems. The findings indicate that:

- Orange are grown under rain fed conditions
- Orange are grown under mixed cropping systems
- There is timid evolution towards the pure stand for individual orange varieties
- Orange are mostly grown without manure and chemicals application
- Orange are grown without any market contract

This results in low production with too poor quality to meet international market requirements. Therefore, the suggested alternative orange farming system aims to improve the situation. Essential characteristics of such a farming system include among others:

- Oranges are grown under rain fed conditions and irrigation where it is possible
- Oranges are grown in pure stand, intercropped with main season stapple crops such maize, beans, etc., and this for 10 years
- The lay out presents a design where orange varieties are in pure stand
- Orange production system is either organic or conventional
- Orange husbandry practices are well performed

4.2.1. Harvesting calendar

By performing orange farming under rain fed conditions, orange ted twice a year. Irrigation brings the third harvest and the scarcity period is broken down

Table 15: Water supply and harvesting calendar in both rain fed and irrigation production systems

Aspects	Months											
	Jan	**Feb**	**Mar**	**Ap**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Activities	H1	H1	W2	W2						W1	W1	H1
					H2	H2	H2	H2	H2			
		H3	H3	H3	H3	W3	W3	W3				
	W4	W4							H4	H4	H4	
Harvesting		H1			H2				H2			
	H1	+	H3	H3	+	H2	H2	H2	+	H4	H4	H1
		H3			H3				H4			

Legend

The letter W symbolizes the water supply periods. W1: short rain season; W2: heavy rain season; W3: water supply by irrigation (jun, july, august); W4: water supply by irrigation (January, February). The water supply by irrigation is mainly done during the dry periods. By allowing two additional harvesting periods, irrigation contributes to breakdown the traditional scarcity periods that cover march-april period and October. H1, 2, 3, 4 represent the corresponding harvesting periods.

4.2.2. Investment plan

Investments are expenses which one expects to earn back and which one can use for several years (AGROMISA, 2008). Investments are written off (depreciable) and this depreciation is spread over several years. Investment plan has been designed with regards to the orange farming water; weather both medium and large scale farms. In this work we have purposely ignored small scale farms. In addition the investment plan has been design with regards to the cost of starting or expanding one hectare (2.4 acre) of orange farm.

Table 16: Initial investment costs in 1 ha orange farm (Tsh)

Aspects	Cost
Land	250,000
Land clearance	75,000
Uproot tree trunks	100,000
Digging holes	50,000
Seedlings	125,000
Planting seedlings	75,000
Rain fed Regime	**600,000**
Irrigation equipment	1,000,000
Irrigation regime	**2825000 (1644.5EUR)**

These investment costs are one time investments. Therefore the ability to secure sufficient funds is crucial. However, some incomes are possible during 10 years, as orange can be intercropped with other seasonal or annual crops. There is a huge difference in cost amount for both rain fed and irrigation water systems. This does not favour the last system, since the returns on irrigation related investments (design and equipment) seem to be not certain. By taking into consideration the farm size *ceteris paribus*, the increase in investment costs is function of the concerned farm size.

4.2.3. Operational cost analysis

In analysing possible operational cost, two farming systems have been considered and that

are conventional and organic farming systems. The irrigation factor is considered as transversal to those two sub systems. Calculations are based on 1ha land area, and per year, assuming that variable cost evolution depends on the size of farm**.**

Concerning the cost of different inputs, 50 kg chemical fertiliser (NPK) cost 40000 Tsh. The fertiliser is applied twice a year with a rate of 2kg per tree. The pesticide mostly used is sumithion that is used against orange fliers. Its application rate is 1l/4ha (0.25l/ha) twice a year and costs 15000-20000Tsh. On the other side, manure is applied with 10kg/tree. It is estimated that the price turn around 100 Tsh per kg manure is applied for three years.

Table 17: Operational costs

Variable factors of production	Conventional	Organic
Fertiliser / manure	400,000	80,000
Pesticides, fungicides (Sumithion, DM45)	40,000	30,000
Labour (weeding, pruning, spraying,)	225,000	215,000
Pruning	50,000	75,000
Weeding	100,000	130,000
Spraying	75,000	30,000
Sub Total without irrigation	**665,000**	**485,000**
Interest on working capital (2%)	**13,300**	**9,700**
Total without irrigation	**678,300**	**494,700**
Irrigation	100,000	100,000
Sub Total with irrigation	**775,000**	**585,000**
Interest on working capital (2%)	**15500**	**11700**
Total with irrigation	**790500**	**596700**

Within the context of Tanga Region, and based on coast price, organic system seems to be the most economic if we consider the variable costs engaged, under irrigation or conventional. This situation contrasts with the case in Spain, where Igual and Izquierdo found that organic production system was more expensive. Figure in the last case show the great difference in labour and fertiliser.

4.2.4. Gross margin analysis

Description	Assumption	Organic	Conventional
Number of trees per ha	250	250	250
Number of orange per tree	1000	1000	1000
Total number of orange per ha	250,000	250,000	250,000
Price per orange	20	20	20
Total income per ha	5,000,000	5,000,000	5,000,000
Variable cost without irrigation		**494000**	**678000**
Gross margin without irrigation		**4,506,000**	**4,322,000**
Gross margin per orange		**18.024**	**17.288**
%		**90%**	**86%**

Variable cost with irrigation	**596700**	**775000**
Gross margin with irrigation	**4,403,300**	**4,225,000**
Gross margin per orange	**17.6**	**16.9**
%	**88%**	**84.50%**

The gross margin per orange as well as in bulk (ha), is always greater with organic farming systems due basically to less investment in terms of variable cost.

4.4. Orange farming business environment

The analysis of orange farming based business has been performed through PESTE tool of analysis. This consists in analysis of the business environment under political;, economical, social, technological and environmental aspects.

Political aspects

- Stable government and political stability Tanzania
- Existence of investment policy in Tanzania
- Definition of Export production zones and related incentives
- Definition of investment profile at all the level of all districts

Economical aspects

- Increasing economic growth
- Expansion of orange export market
- Limited domestic consumption for orange product
- Adequate supply of fruit
- Few investors in Orange sector in Tanga
- Credit scheme which do not favour farmers
- Enlargement and organisation of East Africa market

Social aspects

- Friendly people
- Hospitality
- Existence of orange farmers association and farmers union (TABOGO)

Technology

- Low application of agricultural technology in fruit farming
- Poor irrigation scheme in Tanga
- District extension office in phase of organisation
- Farmers with basic orange related knowledge and skills
- Lack of seedless orange varieties
- District nursery service
- HORTI and SUA involved in research on orange planting material
-

Environment

- Favourable climate
- Some incidence of drought
- Orange with high sugar content
- Existence of three orange varieties well adapted to the climate

CHAPTER 5 DISCUSSIONS

5.1. Orange Production Seasonality and product mix

5.1. 1. Orange production Seasonality

Oranges are the most important fruits crop in Tanga. And, beside sisal and tea, orange is the most important cash crops. Oranges are produced throughout the year. However, the main production season is May to October, with the pick season production between June and August while the period from November to February is considered as a minor orange production season. The period from March to April is basically a period of scarcity in orange production. Tanga region experience an orange production period which is longer that prevailing in Morogoro region.

Table 18: Orange harvesting time in Tanga and Morogoro

Regions	Months											
	Jan	Feb	Marc	Ap	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Tanga	🟧	🟧	🟥	🟥	🟧	🟩	🟩	🟩	🟧	🟥	🟧	🟧
Morogoro				🟧	🟧	🟩	🟩	🟩	🟧	🟧		
Red: Scarcity Period				Yellow: Low Season				Green: High Season				

Source: Adapted of ECI, 2008 and sound information

Morogoro region has a shorter production season but has however the advantage of earlier harvest which enables farmers to produce higher volume oranges in the very low supply period which lies between April and May, when prices are the highest (ECI, 2008).

In Tanga Region, it is estimated that about 65% of oranges are produced during the peak production period (June-august) while at least 25% are produced during the low production season including also that and about 10% are produced during the orange scarcity period.
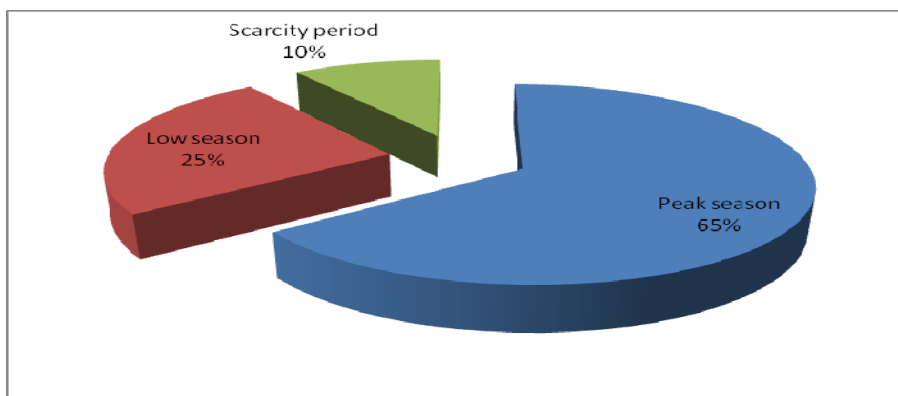
Figure 6:Sale of orange production

Source: Adapted of ECI and Interviews

Interview with farmers has confirmed this trend. Compared to Morogoro, the estimations show about 60-70% of orange are harvested during the peak season (June to August). The remainder of the orange production are harvested before and after the main season.

To palliate to the situation, varieties have been produced with different ripening times, in order to attempt to deal with this seasonality problem. Beside their high yield, one important characteristic is their ability to last longer after the ripening period. The table here below show the seasonality of the three first preferred varieties.

Table 19: Harvesting time for different orange varieties in Tanga Region

Varieties	Months											
	Jan.	Feb	Mar	Ap	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Early Valencia	h1	h1			h2	h2	h2	h2	h2		h1	h1
Late Valencia	h1	h1	h1		h2	h2	h2	h2	h2	h2		h1
Jaffa	h1	h1			h2	h2	h2	h2	h2		h1	h1

Source: own outline

H1: low season 1   h2: Peak season

Msasa (early Valencia) and Jaffa experience the same harvesting moment while late Valencia is reputed as a variety which can stay longer on the tree after harvesting. This has made it famous and most preferred, as it is harvested during the period of low orange supply to the market and bring therefore many earnings to the farmers.

5.1.2. Product Mix

The analysis of orange production seasonality can lead to conclude difficulties in equally maximizing the fruits supply thought the year. Therefore, there is a necessity for fruits supply diversification.

Beside oranges, Tanga Region has tremendous potential in different fruits crops among others, mangos, pineapple, banana and jackfruits, with harvesting time which are different from oranges. The table below indicate estimations of production of different fruits crops in Tanga.

Table 20: Estimation of fruits production by district in Tanga region

District	Fruits				
	Orange	Mango	Banana	Pineapple	Jackfruits
Muheza	120000	10000	20000	4000	25000
Handeni	40000	8000	4000	6000	15000
Korogwe	10000	25000	6000	5000	10000
Mkinga	8000	8000	5000	20000	15000
Pangani	5000	8000	10000	35000	10000
Kilindi	-	8000	2000	-	15000
Tanga	2000	5000	10000	45000	15000
Total	**185000**	**100000**	**57000**	**115000**	**100000**

Source: Estimations from TABOGO Executive Secretary

The table shows that Muheza and Handeni district have high potential in Oranges, Korogwe and Muheza district show high potential in mango, Muheza district has potential in Banana, while tanga rural area, Mkinga and Pangani districts experience high potential in pineapple production. Based on those facts, the product mix definition could be made on the basis of four fruits crops: oranges, pineapple, mangos and banana. However, these figures must be considered as estimations since other sound information provide different figures.

The product mix here proposed has taken into consideration the main fruits crops that include oranges, mangoes, pineapples and banana.

Table 21: Four fruits crops in product mix

Fruits	Production	Harvesting time	Main supply districts

43

Oranges	185000	May to September November to February	Muheza,Handeni, Korogwe
Mangoes	100000	November-February	Muheza and Korogwe
Pineapple	57000	November-February	Tanga, pangani, Mkinga
Banana	115000	Whole year	Muheza, Pangani

It is estimated that banana and oranges can produce during the whole year. Mangoes and pineapple have one harvesting season which covers November, December, January and February with the pick season in December and January. The harvesting time situation for all those fruits crops can be visualized with the map here bellow:

Table 22: Harvesting time for considered fruits

Fruits	Months											
	Jan	Feb	Mar	Ap	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Orange	■	■			■	■	■	■	■		■	■
Pineapple	■	■									■	■
Mangoes	■	■									■	■
Banana	■	■	■	■	■	■	■	■	■	■	■	■

For further supply in pineapple it will be important to collect from Bagamoyo District of coastal region. Indeed, even if the region constitutes the main supply point for UNNAT, the production (56,000 tons for 1750 ha) is higher than UNNAT absorption capacity.

5.2. Current farming system

Tanga region is blessed by its tropical climate which explains its high potential in tropical fruits, where oranges are leading. Importance of orange in Tanga is appreciated with regards to its place in household earning (70%) in average, the land under cultivation (9413 ha).

The current farming system is characterized by unrestricted cultivation right over the property which is owned through traditional inheritance or modern inheritance. This is of great importance, as farmers are therefore motivated to take care of the land in order to increase the productivity. Orange growers are divided into three major categories: small scale (0.4-2ha), medium scale (2ha-6ha) and large scale (>6ha). Despite the great number of small scale farmers, there is currently a development of medium and large scale integral units orange farms, an indicator of the positive trend in development of orange plantations.

The principle orange cropping patterns in Tanga can be distinguished between mixed

cropping system and plantations. By considering the lay out, four cropping subsystems are identified. Mixed orange varieties mixed with food crops for long time, mixed orange varieties with food crops for 10 years, oranges varieties mixed with other fruits and then food crops for long time, pure stand oranges varieties mixed with food crops for 10 years. In general, the most practiced cropping system consists in the mixture of orange varieties with food crops and for 10 years. However, there is development of pure stand orange varieties cropping system, which constitutes an indication of the trend for farmers to specialize. Indeed, most of large scale and medium scale farmers tend to specialize in orange production. Therefore, while small scale have more intercropping and usually utilize the scarce input and labour on the crop which is most profitable, medium farmers and large scale farmers tends to focus more on oranges. However most of the time, oranges varieties are intercropped with seasonal crops for at least 10 years, in order to maximize the land, as the income generated from those annual or season crops can contribute to the return on primary investments.

Orange fruits are grown under rain fed conditions. There is no evidence of irrigation in the region despite the existence of important river namely Zigi and Mkurumuzi. The consequence is that orange production and other agricultural production are subject to seasonality. However, there is a room to improve farming through irrigation by using those rivers (Muheza District council, 2007). If done, this could reduce dependency on rain fed agriculture, including oranges, as the area is of great potential. Indeed, according to Chang and Petersen (2003) orange requires water at different stage growth stage, in order achieve a good yield and fruit quality. Those stages are namely the flowering, fruit set and new flush development period; fruit development period and after harvesting period. As there is an irrigation master plan in Tanzania, the local government could lobby for an irrigation scheme on the rivers stated above. All field activities are performed manually. However, some commercial scale farmers have expressed their need for modern ploughing and irrigation equipment. This could facilitate the management of farm activities.

The use of organic manure is very limited. The relative use of manure is being done within large scale and medium scale farms. The non users advance the reasons that the soil has sufficient fertile so that there is no need to manure it. Our observations during the survey have revealed that most of the families do not grow livestock animal, which could help in producing manure for orange fruits as well as other staple food crops. Indeed, manure or fertiliser application is of a great importance for high yield and fruits quality. The use of chemicals is very limited. This confirms the findings of ECI (2003), that orange is produced basically without any fertiliser, pesticide and herbicides. This is not absolute however, since some commercial scale farmers do use pesticide (in limited proportion however) to protect their plantation in case of disease, but also to avoid fruits to fall after ripening period. At most one large scale farmer located in Muheza district indicated their use. This use is however limited to spray in case of orange flies or disease. The most important disease in Tanga includes among others gummosis and root rot. An orange tree infected is treated by using Dithan M45. On the pest side, the most important are aphids and orange fly which damages the fruits. The treatment is done by using Sumouthion. Farmers apply minimal crop husbandry practices. Indeed, pruning and weeding are performed 2 and 3 times a year. Where oranges are grown in monoculture (orange plantations), slashing of undergrowth and grass takes place twice or three times a year. In case of intercropping, husbandry designed

to improve production of annual also benefits the oranges. Therefore, even if it is stated that orange are generally produced organically, without any fertiliser, pesticide or herbicide, the practice is often by default partly due to the expensive nature of those input. However, organic product represents the stand for both local authorities and foreign investors. The area has been explored by many other investors.

Currently, pest and diseases are present in orange fruits, but have not yet reached the economical threshold to induce strong action. Anths, gummosis and root rot are considered to be the major common problems. Ants infestations are generally removed manually and diseased trees pruned or removed to prevent the spread of disease. However, farmers are not skilled in the domain. Extension service focussed on husbandry practices is quite nonexistent. Handeni district especially, farmers face currently a challenge from *Bactocera invalides*. According to European Plant Protection Organisation (EPPO), this is a new fruits fly species discovered in 2003 in Sri lanka, morphologically very similar to *B. dorsalis has* been and reported spreading rapidly in central Africa. This new pest is attacking mangoes, citrus and other tropical fruits, has been discovered in Tanzania in 2003 for the first time. It attacks the fruit tree during the early ripening stage so that the fruits change the colour before normal ripening time. Its damages are heavy since it can occasion 50-80% orange production loss (EPPO). The main reason is that orange fruits maintenance process is not well performed in that area. Much more effort could be used to sensitise people about the flea.

In Region in general, most of plantations (76%) range between 5-15 years old. The high percentage of young orange trees constitutes a clear indicator of orchard expansion as well as the replacement of old or diseased orange trees. Result from survey revealed that the first option is the most reliable. Indeed, increases in Kenyan export market have as impact the investment of people in orange farming business. It is important to notice that Muheza District (where growing orange started) experience the existence of old generation farms, while Handeni and Korogwe districts experience the expansion of existing farms or establishment of new farms. Among the varieties currently in use, early Valencia (Msasa), late Valencia (Valencia) and Jaffa are the most appreciated. However the quality of seedlings in use is subject to doubt. Indeed most farmers get seedlings from their own orchards, buy them from the neighbours or use wild rootstocks. They are no investors in producing seedlings. During the survey we came up with SCF (2008) that seed certification and certified mother plant orchards are not in place and made known to farmers. Therefore the quality of orange is still doubtful since the lemon rootstock in use is susceptible to phytophtora sp. The absence of investment in seedling production hampers the orange sector. For example, for the moment, all varieties in use are full of grain, while the market requires seedless. For the moment, only the Muheza District Council raises those seedless varieties. A nursery was established in Lunguza for that purpose.

Within Orange business, large scale and medium scale farmers are doing better than small farmers. In fact their farms are closed to the roads or have been able to trace the roads leading to their plots. It is important to notice that the profitability of orange depends to the number of orange produced per ha and per tree and the price farmers receive from their production. Therefore, by being closed to the road, large and medium farmers have much

bargaining power than small scale whose plots are located far from the roads. The road network in Tanga is relatively of good quality in Muheza District than in Handeni District. Local government should think about the maintenance of primary and secondary roads within the production area.

5.3. Alternative orange farming system

The findings of the analysis of the current farming system indicated that orange are grown under rain fed conditions; orange are grown under mixed cropping systems; there is timid evolution towards the pure stand for individual orange varieties; orange are mostly grown without manure and chemicals application; orange crop husbandry practices are not well performed. The resultant of all those trajectories is a low yield and poor quality orange product, to be competitive on export market.

To overcome the situation an alternative farming system is here proposed, where grown under organic or conventional production system, orange production is to be under rain fed and irrigation where it is possible. In addition, oranges are grown in pure stand for individual varieties where crop husbandry practices are well performed. Orange must be grown, intercropped with maize or beans during the 10 first years. The current farming system will requires investments in production of orange seedlings. Indeed, those safe planting material represents the node for good yield of orange.

Irrigation production system justify its self by the need to extend the harvesting time for oranges but also the need to supply water to oranges during stages of development so as to achieve good quality orange product throughout the year. Organic system, because in Tanzania all orange stakeholders are interested in organic production. Local government, researchers, central government are proud of organic product. Indeed as organic market is growing worldwide, Tanzania, with its potential in horticulture in general, fruits in particular especially oranges need to strengthen the organic market segment. In addition, sound information state that many companies (Americans, Swedish, Germany, etc) have conducted exploratory study with the aim of investing in organic orange product in Tanga.

The pure stand cropping pattern is suggested since during our study we observed an evolution of oranges cropping patterns, where the current trends for most of large scale farmers is to specialize in oranges varieties. The pure oranges varieties based stand is helpful for design a better product mix plan. Also the land availability in Tanga favour the establishment of orange varieties based plantations. The farming system suggests the use of certified orange seedling and the crop husbandry practices to be well performed because of the need of maximizing the production and quality requirements from export market.

The investments analysis and coast analysis have revealed that, within the context of Tanga region, the orange organic based farming system, under irrigation or rain fed regime is likely to be more feasible. The analysis of Simplified Gross Margin has come out with the same conclusion. This situation contrasts with the case in Spain, where Igual and Izquierdo (2000) found that organic production system was more expensive. Figures in the last case show the great difference in labour and fertiliser.

While the alternative system as proposed is likely to be feasible, from the cost price angle,

its successful implementation requires: The availability of certified planting material; farmers are trained in good cultural practices (oranges husbandry practices) as well as the production of manure; the market is assured to cover the investment and other financial engagements

The SWOT analysis indicated the main opportunities and threats to the proposed orange farming system.

Strengths	-	Increase in orange productivity
Weaknesses	-	Increase in investment
Opportunities	-	Hardworking and committed orange farmers with basic orange related knowledge and skills
	-	TABOGO support to orange farmers
	-	Growing export market
	-	Existence of Tanzania Irrigation Master Plan
	-	Rivers with good water quality
	-	Favourable policy
	-	Investment of local government
	-	Existence of extension services
Threats	-	Climatic change and seasonality of rivers
	-	Insufficient in livestock production
	-	Water pollution
	-	Insufficiency in credit scheme

5.4. Main stakeholders

This subsection discusses mainly potential stakeholders that could play a determinant role for further improvement within the sector, especially for the implementation of the new farming system. Those are research and education institutions, local government, farmer's organisation, private sector and banks.

Tengeru Horticulture Research Institute

In Tanzania, horticultural crop research is nationally coordinated from HORTI-Tengeru. Apart from HORTI-Tengeru, the following institutions execute horticultural research activities: ARI-Uyole, Sokoine University of Agriculture, and Chollima (Dakawa) Agro-scientific Research Centre. Horticultural research on vegetables, fruits and flowers concentrate its activities with respect to agronomy, plant protection, and crop improvement. The main activities consist in research, plant propagation and extension (Naliwa, J.L, 2007). In 1985-86, HORTI

established at Mkumbi (Muheza district), a citrus cultivar trial aimed to evaluate 20 citrus cultivars introduce from California in order to, alleviate the seasonality of fruits supply through the use of varieties with different harvesting time over the year. Currently, HORTI is concentrated on seedless varieties of oranges.

Sokoine University of Agriculture (SUA)

SUA is based in Morogoro region. With HORTI, SUA is the second most important Research Institution involved in Horticulture. Like HORTI, Sokoine University hosts the germoplasm of vegetables and fruits varieties produced in Tanzania. More recently, the Horticulture Department of SUA has reconstituted a collection of major fruits crops which is used as mother plant orchards. According to Mbeha and Maerere (2002), the unit runs the largest commercial fruit crop nursery in the country. It provides also advisory services including the training of farmers in nurseries related activities. Many commercial farmers in Tanga and Morogoro regions have obtained planting material from SUA nursery (Mbiha and Maerere, 2002).

District council

Decentralized units, District design development plan for all sector and are responsible of their implementation. District council are responsible for coordinating activities of all interventions on its territory. District council counts within its services, the department in charge of agriculture, livestock and Horticulture. The extension services which acts as a cross cutting services, with extension agent at village level are being serving to bring to orange farmers, knowledge and skills related to orange farming. However, the system is not yet well established and its fruits not yet observed.

Further, in same case, District council some initiatives related to provide farmers with improved seedlings. This is the case of Muheza District. Indeed, as there no private investors in seedlings multiplication, the District council has established a nursery of about 30000 plants of seedless varieties, since the demand for these varieties is getting higher.

Tanga Association of Best Orange Growers (TABOGO Co Ltd)

TABOGO Co Ltd is a private company limited by guarantee, formed in June 2005 and registered under the Ministry of Industry and Trade, under registration number 52704. Currently the Apex has 11 members association with 1398 farmers. These 11 association include traders union, located in Tanga town, as since the Apex is willing to link orange farmers and orange traders.

With its vision of which consists in to be a modern and sustainable organization in citrus production, processing and marketing, TABOGO has targeted orange as the main crop. However, the apex is willing to enable market soliciting for other crops which are grown by members, such maize, vegetable, etc. With its capacity of producing 5.000 m, the Apex association covers all Tanga Region Districts except Pangani and Lushoto. However most orange growers are concentrated in Muheza, Korogwe, Handeni and Tanga.

Table 15. Orange production trend within TABOGO

District	Villages	Area(Ha)	Production	Export
Muheza	Kwabada	76.4	950	425
	Kilongo	86.8	1080	540
	Kwafungo	68.8	860	430
	Mtindiro	142	1630	815
	Bonde	40.8	510	255
	Mindu	40.4	500	250
Sub Total		**455.2**	**5530**	**2715**
Handeni	Mkata	83.3	1040	520
	Suwa	78.3	980	490
	Mazingara	116.4	1450	725
	Manga	26.4	330	165
	Kitumbi	16	200	100
	Mailikumi	76.4	950	475
	Kwamgwe	86	1070	535
Sub Total		**482.8**	**6020**	**3010**
Korogwe	Korogwe	20	250	125
Tanga	Mgandini	30	450	400
Total		**988**	**12250**	**6250**

The objective of TABOGO consist to: Identify market for orange growers in and outside; To mobilize small scale farmers orange growers in Tanga to produce high quality orange; to conduct lobby and advocacy to all orange growers in Tanga. The main activity performed by the Apex consisted to provide with orange growers' knowledge and skills related to farming orange. The Apex was sponsored by DAIPESA, Muheza district council, TCCIA Muheza office and Distephano. However for the moment, the Apex is relying on its own since DAIPESA project has finished. TABOGO has experience in identifying market for orange growers.

Financial Institutions

Tanga region experiences the growth number of financial institutions. Those include Exim - Bank, Barclays bank, National Banks of microfinance (NMB), COOPEC and SACOS. However if the last three last financial institutions are accessible to farmers, Exim bank and Barclays are real commercial banks with weak ties with agricultural sector. The development of Saccos constitutes alternatives for farmers to get loans, since they are established through sustainable farmers association and cooperatives as initiative of cooperative members.

Tanzania Chamber of commerce and industry

The Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA) were established in 1988. It was initiated with the support of the Tanzanian Government to strengthen the private sector. The establishment of the TCCIA was an important step in moving on from a centralized, planned economy towards a more open, mixed economy giving full scope to

privately owned enterprises and farms.

The TCCIA seeks to provide effective business representation and advocacy by lobbying for a good and ideal business climate in the country. It also aims at providing its members with quality services which includes business information, business promotional events and counselling services.

TCCIA has opened regional offices in all 20 regions of mainland Tanzania and over 60 district centres. All 20 Regional Chambers are non-profit, with nominal membership fees for its members. Currently having 25% of TCCIA members are farmers and 75% coming from the business community. TCCIA is not operating on its own; it has established a wide network of organizations and associations including orange farmers associations.

While the main aim of TCCIA consists in providing lobbying and advocacy to its members, it provides information to members about market, opportunity, train farmers etc. TCCIA has established micro finance structures within its decentralized structures, where members could take limited loans (3 times the saving), provided that guarantees are available. Most of the time forest plantations are used as guarantee. However all non removable assets including orange plantation can be used as guarantee. TCCIA could is a supporter to Saccos.

5.5. Investment Policy

The investment policy has been reportedly look at with regards to export angle. Therefore the export processing Zones related policy has been analyzed, with its objectives, locations and different incentives to those investors that subscribe under EPZ.

The Export Processing Zones (EPZ) Act was established in April 2002 with as objectives: to attract and promote investment for export-led industrialization; to increase Foreign Exchange earnings; to create and increase employment opportunities; to attract and encourage transfer of new technology and to promote the processing of local raw materials for export (value addition).

There are two types of EPZ: industrial Parks (Morogoro for example) and Stand Alones (single factory units). The eligibility is based on aspects such as to be a new investment. At least 80% of goods produced/ processed should be exported. Annual export turnover should not be less than US$ 100,000.

EPZ provides with investors diverse incentives include non fiscal and fiscal.

Fiscal Incentives*:*
- Exemption from corporate tax for ten (10) years.
- Exemption from withholding tax on rent, dividends and interests for 10 years.
- Remission of custom duty, VAT and other taxes on raw materials and goods of

capital nature related to production in EPZs.
- Exemption from taxes and levies imposed by Local Government Authorities on products produced in EPZs.
- Exemption from VAT on utility and warfare charges.

Non-Fiscal Incentives*:*
- Exemption from pre-shipment or destination inspection requirements.
- Unconditional transferability of profits, dividends, loyalties, etc.
- Lower port charges compared to other cargo box rate (transit cargo).
- Accessing the export credit guarantee scheme.
- Allowance to sell 20% of goods to the domestic market.

EPZ as defined by Tanzanian government are concentrated in Dar es Salaam, Coast Region, Tanga, Mwanza, Kilimanjaro, Arusha, Kagera, Shinyanga (Isaka), etc…..
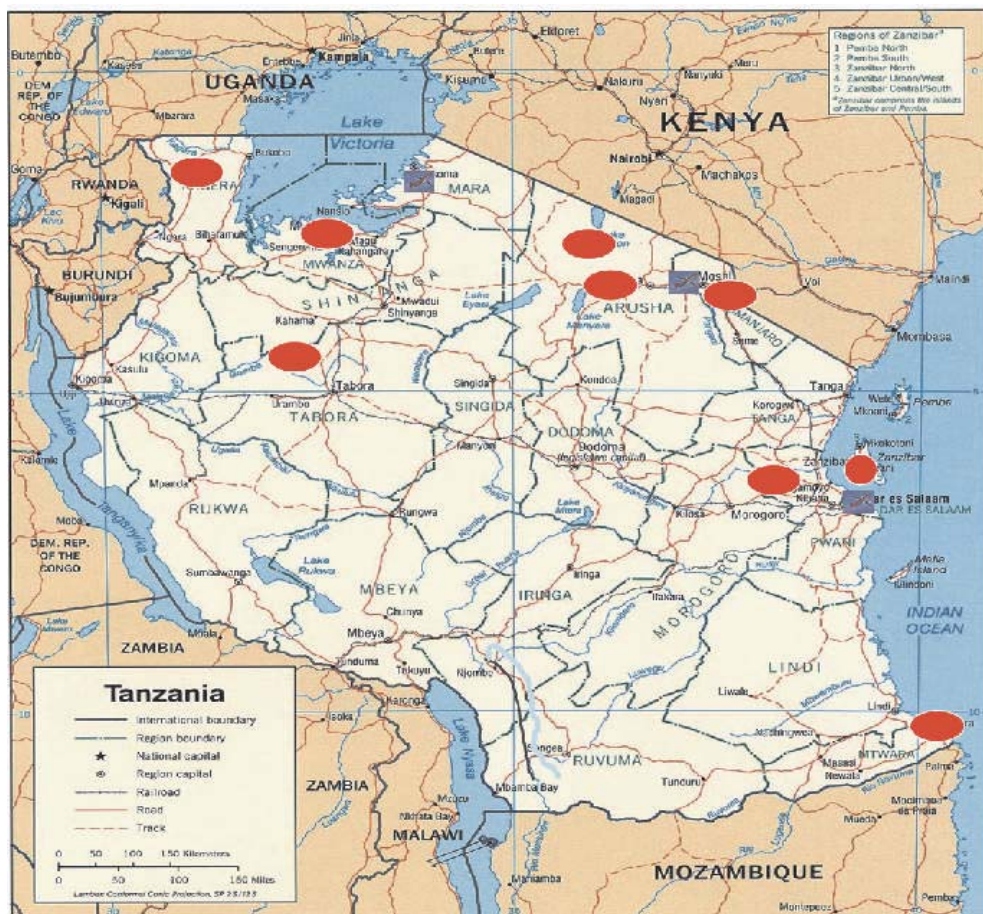
Sound information indicate that, In Tanga region EPZ are located in Segela (handeni district) and Nekma and Kenge (Tanga District) where 809.4 ha are being prepared for that purpose. The place is located at 5km from Tanga town on the road going to Pangani.

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

From the study conducted, findings revealed that the orange farming is not well developed The major cropping patterns consist of: Mixed orange varieties with food crops for 10 years, mixed orange varieties with food crops for long time, Pure stand oranges varieties mixed with food crops for 10 years and orange varieties mixed with other fruits and then food crops for long time (66%, 17%, !0% and 7% respectively). From the findings, there is evolution towards pure stand orange varieties that could trigger the existence of orange plantations.

Most of the farms consist of integral units. The existence of integral large scale farms favours the development of pure stand orange plantations. Oranges are grown under rain fed regime without any form of irrigation. Land operations are mainly performed manually; however some large scale farmers are willing to get modern equipments for mechanization.

There is limited use of manure, pesticides and fertilizers. Orange seedlings are produced by individual farmers in their backyard nurseries. There is no professional company responsible for seedling production. Orange farmers' skills in crop husbandry practices are limited. All orange varieties used, contain many seeds whereas the market demands seedless oranges. The result of those aspects stated above consists in a low and poor quality orange production which cannot meet export market requirement.

Based on the above conclusions, a new farming system has been suggested where:
 - Oranges are grown under rain fed condition and irrigation where possible
- Oranges are grown in pure stand intercropped with seasonal crops (maize, beans) for 10 years
- The layout presents a design where orange varieties are grown in pure stand.
- Orange production system is either organic or conventional
- Orange husbandry practices are well performed by farmers

The investment and coast as well as margin analysis indicates that under irrigation or rain fed regime, the orange business is likely to be more feasible than under conventional farming system.

6.2 Recommendations

Based on the result, it has been realized that nowadays there is a production of oranges. However their quality does not favour any investment in trading fresh orange fruits. Therefore, it is better for the companies to invest in processing oranges into concentrated juice.

For the new farming system to be performed, the following recommendations have been recommended:

To the private sector: to invest in production of certified orange seedlings. Indeed the sector is growing. Is growing also the export market which requires good quality oranges fruits and products. Hence TANSEED could expand its seed production scheme to orange and other fruits in general.

To the farmers: to actively produce and use manure. As they, orange farmers experience difficulties to access minerals and other chemical, the only way of increasing the productivity consist in the use of manure.

To local governments (Districts council): design and perform together with farmers the maintenance of the roads to ease product collection. On the other side, to equip. extension agents at village level with skills and means so they contribute better to train orange farmers on good agricultural practices. To actively contribute in implementation of irrigation master plan. Lobby for active research, production and distribution of seedless varieties as they are highly required by market.

To HORTI and SUA, to conduct active research for medium, long and short season varieties within the seedless varieties.

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APPENDIX

Appendix 1. List of People Interviewed

Research Institutions

1.Naliwa N.J. Researcher

Tenegru Horticultural Research and Training Institute

P.O. Box 1253, Arusha, Tanzania

2. Shabani. Acting Director.

Mlingano Agricultural Research Institute P.O. Box 5088 Tanga

Local Government

3Mr. Peter S. Mbangulila. Regional Trade officer   Tanga Region

4 .Mr. Ephrem William Kalimalwendo. District Executive Director. Muheza District

5. Mr Mwezimpya : DALDO , Muheza District. Phone: +255787582449

6. Mr Mtumbi Mohamed. Agriculture Officer. Muheza District. Phone +255783890410

7. Mrs Nahida Mbwanna. Horticulturist. Muheza District. Phone: +255755740611

8. Mr Kutua. Agriculture Officer. Handeni District. Phone: +255784528567

9. Rosemerry Bughe. Horticulture Officer. Handeni District. +255715463046

Farmers, farmers' organization

10. Mr Isaya Mpulikire.TABOGO Executive Secretary. Phone: +255787788829

11. Martin Mhando. Orange farmer. TABOGO Tresurer. +255712346406

   P.O Box 130 Korogwe

12. Amiri Abdulahamani Kiroboto. Commercial Orange Farmer. Muheza District

   P.O.Box 121 Muheza. Phone: +255712783335 Land line: +2550272641181

13. Members of Kwamugwe Association. Village Kwamugwe. Handeni District

14. Members of Mtindiro association. Mtindiro village. Korogwe District

15. Members of Bonde Association. Manundu village. Muheza District

16. Members of Kwabada Association. Kwabada village. Muheza District.

UNNAT processing factory

17. Mr L Luvmambo. Supply manager, research and development. UNNAT

    Processing Ltd .Morogoro Region

Financial Institutions

18. Mrs. Julia Mkaka. In Charge of credits. National Microfinance Bank. Muheza Branch.

19. Pius Mtangi. Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA). Muheza office. Muheza.

Others

Orange transporters to Mombasa

Orange transporters to Dar-es Salaam

Appendix 2. Questionnaires

1. Questionnaire reserved to citrus farmers

Identification

Name……………………………………………………………………………………….

Village:……………………………………………………………………………………..

Agro-ecological zone:………………………………………………………………………

Age……………………………………………………………………………………………

Gender: Male ☐ Female ☐

Marital status: Single ☐ Married ☐ Others…………………………………………………

Main activity: Agriculture ☐ livestock ☐ Others…………………………………………..

Education level: Primary ☐ Secondary ☐ University ☐ Others……………………………...

Major sources of income: agriculture handcraft selling labour

% of income from fruits…………………………..

Citrus Farming Systems

1.What are the dimensions of your farm in total? ……………………………………………

2.What is the land status? Owner ☐ rent ☐ own and rent ☐ Others:………………..

3. On how much hectares do you produce fruits? ……………………………………………

4. What is the age of the orchards in general?...

5. What is the place of citrus? The most important fruit crop ☐ Among the most important ☐

   Not important ☐ others……………………………………………………………………

6. What are the other fruits crops do you grow?

Other crop	Duration in the field	Harvesting time	Relative importance
Cash crops			
Fruits crops			

Staple crops			

7. What is the main citrus farming objective? Home consumption ☐ Market ☐ Both ☐

 Others:…………………………………………………………………………………………..

8. Which market represents your target? Local ☐ Regional ☐ Export ☐ Others ☐

9. What are the major production techniques and technologies in use?

9.1. What are the citrus growing conditions? Rain fed ☐ Irrigation ☐ Both ☐

9.2. How do you perform citrus farming related activities? Manually ☐ Mechanically ☐

 Both ☐

9.3. How do you appreciate your performance in citrus fruits farming?

 High knowledge and skills in Good Citrus Farming Practices ☐

 Moderate knowledge and skills in Good Citrus Farming Practices ☐

 Insufficient knowledge and skills in Good Citrus Farming Practices ☐

9.4. What are factors of production do you use? Manure ☐ Improved seed (ling) s ☐

 Unimproved seed (ling)s. ☐ Chemicals ☐

9.5. What are the cropping patterns do you perform in citrus farming (including lay out)?

Different orange varieties mixed together ☐ Oranges mixed with other fruits crops ☐

Orange varieties mixed with other cash crops ☐ Orange Varieties mixed with staple crops ad cash crops ☐ One part of land reserved for oranges varieties ☐

10. 1What is the destination of your citrus production?

Where	In which district, city, village	Relative importance (6 to 1)
Farm gate		
Collection point in village		

Local market (near the farm)		
Wholesale (in the city)		
Retail market (in city)		

10.2. Do you often sell your commodity to the same customer?

Yes	**No**
Because of Family relations ☐	Because I am looking for the best price ☐
Because we developed good business relations ☐	Because I don't know anyone I trust ☐
Because of contractual relations ☐	Others:……………………………………..
Others:………………………………….	

10.3. Are there formal citrus products collection centres?..

10.4. What distance separates your farm from the selling points?...

10.5. What distance separates your farm to the road?..

Farm functioning

11. What is your citrus farm size and structure? ………………………………………………………...

One unit ☐

Small widespread units ☐

Others ☐ …………………………………………………………………………………………………

12. What are the major oranges varieties grown and their production?

Varieties	Number of trees	Age of trees	Yield(number of fruits per tree)	Harvesting time	Criteria of appreciation (strong and weak point)

13.1. To what extent do you perform citrus good farming practices?

Farming practices	Well performed	Moderate performed	Not at all	How many times
Weeding				
Pruning				
Hardening				
Fertiliser application				
Diseases management				
Post harvest handling				

13.2. Who performs the harvesting and post harvesting related activities?

Activities	
Harvesting	
Grading	
Packaging	
Transporting	

13.3. What are the major sources of planting material and other agro-inputs?

Planting material	Sources					
	Spontaneous plants		Home nurseries		Specialized nurseries	Others
Rootstocks						
Buds						
Others inputs	Specialized shop	Local market	Neighbours	Associations	Specialized shop	Do not use
Seed(lings)						
Fertilizers						
Pesticides						
Others						

14. What are the major sources [ ]redit for farmers?   Commercial banks [ ] Institutions of microfinance [ ] Saccos [ ] Farmers associations [ ] Tontines   Others

15.. Do you belong to citrus farmers' association/cooperatives? Why?

Participation	Yes	Not
Interest	Training on farming practices [ ]	I am not interested [ ]
	Easy access to improved seed [ ]	I prefer to work individually [ ]
	Credit scheme [ ]	No importance [ ]
	Relevant information [ ]	
	Merge of plots reserved to citrus [ ]	

16. What are the main factors which constraints your current citrus production process/

Access to land [ ]   Access to necessary technology [ ]

Access to irrigation scheme [ ]   Access to high yielding citrus variety [ ]

Pest and diseases [ ]   Skills in post harvest handling [ ]

Post harvest handling infrastructure [ ]   Access to credits [ ]

Nothing [ ]   I don't know [ ]

Farming system development

16. What citrus farming aspects need improvement for further citrus industry development?

Availability of improved seeds and other input   [ ]

Availability of adapted post harvest handling infrastructure   [ ]

Training in good citrus farming practices   [ ]

Remunerative market   [ ]

Remunerative product mix   [ ]

Training in postharvest handling [ ]

Organisation of a remunerative orange collection system [ ]

Others………………………………………………………………………… [ ]

Appendix 3. Interview with key informants

1. How do you appreciate the trends of citrus production these days?

2. To what factors could you attribute the current situation of citrus production?

    What factors do you think that they hinder the citrus production in Tanga?

3. What is the basis of the current citrus farming systems?

    Are citrus fruits produced on a large scale basis in Tanga?

    If not why?

4. a. Who are the main stakeholders and their points of interest?

    b. To what extent do stakeholders collaborate between them?

5. How is the potential market of citrus production?

6. What important changes in farming system do you think could lead to further development?

    What could be the better product mix? What technology? What land size?

    What could be the main investments and infrastructure at farm level?

7. What is the current investment policy in Tanzania?

    Does Tanzania have an investment policy related to agriculture and horticulture?

    What are the main points with regards to agriculture, horticulture and fruit culture?

8. How does this investment policy apply in practice?

Sowing and harvesting plan

Months	Years/plant														
	1			2			3			4			5		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															

Investment plan

Designation	Total investment	Life (years)
Soils		
Soil preparation		
Planting material		
Planting operation		
Buildings		
Office		
Office equipment		
Collection centres		
Packing house		
Equipment		
Weighing equipment		
Trucks for transport		
Pick up		
Tools and material		
Plastic Crates		
Hoes		
Pruning tools		

Variable costs

Designation	Price per kg	Cost per ha per year
Chemicals		
Fertilizers		
Fuel		
Maintenance cost		
Buildings		
Cars and equipment		
Labour		
Manager		
office staff		
Technical staff		
Field workers		
Contract workers(weeding, pruning, harvesting, etc)		

Exchange rates 1Euro: 1820 TZ Shillings

Labour profile

Year 1, 2, 3, 4, 5-10	Number of labour days per ha per month and per activities												
Activities	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**Novem.**	**Decem.**	**Total**
Land preparation													
Planting													
Fertilizing													
Weeding													
Pruning													
Spraying													
Harvesting													
Packing in crates													
General metainance													
Total													
Year 30	Number of labour days per ha per month and per activities												
Activities	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**october**	**Novem.**	**Decem.**	**Total**
Land preparation													
Planting													
Fertilizing													
Weeding													
Pruning													
Spraying													
Harvesting													
Packing in cretes													
General metainance													
Total													

Map: EPZ in Tanzania