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**MINISTRY OF AGRICULTURE AND FOOD
SECURITY**

**STUDY ON THE HORTICULTURE
DEVELOPMENT IN TANZANIA**

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Acronyms

ADPP	Assistant Director of Plant Protection
ARF	Agriculture Research Fund
ARI	Agriculture Research Institute
ASPS	Agricultural Sector Program Support
AVRDC	Asian Vegetables Research and Development Center
BET	Board of External Trade
C&F	Cost and Freight
CBO	Community Based Organization
CIF	Cost, Insurance and Freight
CONVERDS	Collaborative Network on Vegetables Research and Development
CTI	Confederation of Tanzania Industries
DAHACO	Dar es Salaam Airport Handling Company
DALDO	District Agricultural and Livestock Development Officer
DCD	Directorate of Co-operative Development
DED	District Executive Director
DIA	Dar Es Salaam International Airport
DRC	Democratic Republic of Congo
DRD	Directorate of Research and Development
DTI	Directorate of Training Institutions
FANRM	Food, Agriculture, Natural Resources Management
FAO	Food and Agriculture Organization
FINNIDA	Finland International Development Agency
FOB	Freight on Board
GDP	Gross Domestic Product
HIMA	Hifadhi Mazingira
IDA	International Development Agency
IFAD	International Fund for Agricultural Development
IFSP	International Fertilizer Support Program
JICA	Japan International Co operation Agency
JKIA	Jomo Kenyatta International Airport
KATRIN	Kilombero Agricultural Training and Research Institute
KIA	Kilimanjaro International Airport
MAC	Ministry of Agriculture and Co operatives
MAFS	Ministry of Agriculture and Food Security
MATI	Ministry of Agriculture Training Institute
MFI	Micro Finance Institutions
NAEP	National Agricultural Extension Project
NARS	National Agricultural Research System
NGO	Non Government Organization
NCCO	National Cold Chain Organization
NVSIDP	National Vegetable Seed Industry development Program
PPD	Plant Protection Division
PRA	Participatory Rapid Appraisal
PS	Permanent Secretary

PSRC	Parastatal Sector Reform Commission
SACCOs	Savings and Credit Co operative Societies
SADC	Southern Africa Development Co operation
SCSRD	Center for Sustainable Rural Development
SIDO	Small Industries Development Organization
SMEs	Small and Medium Enterprises
TARP II	Tanzania Agricultural Research Project Phase Two
SMS	Subject Matters Specialists
SUA	Sokoine University of Agriculture
TACRI	Tanzania Coffee Research Institute
TARO	Tanzania Agricultural Research Organization
TAS	Tanzania Shilling
TAZARA	Tanzania Zambia Railways Authority
TBS	Tanzania Bureau of Standards
TCCIA	Tanzania Chamber of Commerce and Industries
TDV	Tanzania Development Vision
TFNC	Tanzania Food and Nutrition Center
TIC	Tanzania Investment Center
TOSCA	Tanzania Official Seed Certification Agency
TOT	Training of Trainers
TPRI	Tropical Pesticides Research Institute
TRA	Tanzania Revenue Authority TRC
TRC	Tanzania Railways Corporation
TRIT	Tea Research Institute of Tanzania
UAC	Uyole Agricultural Center
UDSM	University of Dar Es Salaam
UMADEP	Uluguru Mountain Agricultural Development Project
UMHODEP	Uluguru Mountain Horticultural Development Project
UNIDO	United Nations Industrial Development Organization
VEOs	Village Extension Officer
ZRFs	Zonal Agricultural Research Funds

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Executive Summary

Horticulture as an industry dates back in 17th Century when growth of large cities made it impractical for individuals to produce necessary garden crops on their own property. To-date modern horticulture is a multi-million dollar business in advanced countries. In Tanzania, the volume of exports of these crops in 2000 were: vegetables 6,706 tons, flowers 2000 tons, spices 1241 tons, and fruits 3,888 tons, earning the nation over TAS 7.8 billion in foreign exchange. Vegetables and fruits also contribute considerably to improving the quality of diet and human nutrition and income. These crops are excellent sources of Vitamins A and C, iron, calcium, carbohydrates and proteins. Some vegetables have higher protein content than rice and legumes when expressed in dry matter content.

Tanzania has high potential for producing horticultural crops but this has yet to be fully exploited. The main constraints limiting production include:

- ❑ Poor production organization (inadequate supply of seeds as well as inputs, and poor research and extension services);
- ❑ Poor marketing system resulting in quality deterioration and huge post-harvest losses;
- ❑ Inadequate storage, packing technology and processing facilities which in turn create gluts and severe shortages of these items during off season;
- ❑ Poor roads, particularly feeder roads and inadequate and inappropriate transport availability;
- ❑ Poor quality control system and lack of packing materials.

The objectives of this study are:-

- To exploit the potential for developing horticulture production in Tanzania;
- To asses and map out the constraints that have to be overcome;
- To make recommendations on measures/interventions to pave way for sound development of the horticulture sub-sector.

This study has carried out a professional assessment of the Horticulture Sub-sector through scientific collection of facts and information from over 150 key service providers and other stakeholders (DALDOs, SMS, VEOs, producers, processors, consumers traders, etc.) from nine (9) districts that enabled sound and quality analysis of the findings and giving recommendations.

Major findings and recommendations

The existing policy on horticulture development is still what is contained in the agricultural policies of 1983 and 1997. In view of the importance of this sub-sector, there is need for the Ministry of Agriculture and Food Security to formulate a horticultural policy to address aspects of production, processing, marketing, and support services (research, training, extension and regulatory services).

The most important technical constraint to horticulture development in Tanzania is availability of disease free planting materials adapted to various agro-ecological zones and high reliance on imported vegetable seed, some of which are of very low quality. There is need to encourage local horticultural crops seed producers through provision of incentives such as in facilitating acquisition of land, taxes relief.

Since horticulture demands specialized interventions, there is a need to spell out some specific strategies for its development. The following strategies are suggested:

Creation of marketing body that represent the interests of horticultural producers.

Since women are the key players in horticultural activities (growing, selling, extension services, utilization), provision of a range of training technical assistance services to women and youth groups in organization of their groups, in technical aspects of production, processing and marketing of their products.

Creation of enabling/favourable climate for horticultural related services and industry particularly land title deeds, water rights (irrigation) and taxes/tariffs on raw materials for horticultural crops processing and notably packaging materials.

The Government in partnership with other stakeholders avail a preferential research support (financial and logistics) to horticulture research institutes.

The Agricultural policies have encouraged private sector participation in commercial horticultural crops production. The flower industry has been leading in this initiative and a few small and medium enterprises (SMEs) through efforts of some interested entrepreneurs have emerged, promoting production of tropical fruits and vegetable for the export market. In order to support these initiatives there is need to have a clear land policy and along with the policy of Government/Private sector partnership to support development of varieties of fruits and vegetables of export qualities, to reorient research and extension to be not only client oriented and demand driven but also to be market oriented.

There is a need for the Government, Marketing associations and other relevant authorities to collaborate and cooperate in undertaking marketing information studies of horticultural crops as well as establish cold room facilities throughout the marketing channel to minimize losses.

In the light of the contribution of the processing plants to alternative markets for vegetables and fruits, it is recommended that the Government supports the factories through policy reviews that can remove unfair competition with imported processed products and reduction of operational costs.

The Government through its regulatory mechanisms ensure processors who assumed ownership of the strategically located factories during privatization adhere to their agreed processing contracts.

The government should stimulate organically produced commodities by creating conducive policies that will eliminate both marketing and technical barriers to improve its competitive ability.

Relevant information on organic farming should be made available to all small-scale farmers so that they become aware of what they ought to do and the benefits they can gain from such production. This can be done through extensive extension services to individual farmers, groups and co-operatives, stress on IPM utilizing botanicals.

Streamlining export procedures and taxes currently in existence.

- Efforts should be made to install enough capacity of refrigerated and handling facilities at DIA and KIA as well as promote use of refrigerated trucks on road and refrigerated warehouse at the collection points. A lot could be learnt from the defunct NCCO.

- Strengthen horticulture exporters association(s) so that they could work towards perfecting the market channel geared for export market.
- Stake-holders should agree on issues pertinent to the growth of the horticulture industry.
- Farmers should be mobilized, sensitized and empowered to form their own Micro-Enterprises (MEs), Micro-Finance Institutions (MFIs) and Savings and Credit Co-operative Societies (SACCOs) which will help them in provision of capital/funds in form credits for further development/expansion of horticultural production.

2.0 Introduction

1.1 Definition

Horticulture (Latin *hortus*, “garden”, culture, “cultivation”) is a science and art of growing fruits (pomology), vegetables (olericulture), flowers (floriculture), shrubs and trees (landscape gardening). Horticulture originally meant the practice of gardening and by extension, now means the cultivation of plants once grown in gardens. In contrast, agriculture by derivation referred to more open forms of culture such as production of grains, grasses etc.

Commercially horticulture is subdivided into nursery industry (production of fruit trees for fruit growers and ornamental plants for the ornamental horticulturist). Plant growing industry (supply annual, biannual and perennial plants to the vegetable and flower as well as ornamental horticulturist) and the seed production industry (produces and supply seeds required by vegetable and flower growers). Horticulture as an industry dates back in 17th Century when growth of large cities made it impractical for individuals to produce necessary garden crops on their own property. To-date modern horticulture is a multi-million dollar business in advanced countries such as The Netherlands, Germany, France, Belgium, United States, Japan China and countries of former Soviet Union, Australasia and in Africa, South Africa is the lead followed by Kenya, Zimbabwe, Zambia. While Tanzania has a higher potential than most of the African Countries, this potential has yet to be realized.

1.2 General overview

1.2.1 Agriculture and the Economy

Agriculture that by definition also includes horticulture continues to play a predominant role in Tanzanian economy. It contributes about 48% of the Gross Domestic Product (GDP), generates about 60% of the total export earnings and employs about 84% of the labour force (Appendix 1) (Planning Commission, 2000). It provides the bulk of the national food supply and contributes greatly to the livelihood of the populace.

1.2.2 Horticulture Sub-sector and the Economy

Horticulture production in Tanzania has been increasing considerably since 1990s. Six-year data (1990 – 1996) compiled from twelve regions indicate production volumes of 328,482, 673,763, 820,349, 990,772, 1,082,611 and 1,474,521 for 1990/91, 1991/92, 1992/93, 1993/94, 1994/95 and 1995/96 seasons respectively (Appendix 2). Consumption of horticulture products locally is substantial but low compared to what is produced. FAO estimated the domestic consumption for 1993 and 2000 as being 9,805.5 and 11,599.7 tons respectively (Appendix 3), and is rising. Increased domestic consumption improves the dietary status of the population, stimulates increased production and creates new job opportunities. Generally horticultural production has not been export oriented since the level of farming practices is inadequate resulting into low exportable yields, poor quality and high unit costs, thus rendering the produce non-competitive (Vakis, 1998). However since the 1990s new investments, some provisions for extension services, improved seeds, research services and some accessibility to both local and

external markets has enabled considerable production and export of vegetables, fruits, flowers and spices. Much as the Tanzania Government does not yet have a specific policy on horticulture development, serious concern has been given to improvement of exports of non-traditional products including fresh fruits, and vegetables. Data on export volumes and earnings of the horticulture products have been scanty and hard to locate, basically due to the un-coordinated institutions responsible for export, monitoring and control. However, available data indicate slow but notable contribution of horticultural crops to the country's total crop exports, which has been increasing since early 1990s to reach 4.6% in year 2001 (Table 1).

Table 1: Contribution of Horticultural products to Agricultural export earnings (TAS Million)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Exch. Rate TAS/\$	208	268	329	390	444	511	571	632	693	753	814	874
Agric Export	44843	53600	75670	97700	151126	194411	245803	271760	242550	232584	243956	210634
Horticultural export	1163.0	NA	NA	200.0	166.33	230.87	272.6	NA	NA	6683.9	7895.80	9614.0
% Hort cntrbn	2.6			0.2	0.11	0.12	0.11			2.87	3.24	4.56

NA = Data not available

Source: Planning Commission, 2001; 2002; Mwasha, A.M., 1998; Kitule, Z.A., 1998.

The volume of exports of the horticultural crops in 2000 were: vegetables 6,706 tons, flowers 2000 tons, spices 1241 tons, and fruits 3,888 tons (Planning Commission, 2000) earning the nation over TAS 7.8 billion in foreign exchange which amounted to 1.4 % of the total exports. Likewise, earnings from export of horticultural products increased by 18% from TAS 7896 million in year 2000 to TAS 9614 million in year 2001.

Tanzania has high potential for producing horticultural crops. The existing wide range of climatic conditions allows for the production of temperate, sub-tropical and tropical horticultural crops. This does not mean current production has been purely of subsistence in nature. On the other hand, these smallholder farmers always have some surplus to sell which get into the country's trade. Towns and cities absorb the bulk of the surplus. The increase in population, strategies to reduce poverty and the demand to revamp the economy have exerted positive impact on the development of the Horticulture sub-sector. Despite the positive picture, horticultural production has not made the expected speedy increase. This is basically due to a complex of problems and constraints that need to be addressed to allow faster development of the sub-sector.

Vegetables and fruits contribute considerably to improving the quality of diet and human nutrition and income. These crops are excellent sources of Vitamins A and C, iron, calcium, carbohydrates and proteins. Some vegetables have a higher protein content than rice and legumes when expressed in dry matter content, as such nutrient deficiencies can be corrected using selected vegetables and fruits and may also be the means of ensuring food security for households. Production of horticultural crops for processing will stimulate rural industrialization and add value to these crops for local markets and for export.

1.3 Features of horticultural crops production

Generally most technologies developed so far that increase agricultural production have had high cost requirements, including the indirect costs of manufacturing fertilizers and pesticides, which are passed on to the producer. Other direct costs include those needed for initial field preparation, application of the fertilizers and pesticides, harvesting, transportation and drying the crop. These costs vary from crop to crop depending on the input needs, but it is generally accepted that high input technological agriculture including horticulture yields highly but the cost required to produce a unit of food is greater.

Increased use of natural fertilizers and organic waste if well executed helps to reduce costs. Also, crops that symbiotically fix nitrogen from the atmosphere and use of natural predators that control pests and diseases reduce production costs. Such options fit well in horticultural production systems but available technology require more refinement and development.

Rain-fed agriculture is cheaper in terms of energy requirement to supply the crop water needs as compared to irrigated agriculture, but is inefficient. Most irrigation systems are energy intensive. Different irrigation systems have different water use efficiencies thus varying energy requirements. It is highest for surface irrigation, followed by sprinkler and

lowest for drip irrigation. Clearly pumping water from great depths or long distances is usually not economical. An efficient irrigation system for horticultural production is highly desirable, but ought to be combined with systems that help conserve moisture in the soil.

Current production of horticultural crops in Tanzania is very low and basically is done by small farmers (with the exception of flowers). With good weather and a wide range of ecological zones suitable for sound and sustainable production can be increased several fold, beyond subsistence. The contribution of fruit and vegetable production to the National Export earnings has more or less doubled while that of cut flowers has remained constant over the past 5 years (Table 1). In most potential areas production has increased. This situation can be attributed to several factors including:

- ❑ Land pressure, necessitating producers to go for more intensive production and higher value crops (Kilimanjaro and Arusha Regions).
- ❑ Changes in the nutritional and living standards of Tanzanians have increased demand for horticultural food crops.
- ❑ Increased food processing industries have created demand for raw materials (juices, syrups, pulps, pickles, etc.).
- ❑ Villagelization and urbanization has disrupted the traditional collection of vegetables, fruits and mushroom from the wild, thus encouraging home gardening and market gardening endeavors (more pronounced within and around cities).
- ❑ Horticultural crops are now gaining status in the cash economy, sometimes at the expense of existing cash crops because in most cases they have higher value per unit area (tomatoes, passion fruits, avocado, mushroom, flowers, etc.).
- ❑ With the liberalization of trade new markets are now available outside the country where vegetables, fruits and flowers from Tanzania are steadily gaining export market.

1.4 Agricultural Policy and Horticulture Development

The Agricultural Policy (1997) lists important horticultural crops that are commonly produced for the market and for which efforts to promote their production need to be increased in the next decade. The most important fruits mentioned are pineapples, passion fruits, citrus fruits, mangoes, peaches, pears and dessert bananas. Vegetables include tomatoes, spinach, cabbages and okra. Flowers include tropical varieties e.g. tuberous roses and some temperate types e.g. carnations, Lisianthus and Chrysanthemums. Tropical flower crops worth researching on include dwarf heliconia (*Heliconia stricta*), torch ginger (*Etlingera elatior*), tulip ginger (*Elletariopsis elatior*), cigar calathea (*Calathea lutea*).

The policy points out that while some of these crops can be produced throughout the year, the majorities are highly seasonal. Most of them are consumed at farm level, leaving the domestic market with gluts during the season and severe scarcity during off-season.

The policy continues to stress that increased production faces the following challenges, which need to be overcome:

- ❑ Poor production organization (inadequate supply of seeds as well as inputs, and poor research and extension services);
- ❑ Poor marketing system resulting in quality deterioration and huge post-harvest losses;
- ❑ Inadequate storage, packing technology and processing facilities which in turn create gluts and severe shortages of these items during off season;
- ❑ Poor roads, particularly feeder roads and inadequate and inappropriate transport availability;
- ❑ Poor quality control system and lack of packing materials.

The Policy observes that the external market of fruits and vegetables present good opportunities in the neighboring and some overseas countries such as the Middle East and Europe. However, while exports to the neighboring countries and Middle East can be shipped throughout the year, penetration of the European markets is confined mainly to off-season. During this period Tanzania has to compete with other world producers whose systems are much more efficient. The obstacles on the export front are even more challenging. To gain access to these markets the country needs to tackle the constraints and stringent demands on standards by the European customers.

The policy falls short of emphasizing development of traditional/indigenous horticultural crops (fruits and vegetables). These, though low yielding, have many comparative advantages including adaptability to the environment throughout the year, resistance to pests and diseases, less input needs and high nutritive values. A lot of these crops are grown at homesteads for household consumption and within city gardens for sale in the local market. Mchicha-amaranths (*Amaranthus Spp.*), kismvu-cassava leaves (*Manihot esculenta* & *Manihot glaziozii*), mnavu-nightshade (*Solanum vilosum*), ngogwe-African egg-plant (*Solanum macrocarpon*), mboga ya maboga-pumpkin leaves (*Curcubitacea Spp.*) and matembele-sweet potato leaves (*Ipomoea Spp.*) are some of the existing examples in point. They are cheaper vegetables to produce, are widely consumed, and are higher in nutrients than exotic vegetables and very important for food security.

The policy also does not mention the development of mushroom production as a rich source of protein and high value vegetable crop for local and external markets.

1.5 Objectives of the study

The main objectives of the study as specified under the TOR (Appendix 7) include:

- Establishing the potential for developing horticulture production in Tanzania;
- Assessing and mapping out the constraints that have to be overcome;
- Make recommendations on measures/interventions to pave way for sound development of the horticulture sub-sector.

Further details on the specific objectives are as described in Appendix 7.

2.0 Methodology

This study has carried out a professional assessment of the Horticulture Sub-sector through scientific collection of facts and information from key service providers and other stakeholders (DALDOs, SMS, VEOs, and producers, processors, consumers and traders, etc.) that enabled sound and quality analysis, leading to giving recommendations. The assignment was approached through coverage of the following major aspects or components:

Policy and regulatory functions

Horticulture production

Support services (research, manpower and extension network)

Irrigation potential and facilities

Processing (current state and existing potential)

Economics of production and marketing.

2.1 Constraints to be studied

Knowledge gaps: Know-how on the techniques to grow various crops demanded by the market; high yielding varieties, high value vegetable crops (mushroom), proper agronomic practices, fertilizer applications, pest and disease control, harvesting as well as post harvest handling (preservation/processing), packaging, marketing, etc.;

Irrigation development: Most horticultural crops, and indeed their production technologies demand abundant water to express their potential. Supplemental irrigation or total irrigation is necessary for successful production of horticultural crops. Development of small-scale irrigation systems for production of horticultural crops is of high priority. Irrigation efficiency is key to the success of the production system);

Marketing strategies, marketing channels and the role of middlemen: In principle increased production is generally a response to demand. The demand creates a stimulus to produce more. For the economic producer the demand is expressed by the availability of the market for what is being produced. But the markets do not just happen. Proper techniques and plans have to be worked out to reach and exploit the existing market(s). Horticultural production demands ready and sustainable market. Reliable market will stimulate growth;

Policies: Proper and well implemented policies support development of the production process. The policy of keeping rural communities from migrating into cities should not be synonymous to keeping them on the farm aimlessly. Community based programmes should be encouraged/instituted and for example, focus on how to organize the farmers (consolidate the farms or farmers) under horticultural production systems to exploit the market in the near-by city or for export. Their income will increase; there will be a demand for consumer goods and services such as sharpening plows, blacksmith services etc. The village will earn more, which will tend to keep the people from migrating to the city. Other policies like taxation, availability of credit, input supply mechanisms, etc. will need to be critically looked into.

Role of research: Research is important to improve the quantity and quality of horticultural production. Important areas include agronomic practices, genetic improvement, disease and pest control, seed production, packaging and processing.

Research helps to generate new information that is needed to bridge the existing knowledge gaps. Market research and information is also high on the agenda.

Environmental protection: It should be recognized that the smallholder farmers are the primary custodians of the soil and water resources of the ward/village. Farmers' agricultural/horticultural activities will greatly affect the direction that natural resources go, starting at each individual farmer's plot(s) where increased runoff and erosion may start, culminating into streams flooding and siltation of irrigation systems during storms. It is therefore important that the small horticultural producers are integrated in the conservation programmes in the given area.

Infrastructure: Of major importance include:

- Production facilities (including water supply systems)
- Research facilities (including laboratories, research fields with irrigation facilities and other equipment)
- Post-harvest handling and processing facilities
- Access roads
- Transit warehousing/storage facilities

2.2 Procedure

The current important regions for horticulture production in Tanzania are listed in Table 2 and the most prominent crops shown. For the purpose of the study the regions were grouped into 6 zones.

Table 2. Current important horticulture production regions

Zone	Region/District	Important horticultural crops grown
1. Northern and North Eastern Highlands Zone	Arusha, Kilimanjaro	Flowers, Temperate fruits and vegetables Flowers, Avocado, Bananas, Temperate fruits and vegetables, mushroom
	Tanga (Lushoto, Korogwe, Muheza)	Temperate fruits and vegetables Tropical fruits & spices (cardamom)
2. Eastern Zone	Tanga (Rural)	Tropical fruits
	Coast	Tropical fruits
	Da Es Salaam	Tropical fruits and vegetables, mushroom
	Morogoro (Rural)	Tropical & Temperate fruits and vegetables (include dessert bananas and onions) and spices (clove, ginger and tumeric)
3. Central Zone	Dodoma	Grapes Tomatoes and onion
4. Southern Highlands Zone	Iringa	Temperate fruits, Tropical vegetables (tomatoes, onions etc.)
	Mbeya	Temperate and tropical fruits & vegetables (avocado, tomatoes, banana, citrus etc).
5. Lake Zone	Kagera	Vanilla, Banana
	Mwanza	Tropical vegetables (eggplant, cabbage etc.)
	Mara (Tarime)	Banana and Tropical vegetables
6. Western Zone	Kigoma	Tropical vegetables (onions, carrots) Spices (vanilla, turmeric, ginger, etc.)

There are over 30 districts producing horticultural crops of various kinds and at different levels of production in Tanzania. Some are more famous than others for specific crops. Given time and resources it would have been more appropriate to collect information from all the horticulture-producing districts since each have unique environmental and infrastructure benefits and problems. However under the given circumstance only key but representative districts were visited and information about the others will be inferred to from literature and other sources.

Considering the nature of the assignment FANRM made field visits to research/collect the needed information in nine sample districts within seven regions as detailed in Table 3.

Table 3. Districts selected for data collection during the study

S/N	Region	District selected for study
1	Tanga	Lushoto, Muheza (2)
2	Kilimanjaro	Hai (1)
3	Arusha	Arumeru (1)
4	Dar es Salaam/Coast	Temeke, Kibaha (2)
5	Morogoro	Morogoro Rural/Kilosa (1)
6	Iringa	Iringa Rural (1)
7	Mbeya	Mbeya Rural (1)

These districts were selected on the basis of the following criteria:

Current importance and production levels

Potential for expansion of horticultural production

Market potential for the production output (internal and export markets)

Location as zonal representatives

Existence of service/regulatory institution(s) within district

Location proximity, given the time limitation.

In order to collect and analyze the information needed scientifically FANRM Research Consultants carried out the study through a series of procedures and in logical steps that ensured capture of all aspects. This led to making proper recommendations, thus focused onto the objectives. The study was carried out as detailed under 2.3 - 2.11.

2.3 Literature review

Some information about horticultural production in Tanzania exist in the form of study reports, project annual reports, final reports and valuation reports, research findings from various Research Institutes (including TFNC), MAFS Research and Training Institutes and Universities (Sokoine University of Agriculture & University of Dar es Salaam). There is also some information on marketing from the Bureau of Statistics, Tanzania Revenue Authority (TRA) and Board of External Trade. A thorough search of all this information and others formed basis for establishing the current status of production and mapping out important production areas. With this information the productive zones in relation to crops grown was ranked. This stage will be proceeded by mobilization stage in

which the consultant will carefully go through a briefing process by the client and ensure that each team member of the consultant's team knows what is expected, making sure the output is delivered on time to meet scheduled timings.

2.4 Interviews with Stake Holders

There are a number of institutions and government departments that are responsible for promoting and supporting horticulture development in Tanzania. All have in one way or the other acted in the process of developing horticulture production, utilization and marketing. FANRM arranged discussion visits with these officials and through lead type questions (pre-determined) discuss various aspects related to production, constraints, marketing, transport, export, etc., thus collect as much information from them as can be delivered. This information will be tabulated and analyzed carefully so that recommendations can be drawn. The following institutions and government officials were visited:

Ministry of Agriculture and Food Security headquarters (ASPS Coordinator/Head of the technical Advisory Unit Seed Component/and others, PS, DPP, DCD, DRD, and DTI);

Research and Training Institutions (SUA, University of Dar es Salaam, HORTI Tengeru, MATI Tengeru, ARI Uyole, and TFNC);

Ministry of Co-operatives and Marketing;

District Officials (DALDO, SMS-Horticulture, DED, Planning Officers and selected Legislators) in the following districts: Muheza, Lushoto, Hai, Aru-Meru, Morogoro Rural, Iringa Rural, Mbeya Rural, Temeke, and Kibaha;

Other Regulatory Institutions (SIDO, TIC, CTI, TRA, BET, TBS).

NB

Since these institutions are sparsely located, individual consultants facilitated discussions.

2.5 Questionnaire administration

In this group of stakeholders information was collected not only by factual (type of crops, constraints, input sources, etc.) but also some statistics (i.e. figures such as acreages, irrigated land, amounts produced per year, amounts packed and sold /exported, prices, etc., were requested). Such wide and diverse information is best collected through structured questionnaires from which tabulated summaries can be made and by employing standard statistical procedures as a tool draw some conclusions from the figures.

FANRM Research Consultants used such structured questionnaires based on what have successfully been used in other similar surveys but with some adjustments to fit the particular needs of this assignment. Questionnaires to suit the four stakeholder groups were prepared as shown below:

Key Farmer/producers (of flowers, fruits, vegetables and spices) and Seed Production Companies. (Known key farmers/producers in the selected districts were covered. Important farmer organizations e.g. MVIWATA was covered.

Small farmer producers. They were the largest group of the stakeholders. Due to the complexity and nature of this group the questionnaire used was specially tailored to capture characteristics typical of the group. Attention was made to find out their

production capabilities, constraints and how they make efforts to overcome them. Financing sources, marketing structures, gender involvement and others were also looked into. Due to the large size of this group, a sampling procedure was employed so that a number of farmers in each district listed under 1.6.4 above were included.

Processors (large, medium and small scale). This was also a diverse group. The questionnaire to suit the group covered their sources of raw materials, constraints, standards, credit facilities, energy costs and market outlets. Here sampling was used, paying particular attention to the starter-up small producers, many of whom are under the support of SIDO and NGOs.

Exporters. TRA, BET, TCCIA were visited for information on export of horticultural commodities. Among others questions on export volumes, prices and market routes were stressed.

In administering questionnaires, some of which took about an hour, consultants required the support of enumerators, carefully recruited for this type of work. They supported through speeding up the work and widened the scope of coverage in each district visited.

2.6 Data Analysis

The information so collected as described above was analyzed using standard statistical procedures and conclusions drawn from the data. The analyzed data was then used to support conclusions and recommendations for the study.

The existing sector development documents (Agricultural Policy - 1997, Agricultural Sector Development Strategy and the Agricultural Sector Development Programme paper) were studied carefully to identify strengths and weaknesses on horticulture development in Tanzania, to address short falls that require policy improvement on the Horticulture Sub-sector).

3.0 Study findings

3.1 Policies, strategies and programmes relating to horticultural development

Horticultural Development in Tanzania has linkage to many policies and regulations governing production, processing and marketing of these crops. Paramount among these are the Agricultural policies, the policy of decentralization and the Rural Development Policy, the Cooperative Development Policy and the Tanzania Development Vision 2025.

3.1.1 Agricultural Policies

The agricultural policy of 1983 put emphasis on horticultural crops (fruits, vegetables and flowers), their contribution to improved diet for the people and their usefulness as export crop possibly after processing. To achieve this, the policy assumed increased production through adoption of improved husbandry practices and use of improved varieties. It directed the undertaking of research on best varieties for improved yields and pest and disease control as well as the need for better transport facilities to assist in marketing and improved market outlets. The need for processing facilities to increase the shelf life of these crops was also given importance as well as local communities consumption, urban

consumption and for export. It emphasized simple processing techniques such as drying and other traditional methods to start with.

The 1997 Agricultural and livestock policy on fruits, vegetables and flowers placed emphasis on:

- Enhanced production of high yielding and disease resistant varieties of these crops, giving high priority to strengthening research, extension and small-scale irrigation.

- Government assistance to the private sector to organize domestic as well as export markets for these crops, while the government takes responsibility in quality control, advocating for private sector to acquire capital for storage, packing and transport facilities and provide market information.

- Government in partnership with the private sector to support breeding programmes for fruits, vegetables and flowers to produce export qualities of these crops for the fresh export market.

- Government to continue streamlining export procedures in order to encourage private sector to export greater quantities of the popular varieties to overseas markets and Government to facilitate negotiations with both regional and overseas airlines for increased cargo space to accommodate Tanzanian produce.

- Both policies did not mention herbs and spices but discussions with the Ministry of Agriculture and Food Security Crop Promotions Services section indicated that these are being given priority as crops. Accordingly, germplasm collection, maintenance, testing and selection are being initiated at KATRIN Ifakara Research Station.

3.1.2 The Policy of Decentralization and the Rural Development Policy

The Rural Development Policy sets to address challenges confronting geographical areas in which primary production takes place and where majority of the population are found. It therefore addresses a wide range of agricultural, farm and non-farm activities. The policy of decentralization of responsibilities and resources from the center to the local democratic institutions (Regional Administration Act No 19 of 1997) further defined the roles of the sector ministries including the MAFS and the District Councils. In the case of Horticulture (Guidelines for MAC-MRALG Interface 1999), the roles of the MAC now MAFS include:

- Formulation of Horticultural policy

- Regulatory function

- Importation/selection of planting materials for germplasm conservation,

- Dissemination of internal/external market prices

- Promotion and coordination of linkages with relevant national and international institutions with interest in the horticulture industry

- Development of legislation for quality control of produce and planting materials and

- Assessment of socio-economic factors that might influence horticultural technology uptake and adoption.

The District Councils on the other hand have the following responsibilities:

- Collection of production data, area and assessment of potential areas for expansion

- Promote the utilization of indigenous fruits, vegetables, spices and flowers
- Disseminate post harvest technologies
- Promote establishment of mini orchards of mother trees as a source of planting materials in seed nurseries
- Facilitate formation of production and marketing farmer groups
- Establish marketing centers; disseminate horticultural production technologies
- Promote private entrepreneurs and rural communities in identifying viable horticultural activities and
- Address cross-cutting issues that affect the Agriculture Sector (including horticulture) and others and includes among other:
 - Rural infrastructure such as roads, communication network and energy
 - Civil service and LGA reforms
 - Village Land Act implementation
 - Health (HIV/AIDS, Malaria, etc.)
 - Gender
 - Environmental Management
 - Forestry and Fisheries
 - Water
 - Education.

3.1.3 The Cooperative Development Policy

This advocates a change from state controlled cooperatives to ones that are more independent and wholly controlled by members. It aims at empowering farmers to have stronger negotiating and bargaining powers in their activities.

3.1.4 The Tanzania Development Vision (TDV)

The TDV outlines what the society and the economy of Tanzanians would wish to achieve by the year 2025. The major expectations are a high quality life, peace, stability and unity. It [predicts Tanzania graduating from least developed to middle income Country by 2025, with high economic growth of 8 percent and devoid of abject poverty. The Government is at reducing the proportion of those living in poverty by 50% by 2010 and eliminating poverty by 2025. Agriculture that includes horticulture is quoted as having the key role in this endeavor.

3.1.5 Current Status of Implementation of Policies and Regulations Covering Horticulture Development

3.1.5.1 Research and Development under the MAFS

In efforts to address the Agricultural Policies of 1983 and 1997 as they relate to agricultural crops generally and horticulture in particular agriculture research has gone through different phases of restructuring.

In the early 80's research was restructured into semi-autonomous parastatals (TARO, TALIRO, UAC and TPRI). The Tanzania Agricultural Research Organization (TARO) had mandate for all crop research including horticultural crops. Research Institutes and

Stations undertaking horticultural research included HORTI Tengeru, KATRIN Ifakara and Chambezi Research Station. Major emphasis was on smallholder cash and food crop producers and linkage with extension was through the Farming Systems Research Approach. In addition to the Horticulture Research Research Training Institute- Tengeru (HORTI Tengeru) conducted diploma training in Horticulture. The Uyole Agricultural Center (UAC) was a semi-autonomous research parastatal with mandate for all crops and livestock research in the Southern Highlands. It conducted research on various crops including horticultural crops. The Tropical Pesticides Research Institute (TPRI) had mandate for conducting research on all fundamental aspects of pesticides and to offer technical services on various aspects of pesticide quality control, plant quarantine, herbarium and plant genetic resources.

The details of the activities and output from these institutes during this period will be given under section 3.4. Overall, efforts were made to address the 1983 national agricultural policy requirements on horticulture.

The early 90s was the era of consolidation and restructuring of research as a Department of Research and Training (DRT) under the Ministry of Agriculture and Livestock Development. The salient features were focused on major agro-ecological zones, and establishment of zonal agricultural research centers based on the Uyole model. Linkage with extension was through the establishment of Extension Liaison Officers. National and zonal research priorities were drawn. In the national prioritization only vegetables were placed under priority two. In the zonal prioritization, Horticulture was placed under priority one in the Northern and Southern Highlands zones while in all the other zones fruits/vegetables were placed under priority two. Floriculture, and spices and herbs did not feature in these prioritizations.

During the late 90s and early 2000 restructuring of Agricultural Research was continued and in response to the Government policy on decentralization to the district councils; Decentralization of research was implemented alongside innovation of different mechanisms to mobilize and allocate funds for research. With increased autonomy the zones have to plan, prioritize and implement their research programmes. Zonal Agricultural Research Funds (ZARFs) are being established in each zone to fund priority research on a competitive basis. The District Councils are being urged to contribute to the ZARFs. Food crops commodities including horticultural crops are to benefit from these funds. At the same time privatization of research on some commercial crop commodities were effected to improve funding and efficiency under their respective industries. The Tea Research Institute of Tanzania (TRIT) was established in 1996 for tea and the Tanzania Coffee Research Institute (TACRI) in 2001 for coffee. The Main focus for research during this period has been Client-oriented and demand driven and contract research. Linkage with extension and farmers is through the COR Liaison Officer. This approach is specific to the Lake and Northern zones and large horticultural growers and district councils are the clients of this approach. In the Eastern zone they have a similar approach, The Eastern Zone Client Oriented Research and Extension (EZCORE). These moves have yet to be institutionalized in all the seven zones.

3.1.5.2 Sokoine University of Agriculture (SUA) Development Programmes

The main mandate of SUA is training. However, SUA has been undertaking some research alongside their training mandate. The policy guidelines (SUA 1992) for efficient and sustainable research are:

- Research should be small holder-oriented and demand driven
- Emphasize on applied, adaptive and on-farm research

Under the IDA-TARP II a deliberate initiative has been taken to facilitate the mainstreaming of SUA into the NARS by supporting collaborative research between SUA and DRD particularly in the Eastern zone and the Southern Highlands zone. This will be on competitive grants basis according to the zonal research priorities in these zones. Horticulture is among the top priorities in both zones.

SUA has also contributed greatly to horticulture development through the output from the B Sc. Horticulture degree that is working towards alleviating the critical shortage of professional horticulturists in the country.

3.1.5.3 Tanzania Food and Nutrition Centre (TFNC)

TFNC undertakes some horticultural research on all vegetables and fruits rich in vitamin A and Ascorbic Acid and TOT at district level to sensitize communities on the importance of these fruits and vegetables. They also train local communities simple drying techniques using simple solar driers and jam and fruit juices making as well as provision of recipes that preserve the nutritional qualities of vegetables.

3.1.5.4 Seed and Planting Materials Production and Distribution

The agricultural and decentralization policies require the Ministry of Agriculture and Food Security to develop legislation for quality control of seed and planting materials while the District Councils promote the establishment of mini-orchards of mother trees as a source of planting materials in seed nurseries. The MAFS has accordingly put in place various legislative mechanisms to ensure good quality seed and planting materials. They include:

- The Seed Act of 1973 that prescribes the rules and regulations for production and distribution of seed.

- The Tanzania Official Seed Certification Agency (TOSCA) who are mandated to test and certify all seed produced in the country as well as those imported into the country.

TOSCA has been responsible for the preparation of the regulations that govern field crops seed production and distribution in Tanzania. The aim is to improve the quality of the seed industry under Tanzanian conditions so as to maintain or improve the seed sold to farmers, particularly the smallholder farmers. They maintain the register of seed distribution (marketing) institutions (producers and importers) and are responsible for inspecting production fields and test the seed locally produced as well as the imported seed. The systems in place for implementation of their activities will be discussed in detail under 3.3.3.1.

The Ministry of Agriculture and Food Security Horticulture Unit has maintained a range of mother tree orchards in various parts of the country. Of late these orchards have

not been well maintained due to limited or no funding. With the current demand for improved horticultural planting materials the orchards need to be revived and new mini orchards and nurseries established within the districts where horticulture crops are important.

Quality control of propagated materials is supposed to include proper propagation and labeling and use of virus indexed disease free budwood. This requires qualified Virologists cum Pomologists who do not seem to exist in the MAFS.

Plant Import Permits and Phytosanitary Certificates coupled with inspection and screening is pre-requisites for importation and export of planting materials. The Plant Protection Division (PPD) of the MAFS and the Plant Quarantine Station at TPRI are the regulatory organs for this purpose.

Despite all these regulatory mechanisms, it still remains that the most important technical constraint to horticulture development in Tanzania is availability of disease free planting materials adapted to various agro-ecological zones (Mwasha, 1998). There is still very high reliance on imported vegetable seed, some of which are of very poor quality.

3.1.5.5 Production of Horticultural Crops

The agricultural policies of 1983 and 1997 emphasized enhanced production of high yielding and disease resistant varieties of horticultural crops giving high priority to strengthening research extension and small-scale irrigation.

Despite this policy guideline, horticultural production in Tanzania has remained in the hands of small-scale peasant farmers who produce for their home consumption with some surplus for the local markets near the production sites and some to the urban markets. Research and extension has to a large extent supported these producers through development and distribution of some high yielding and disease free varieties of these crops.

Though the policies have encouraged private sector large and medium scale commercial production for domestic and the export market this has taken place to a very limited scale. The flower industry has been leading in this initiative and a few small and medium enterprises (SMEs) through efforts of some interested entrepreneurs have emerged, promoting production of tropical fruits and vegetable for the export market.

In order to support these initiatives there is need to have a clear land policy and along with the policy of Government/Private sector partnership to support development of varieties of fruits and vegetables of export qualities, to reorient research and extension to be not only client oriented and demand driven but also to be market oriented so as to develop the varieties and types of these crops demanded by the export market.

3.1.5.6 Infrastructure and Transport Facilities

The agricultural policy emphasized the need for better transport facilities to assist and further stipulated that government would facilitate negotiations with both regional and overseas airlines for increased cargo space to accommodate Tanzanian produce.

During this study, poor infrastructure and transport facilities were the number four constraints among farmers interviewed and the number one problem among the fruit sellers and middlemen followed by lack of storage facilities and high spoilage. The middlemen also quoted high transport costs as a problem. Mitawa and Swai (1998) came up with the need for improvement of rural and feeder roads to facilitate transport of inputs to the production areas and for marketing of produce.

Availability of good feeder roads to airdromes, airport handling facilities, including cold storage and freezing facilities at airports are also among the requirements for efficient export of fresh vegetables, fruits and flowers.

Respondents to this study have indicated that airfreights from the Dares Salaam International Airport (DIA) and the Kilimanjaro International Airport (KIA) are still limiting to horticultural exporters. KLM used to operate daily from KIA but has now reduced to four times a week and a British Air Cargo plane with capacity for only 10 tons operates three times a week from DIA. Cargo handling also seems to be a problem. Some limited cold room facilities are available at KIA and at DIA. The Tanzania Airport Authority is not in favour of DAHACO establishing such facilities.

There is need for Government and Marketing Associations to lobby with relevant authorities to collaborate and cooperate in establishing such facilities to create favorable environment and fix reasonable charges for horticulture exports. Currently most of the horticultural export from Arusha and Kilimanjaro is air-freighted from the Jomo Kenyatta International Airport (JKIA) where apparently the services are faster, better facilities and demand more reasonable charges.

3.1.5.7 Strategies for Horticulture Development

Tanzania has recently adopted the Tanzania Development Vision 2025 (TDV) that envisages raising the general standards of living of Tanzanians to the level of a typical medium-income developing country by 2025 in terms of human development. It identifies three priority goals namely, ensuring basic food security, improving income levels and increasing export earnings. The Agricultural Sector Development strategy (ASDS) is one of the initiatives of this vision.

The ASDS has not come up with any specific strategies for horticulture development in Tanzania. The strategy has focused on improving support services including research, extension, training, regulatory services, crop protection services, land and water resources utilization and management, agricultural mechanization, agricultural information services, investment and finances and marketing inputs and outputs.

Since horticulture demands specialized interventions, there is a need to spell out some specific strategies for its development. The following strategies are suggested:

- Creation of marketing body that represent the interests of horticultural producers.

- Since women are the key players in horticultural activities (growing, selling, extension services, utilization), provision of a range of training technical

assistance services to women and youth groups in organization of their groups, in technical aspects of production, processing and marketing of their products.
Creation of enabling/favourable climate for horticultural related services and industry particularly land title deeds, water rights (irrigation) and taxes/tariffs on raw materials for horticultural crops processing and notably packaging materials.
The Government in partnership with other stakeholders avail a preferential research support (financial and logistics) to horticulture research institutes.
The Government in collaboration with the private sector to formulate modalities of collecting cess for promotion of horticultural activities in the country

3.1.5.8 Horticulture development program

The Agricultural sector development Strategy (ASDS) identified five strategic issues to be addressed, namely:

- Streamlining of the institutional framework
- Creating favorable environment for commercial activities
- Public and private sector roles in improving support services
- Strengthening market efficiency for input and output
- Mainstreaming planning for agricultural development in other sectors.

The Agricultural Sector Development Programme (ASDP) of November 2002 has identified sub-programmes, components and sub-components on the basis of the Agricultural Sector Development Strategy (ASDS) strategic areas. These have been consolidated into three sub-programmes for implementation purposes. They include:

- Sub-Programme “A” – Agricultural Sector Support and implementation at District and Field level.
- Sub-Programme “B” – Agricultural Sector Support at National level.
- Sub-Programme “C” – Cross-cutting issues with other sectors at National level

These sub-programmes have been broken down into main components and sub-components.

The ASDP has also identified possible interventions within each sub-component. Though horticulture does not appear as sub-component, it is assumed that during the second phase of ASDP formulation it will be considered in districts where it is a priority. The ASDP stresses that sub-programme “A” interventions and activities will be increasingly undertaken through the District Agricultural Development Plans (DADP).

3.1.5.9 Legislation, Rules and Regulations Governing Horticulture Development

The horticultural industry is governed by many rules and regulations relating to the quality of production, processing, marketing and food standards as a whole. Some of those which relate directly or indirectly to this industry include the Plant Protection Act No.13 of 1997, The Tropical Pesticides Research Institute Act No, 18 of 1979, The Cooperative act No 15 of 1991, The Food (Control of Quality) Act No. 10 of 1978, The Seeds Act, 1973 The Tanzania Bureau of Standards Act No.1 of 1979 and the Land Act No. 4 of 1999. These will be mentioned in relevant sections where applicable.

3.1.3.10 Recommendations on Policy issues.

- The existing policy on horticulture development is still what is contained in the agricultural policies of 1983 and 1997. In view of the importance of this Sub-Sector, there is need for the Ministry of Agriculture and Food Security to formulate a horticultural policy to address aspects of production, processing, marketing, and support services (research, training, extension and regulatory services)
- Following the setting up of a major sub-component on production and processing of agricultural outputs to be implemented at district and field level under the ASDP, the MAFS in collaboration with the MRALG should develop criteria for priority setting at district level to ensure that priority commodities including horticultural crops may be addressed where applicable.

3.2 Status of Horticultural Development

3.2.1 Horticultural crops grouping

Horticultural crops represent an array of over 100 crops grouped as fruits, vegetables, spices/herbs and ornamental crops. Horticultural crops grown in Tanzanian include

3.2.1.1 Fruits

(i) Tropical fruits- Papaya *Carica papaya*, Mango *Mangifera indica*, Pineapple *Ananas comosus*, dessert banana *Musa spp*, Annonas *Annona spp*, Guava *Psidium guajava*, Grapes *Vitis venifera*, Carambola *Averrhoa carambola*, bilimbi *Bilimbi Averrhoa*, and indigenous fruits such as Tamarind *Tamarindus indica*, baobab *Andersonia digitata*, Masuku *Uapaca, kirkiana*, Mng'ongo *Sclerocarya birrea*, monkey orange *Strychnos spp*, sungwi/ntalali *Vitex mombassae*, Mbula *Parinari curatifolia*.

(ii) Temperate fruits- Peaches *Prunus persica*, Pears *Malus spp*, Apples *Malus amygdalus*, Strawberries *Fragaria spp*, Apricots *Prunus spp*, plums *Prunus americana* etc.

(iii) Subtropical fruits- Citrus *Citrus spp*, Avocado *Persea americana*, Lychii *Litchi chinensis*, Cape gooseberry *Physalis peruviana*, Tree tomato *Cymphomandra betaceae*, Pomegranate *Punica granatum* etc.

3.2.1.2 Vegetables (including mushrooms)

(i) Exotic vegetables- Tomato *Lycopersicon esculenta*, Onion *Allium cepa*, Leeks *Allium sativum*, Shallots *Allium cepa* var *aggregatum*, Chives *Allium schoenoprasum*, Sweet pepper *Capsicum occidentale*, Cabbages *Brassica oleracea* var *capitata*, Chinese cabbages *Brassica rapa*, Lettuce *Lactuca sativa*, Peas *Pisum sativum*, Carrots *Daucus carota*, Cucumber *Cucumis sativum*, Water melon *Citrullus lanatus*, String-less beans *Phaseolus spp*, Peas *Pisum sativum*, Cauliflower *Brassica oleracea* var *botrytis*, Oyster mushrooms etc.

(ii) Indigenous/Tropical vegetables- Cherry tomato *Lycopersicon esculenta* var *cerasiforme*, Amaranths *Amaranthus spp*, Eggplants *Solanum melongena*, African egg plants *Solanum macrocarpon*, Okra *Abelmoschus esculentus*, Collards/mustards *Brassica oleracea* var *viridis*, green leafy vegetables such as Nightshades *Solanum vilosum*, Pumpkin leaves *Curcubita spp*, sweet potato leaves *Ipomoea spp*, cassava leaves *Manihot esculentum/Manihot glaviozii*, and many more which are yet to be seriously domesticated

as well as local mushrooms *tectomycetes* still collected abundantly from the wild and have yet to be domesticated etc

3.2.1.3 Spices and Herbs

Mints *Mentha piperita*, Cinnamon, Cardamon, Tumeric, Ginger *Zingiber officinale*, Coriander *Coriandrum sativum*, Parsley *Petroselinum crispum*, Celery, Black pepper *Piper nigrum*, Paprika/hot pepper *Cupsum frutescence*, Garlic *Allium sativum*, Cloves, Vanilla *Vanilla fragrans*, lemon grass, nutmeg *Myristica fragrance*, ylang ylang *Cananga odorata*, herbal teas such as Rosella *Hybiscus sabdarifa* etc.

3.2.1.4 Ornamentals

Shrubs, potted plants and cut flowers such as Roses, Carnations and Chrysanthemums.

3.3 Production status

3.3.1 Fruits and Vegetables

Due to high variation in topography, altitude, altitudes which dictates climatic changes Tanzania has the potential of growing all horticultural crops except those requiring very high chilling such as cherry and those requiring very long days/nights e.g. some onion varieties. It is estimated that 1000ha of vegetables alone are grown each year (Mwasha, 1998) while it is estimated that 2 million tons fruits are produced annually. Our findings in 9 districts indicate production and priorities shown in Tables 2, 3 and 4. Appendix 4 shows production trends in Morogoro district from 1997/98-2000/02.

The priorities are based on the volume of the produce, contribution to income generation and food security. The priority listing precludes nutritional and aesthetic value of these crops that ought to be considered too as it would influence changes in attitude towards consumption of fruits, vegetables, spices/herbs and ornamentals and consequently increasing the horizon of local markets.

Table 4. Production priorities of horticultural crops in studied districts

District	Priority 1	Priority 2	Priority 3	Priority 4
Arumeru	Vegetables	Fruits	Spices/Herbs	Ornamental
Hai	Vegetables	Fruits	Spices/Herbs	Ornamental
Iringa	Vegetables	Fruits	Spices/Herbs	Ornamental
Kibaha	Vegetables	Fruits	Minor	Minor
Lushoto	Vegetables	Fruits	Spices/Herbs	Ornamental
Mbeya	Vegetables	Fruits	Spices/Herbs	-
Morogoro	Fruits	Vegetables	Spices/Herbs	Ornamentals
Muheza	Fruits	Spices/Herbs	Vegetables	Ornamentals
Temeke	Vegetables	Fruits	-	-

Table 5: Survey results on the production statistics of horticultural crops in the studied districts^v

District	Hectarage (ha)		Yield volume (tons)	
	Vegetables	Fruits	Vegetables	Fruits

Arumeru	10.4 (1.3)	1.0 (0.13)	210 (26.3)	16.5(2.6)
Hai	8.1 (1.0)	0	63 (7.9)	0
Iringa	11.1 (1.4)	-	243 (30.3)	-
Kibaha	4.4 (0.6)	2.4 (0.4)	33.4 (4.7)	36 (5.1)
Lushoto	18.8 (2.7)	10.5 (2.7)	133 (19.2)	55.9 (11.2)
Mbeya	4.18 (0.5)	0.5 (0.1)	48.2 (6.0)	1.72 (0.25)
Morogoro	0.25 (0.03)	13.8 (1.7)	0.35 (0.04)	111 (13.9)
Muheza	2.5 (0.4)	27.3 (3.4)	2.5 (0.3)	80.6 (10.1)
Temeke	2.9 (0.41)	5.1 (0.73)	108 (15.5)	187 (26.6)

Sample size = 8 interviewee per district

^v Numbers in brackets indicate mean hectareage and yield

Table 6. Priorities and production of horticultural crops in the given districts

District	Priority	Crop species	Production/Yield				
			Acreage (Ha)	Volume (T)	Productivity (Tons/ha)		
Lushoto	1 Vegetables	Tomatoes	1289	38670	30		
		Cabbage	1600	4800	30		
		Carrots	85	2550	30		
		Lettuce/chards /cucumber/egg plant	10	150	15		
		Cauliflower	10	250	25		
		Onion/leeks	300	9600	32		
	2. Fruits	Plums	339	14830	44		
		Pears	2813	161806	57		
		Apples	82	3275	40		
		Avocado	10	20	2		
		Mangoes	25	375	15		
		Peaches	164	2619	16		
		Passion	10	30	3		
		Loquat	18	459	25		
		Annona	8	24	3		
		Citrus	77	77	1		
		Papaya	5	25	5		
		Hai	1. Vegetables	Tomatoes	900	9000	11
				Carrots	300	2400	8
Cabbages	950			9500	10		
Cucumber	-			-	-		
Indigenous vegetables	1000			36350	4.6		
Onion	500			4000	8		
Eggplants	20			160	8		
	Avocado		200	2000	10		
	Orange		125	1750	12.5		
	Pawpaw		10	3100	310		

	2. Fruits	Mango	100	1500	15
		Passion fruits	10	50	5
		Banana	21000	225000	10.7
	3.Ornamental	Roses/ other Flowers	50	10	0.2
	4.Spice/Herb	Ginger, lemon grass and Rosella in small volumes			
Iringa	1.Vegetables	Tomatoes	4248	101952	24
		Onion	1584	11088	7
		Cabbage	713	10695	15
		Other	117	1521	13
	2. Fruits	Peaches	1290	10320	8
		Pawpaw	215	1720	8
		Plum	43	3044	71
		Mango	522	2980	6
Mbeya	1. Vegetables	Tomatoes	380	4940	13
		Cabbage	270	3510	13
		Onion	90	1170	13
		Carrots	83	1079	13
		Leafy Veggie	117	1521	18
	2.Fruits	Peaches	1290	10320	8
		Pawpaw	215	1720	8
		Mangoes	522	2980	6
		Plums	43	3044	71
	Spices/Herbs	Garlic	Small quantities		
Morogoro	1. Fruits	Banana	6130	91950	15
		Citrus	1650	19400	12
		Pineapple	1000	40000	40
		Papaya	130	1560	12
		Annona	670	16400	24
		Peaches	210	2100	10
		Plums	170	680	4
		Apples	25	500	20
	Pears	50	750	15	
	2. Vegetables	Tropical/ Temperate Amarathus, okra, African egg plants,	5102	127548	-
	3. Spices Garlic, clove, black pepper, cinnamon, cardamon, ginger, tumeric	2550	4790	-	
	Fruits	Pineapples	245	2651	11

		Citrus	230	2117	9
Temeke	Vegetables	Banana	307	3036	10
		Mangoes	243	2101	8.6
		Passion fruits	3	68	22.7
		Amaranthus	59	430	7.3
		Tomatoes	353	5243	14.8
		Okra	13	30.5	2.3
		Cucumber, water melon,	Minor	Minor	

Source: DALDO's offices

3.3.2 Production characteristics, constraints and recommendations to seed production

Production of horticultural crops is characterized by low productivity due to use of disease and pests ridden planting materials, use of nondescript varieties of low yield potential, coupled with low investment in production inputs and production techniques.

Production of horticultural crops in Tanzania is not export oriented and the high potential has not been exploited and is not given the right priority at the high decision making level until the late 1980's.

Production for local market also leaves much to be desired in terms of quality, efficiency, agronomical practices employed, yields and cost effectiveness.

Diseases such as early and late blight in tomatoes and purple blotch in onion cause substantial losses particularly during the rainy season. Pests such as aphid American bollworm, cutworms and grasshopper seem to be mostly severe during the dry season.

Production is not targeted to any planned market leading to production of similar/uniform crops that end up in gluts during peak season. Gluts may also be caused by lack of choice of varieties i.e. early, mid and late varieties that could stagger or lengthen harvest season.

Easier to grow crops such as amaranths, tomatoes and onions are overproduced leaving out empty niche of other high value crops such as Coriander and stringless beans.

Production is characterized by large post harvest losses due to pests and diseases attacks, mishandling and delayed harvesting for lack of market.

It was not possible to get the figure of produce losses just before harvesting but it is quite substantial. Table 7 summarizes production characteristics/constraints as observed and pointed by interviewed farmers, subject matter specialists and DALDOs in surveyed districts.

The following constraints need to be elaborated:

The most horticultural growing areas are hilly and inaccessible (Mgeta, Matombo, Lushoto, Uporoto etc) with bad slippery access roads and broken bridges. Getting the produce to the market in village centers, town centers, or buyers accessing farmer plots becomes unreliable and costly. This have a negative impact on marketing plans especially for export ventures.

Lack of markets for horticultural produce prohibits expansion of acreages.

The horticultural extension officers are not facilitated enough to cover the fragmented units that characterize horticultural production areas therefore extension activities are very slow except in areas where special projects are operative such as IFAD, IFSP, UVPP, and Non Government Organizations such as CONCERN, HIMA, ASPS-Seed production support.

Inadequacy of quality seeds and planting material also was noted to be prohibitive to increased production and productivity. Seeds seemed to be too expensive for the farmers, this coupled with large volume packaging instigated repackaging by village stockists hence affecting viability and provoking adulteration.

There is high demand for fruit planting materials (seedlings and/or propagules) but these are in short supply and where found were of undesirable quality. Indiscriminate use of planting materials has an impact on tree productivity and later fruit quality.

Existing citrus fruit trees are highly attacked by gummosis (*Phytophthora spp* or micronutrient deficiency), citrus stem borer, scale insects and aphids as well as some unknown diseases (bacterial?, *tristeza*?, micronutrient deficiency?).

Table 7. Factors limiting horticulture production in Tanzania

Recorded constraints	Source & Scores			
	Farmer *		Extension **	
	Freq.	%	Freq.	%
Markets unreliable/undeveloped/lack of market information	20	19.2	9	15.5
High input prices/Low producer prices	26	25.0	3	15.2
Pests and disease incidences	12	11.5	3	5.2
Poor infrastructure/Transport facilities	9	8.6	6	10.3
Low productivity in the industry	8	7.7	-	-
Weak advisory services/knowledge on field management	7	6.7	3	5.2
Inadequate irrigation facilities	5	4.8	3	5.2
Frequent produce price fluctuations	4	3.8	-	-
Poor varieties/Unimproved seed and propagules	4	3.9	2	3.5
Poor packing materials	4	3.8	-	-
Lack of collection/market centers	3	2.0	-	-
Too much wastage/damage	1	1.0	-	-
Undeveloped post-harvest handling / packing / grading	1	1.0	3	5.3
Poor quality produce	-	-	6	10.3
Inadequate processing plants	-	-	4	6.9
Poor facilitation of extension staff (horticulture)	-	-	3	5.2
Lack of quality standards and control	-	-	2	3.4
Inadequate credit and loan facilities	-	-	2	3.4
Inadequate qualified field staff (Horticulture)	-	-	2	3.4
Low farmer purchasing power	-	-	1	1.8
Lack of proper equipment for field management (fruits)	-	-	1	1.7
Low Gov. (central & local) funding level for serves	-	-	1	1.7
Inputs adulteration (pesticides, seed)	-	-	1	1.7
Low soil fertility	-	-	1	1.7
Limited suitable land	-	-	1	1.7
Taboos and beliefs hindering increased investment	-	-	1	1.7
TOTAL SCORES	104	100	58	100

* Sample size = 70 farmers

** Sample size = 9 districts

Recommendations to increased production

Government in partnership with Community based organizations such as SACCOS, NGO should facilitate provision of credit facilities to smallholder farmers at reasonable interest rates and conditions. On the other hand farmers should be sensitized to make use of available credit facilities.

Horticultural extension personnel should be facilitated to conduct training and visit programs appropriately so that farmers can produce good quality products.

Production should be targeted to market demand e.g. farmers should be encouraged to engage in contract growing in partnership with processing factories and or exporters.

A marketing body is proposed which should oversee marketing of horticultural crops and particularly offer marketing information to growers. Farmers also should be encouraged to organize themselves into producer cooperatives/associations to improve their bargaining power.

Relevant information on organic farming should be made available to all small-scale farmers so that they become aware of what they ought to do and the benefits they can

gain from such production. This can be done through extensive extension services to individual farmers, groups and co-operatives, stress on IPM utilizing botanicals where feasible.

Farmers to be trained in appropriate post-harvest handling including harvesting, sorting, packing, storage and transportation to destination.

3.3.3 Seed production

3.3.3.1 Status

Unavailability of improved seed was registered by a number of farmers and interviewed subject matter specialists (see Table 7). For most open pollinated species, farmers rely mostly on seed saved from previous cropping season. Seeds of this nature are highly variable and unreliable in terms of trueness to type hence quality, as well as performance particularly viability and vigour, they may also carry pest and diseases and therefore have low yielding potential.

On the other hand, production of certified vegetable seed needs seed production professionals, is a very expensive venture demanding heavy investment in input resources and seed processing infrastructure, constant pest and disease monitoring from planting to harvesting, grading, storage and packing. This has been the major bottleneck to vegetable seed production warranting importation to the tune of up to 40 tons mixed seed lot annually (Ngwediagi, 1998).

To-date, the only local commercial producers of certified vegetable seed (tomato only) are Alpha Seed Company located in Tengeru, Arusha. A visit to this sole local company revealed the following constraints:

- Land and water right/costs to effect optimal production of quality seed
- Unavailability of packaging material (aluminium of special gauge) and high taxation of imported packaging material
- High field inspection charges

The above inflate the costs of production of locally produced certified seed hence creating unfair competition with cheaper imported seeds.

3.3.3.2 Seed Importers, Distributors and recommendations seed production

Other seeds (standard seeds) are supplied through importation. There is an array of registered foreign/private companies importing standard seeds and distributing them throughout the country through their shops or stockiest in various districts, township and village shops. These include companies such as Popvriend, Rotian seed, East African Seed Company etc. East African Seed Company alone distributes 200 kg each of 4 cabbage varieties/season, 200 kg each of onion, sweet pepper and tomatoes. TOSCA/TPRI regulates these seed suppliers/producers to ensure regular supply of quality seeds. Through the interview, it was learnt that most of these seed companies were concentrated in Arusha to cut down on transportation and cold storage costs.

The companies enjoys waiver on taxes because they import agricultural goods which give leverage to the price of their commodity over the locally produced seeds that have to pay high taxes on imported packaging materials.

If local producers are to be encouraged, then some incentives need to be put in place. Some efforts to produce seeds have been on at relevant research institutes. Fully-fledged observation and seed production trials (onion and tomato) were undertaken by the Government with the help of a Dutch seed production specialist in 1984-86 and later 1989-1995 by FAO experts.

Seed production project followed in 1989 producing a trial output of 2 tons of improved seeds at HORTI-Tengeru and CASRC-Dakawa. A National Vegetable Seed Industry Development Program (NVSIDP) formed in 1992 was a product of this research effort and have a responsibility of overseeing variety development and maintenance, seed production of nucleus (breeders) and parental seed, commercial seed production, quality control, seed processing, marketing and distribution as well as on-farm seed production. Simpler alternatives developed by FAO introduced what is known as “Quality Declared Seed” that reduces human and other resource load and therefore cheaper to produce. With the support of ASPS on-farm seed production unit, farmer managed Quality Declared seed is being produced by small-scale farmers for local markets and at reasonable cost. A sample of a farmer produced QDS is given in Table 8. This is too small compared to the National seed requirement of over 40 tonnes.

Table 8. Amount of Quality Declared Vegetable Seed (kgs) Produced in three Regions under the ASPS programme (2000/2001)

District	Tomato	Onion	Okra	A/eggplant	Amaranthus	TOTAL
Ludewa	4.5	-	8.0	3.0	9	24.5
Mpwapwa	3.5	35	-	-	-	38.5
Dodoma Rural	-	-	-	-	3	3
Kongwa	-	15	-	0.3	20.5	35.8
Ulanga	10	1.3	-	-	-	11.3
Kilosa	39.4	6.0	-	2.5	38	85.9
Iringa Rural	22.7	15.0	5.5	4	-	47.2
Kondoa	0.55	-	-	-	4	4.55
Kilombero	7.7	-	44	3.8	125	180.5
TOTAL	88.35	72.3	57.5	13.6	199.5	431.25

In these areas, TOSCA relies on inspection agents who have been trained by the Institution to monitor and inspect the bulk of the production process. The following criteria are checked for QDS:

- Access to seeds which is of eligible variety and suitable for further multiplication. e.g. Tanya and Tengeru 97 for tomatoes and Bombay red for onion.
- Suitable area for seed production, non-contaminated area or areas close to similar crops
- Basic knowledge in seed production technology including field inspection, quality control and conditioning.
- Access to suitable equipment and seed conditioning and storage.
- Access/Proximity to a seed-testing laboratory that is located in Morogoro, Arusha or Njombe.

Quality control measures required by the regulations include:

- Agreement to produce and distribute the seeds according to the agreed procedures
- The seed producer to be responsible for quality control measures
- Fields to have satisfactory previous cropping histories
- Seed crop well grown and whenever necessary remedial measures taken to correct shortcomings e.g. rouging
- Institute field inspection according to the procedures outlined in the appropriate crop standards (MAFS, 2001)

Recommendations to seed production

There is a need for capacity building for local seed production.

Institute strict regulations on imported seeds

TOSCA/TPRI to be adequately facilitated to monitor horticultural seed production

Relevant ministries (Ministry of Lands and Settlements Development, Ministry of Livestock and Water and the Ministry of Agriculture and Food Security) to provide necessary support for local seed producers to be able to acquire the needed seed production facilities such as land and water rights.

3.3.3.3 Fruit planting material

Before decentralization fruit propagule production was the responsibility of research centers and central district nurseries supervised by district horticulturists. Rootstocking materials and budwood were obtained from the research and district mother tree orchards. From these centers, individual nurseries obtained budwood for multiplication. This arrangement ensured adherence to nursery ethics of propagating materials that are true to type, disease and pest free.

Decentralization has caused demise of the central nurseries. A total of 25 mother tree orchards and corresponding nurseries were in existence in the 1970's including 1 spices/herbs collection at Zigi in Amani-Tanga. This number has dwindled to only 6 namely 1 each at Igurusi in Mbeya; Mpiji in Dar Es Salaam; Songa in Muheza; Bugaga, Kasulu for tropical fruits and 2 in Lushoto for temperate and tropical fruits. The list of varieties in each of these mother tree orchards could not be immediately obtained but it is evident that these mother tree orchards are in bad condition due to lack of funding and rehabilitation needs. Some of the varieties have long been lost and overgrown by rootstock shoots. The orchards are old and needs replanting/replacement. There is need to upgrade the orchards to cater for the growing demand of fruit tree propagules with a wide variety of choices such as extending the harvesting period, processing requirement and for fresh market. There is a big operational gap between mother tree orchards and mini nurseries now managed by individuals or communally based nurseries. There is need to revive the central nurseries, invest in training pomologist/virologist who should oversee that materials to be distributed are really clean by conducting virus indexing. Farmers should be sensitized to invest into nursery plant production and be offered necessary training.

Recommendations to propagule production

Revival of Central Nurseries and Mother Tree Orchards under the MAFS/District Local Government.

Introduce new and improved varieties through Research Institutions

The Ministry of Agriculture and Food Security to undertake capacity building in propagation, inspection and virus indexing.

3.3.3.4 Floriculture

This is a new area evolving mostly with big foreign growers in the Northern zone. These include companies such as Multiflower Ltd., Arusha cuttings, Tanzania Flowers, LaFleued de Afrique, Kiliflora Ltd., Hortanzia Ltd., Continental flowers, Kombe Roses, Green Stars, Horticulture Farms etc covering 80Ha of greenhouses under Chrysanthemums, Roses, ornamental sunflower and Linciathus. Most of these flowers are exported out of the country. For example Arusha cuttings specializes in rooting chrysanthemum cuttings in their 3-5 ha green houses located in Njiro, Arusha and ship the vegetative plants to Holland for flowering and eventual sale/auctioning as pot plants and cut flowers. Small farms of less than 0.5 acres each are found in Iringa (Carnations), DSM (Tuberous roses). These are more or less limited to local markets that are on a rise due to the presence of foreign community and as vanity and sophistication increases among Tanzanians.

Similar explanation goes to the mushrooming women owned roadside nurseries for fruit trees, shrubs and pot plants which employs mostly youth and suffers immensely land (they utilize open areas hence may conflicting with City Council Administrators) and water shortages. Actual figures for this industry is difficulty to get without well planned studies, but it is evident that they contribute a lot to plant requirement and beautification of the Cities notably Dar Es Salaam.

3.3.3.5 Constraints facing large flower farms/remarks

Electricity tariffs in Tanzania are higher than in Kenya. Handling and storage charges by DAHACO are 10 times higher than in Kenya. All these factors make cost of production equally higher in Tanzania than in Kenya.

For cost reduction purposes and lack of local alternatives they are forced to use obsolete chemicals from abroad, an issue that could have an implication on the environment.

The Government should institute a policy to involve small-scale growers as outgrowers for these large-scale flower growers. Otherwise, organize small-scale growers for group marketing as well as sensitizing Tanzanians for local markets. This would not only increase income generation activities for the small growers, but also boost capacity building in the flower industry.

Need for capacity building in floriculture is imminent as none exists even at the 2 horticultural training Institutes (HORT-Tengeru and SUA).

3.3.3.6 Mushroom production

Tanzania has always relied on local seasonal mushrooms (*Tectomyces spp*) collected from the wild particularly in regions covered by the Miombo woodlands. Of recent, cultivated mushrooms are coming into the picture, based mostly on Oyster mushroom (*Pleurotus spp*) which is hardy and can sustain the less anesthetic conditions of the tropics. Strains currently available include *Pleurotus oestratus* (cool), *P. sapidus* (all weather), *P. flabellatus* (all weather), *P. djane djane* (all weather), *P. polmomerius* (tropical). The button mushroom (*Agaricus spp*) has yet to be grown because it needs higher degree of anesthetic conditions. Market for mushroom is on the rise but supply is minimum due mostly to difficulty of farmer access to spawn and lack of knowledge about the industry.

Research on adaptive strains, agronomy and spawn production is currently being done by TIRDO and UDSM, ARI-Uyole, Hort Tengeru and other private individual growers. Some financial support to promote cultivation by small growers and researchers in Tanzania has been derived through IFAD, ZERI/COSTECH.

3.3.3.7 Constraints facing mushroom production in Tanzania

The mushroom cultivation industry is still very young in this Country so require some input in publicizing and promotion. A lot is still used for fresh consumption. This requires cold storage for surplus hence necessitating need for processing and other value added products that are less perishable such as mushroom powder. Relevant institutes should publicize the nutritional and medicinal value of different mushroom strains to attract more local consumption. This should include provision of mushroom recipes. Organized marketing is crucial for this highly perishable commodity.

3.4 Research and Development

3.4.1 Past research

The scanty, inconclusive and discontinuous Horticultural research in Tanzania has been in place since 1960's (Shao et al, 1988) at Institutes strategically located in the vicinity of the most horticultural crops growing regions in the country namely ARI-KATRIN (Morogoro 1970's), HORTI-Tengeru research Institute (Northern Highlands 1978), SUA (wetter Central plateau 1970), ARI-Uyole (Southern Highlands 1972) as well as Cholima-Dakawa (drier and hotter Central plateau 1980's). Research focus was mainly on germplasm collection/introduction and evaluation trials for both vegetables and fruits aimed at selecting adaptable varieties. Furthermore, agronomical research (inorganic and organic fertilizes rates, spacings, training and pesticide rates and timing) was given impetus with an objective of improving yield performance. Specific emphasis at respective stations were:

3.4.1.2 ARI-Uyole

Temperate and tropical fruits and vegetables. The program was initiated in 1970 by the Nordic Countries and later FINNIDA to evaluate temperate and subtropical fruits and vegetables for the Southern Highlands. The project contributed substantively to the

improvement of horticultural production in this zone. It has produced production packages for tomato, and identified planting materials of some temperate fruits that are currently multiplied at surviving nurseries in the zone. The programme suffered substantively in 1992 when the donors pulled out and the station reabsorbed by the MAFS Except for bananas, the collection-cum-mother tree orchard of more than 200 fruits has long since died due to mismanagement.

3.4.1.3 KATRIN

Mostly tropical fruits. Germany supported research until 1990's. The Institute is currently mainly involved with rice research and propagation of fruit varieties that were researched on before the discontinuation.

3.4.1.4 SUA

Tropical and temperate fruits and vegetables. FRANCO-Tanzania Project, a French Bilateral organization initiated and supported Uluguru Mountain Horticultural Development Project (UMHODEP), an active research on vegetable production in Mgeta and other areas in Morogoro up to 1994. The research findings were an improvement in the production package for vegetables and fruits in the project area.

3.4.1.5 HORTI-Tengeru

Temperate subtropical and tropical fruits and vegetables evaluations. The DUTCH Government sponsored research and training (Diploma in Horticulture) facilitated conduction of vegetable and fruit research as well as seed production. A lot of introductions of a lot of fruit cultivars distributed also to ARI-Uyole and SUA-HORT project. The collection cum mother tree orchard of more than 200 fruit cultivars is in existence but suffers mismanagement.

3.4.1.7 ARI-Makutopora

It is important for Viticulture. The program involved variety screening, agronomical studies visa-a-vi pruning, spacing and fertilizer rate and timing evaluation as well as control of downy and powdery mildew. The station is invaluable for further promotion of grape/winery development in Tanzania.

The results from these activities at all the above Institutes, inconclusive as most were, still forms major varieties and recommendations used to-date.

Constraints then included mostly inadequate and inexperienced researchers, lack of infrastructure for such a specialized industry (green houses, growth chambers, laboratory ware and chemicals) as well as lack of technical information.

An extra effort to boost horticultural research in Tanzania was made in 1987 with a 2 week Horticulture Research Methodology course organized by AIC-Wageningen, The Netherlands conducted for all relevant researchers followed by a 5 day Workshop for Vegetable research and Development in SADC countries in 1990 culminating in research prioritization and initiation of CONVERDS as well as instituting AVRDC Africa Centre in Arusha in 1992. The outcome is as detailed in table 9 below.

Table 9. National Horticultural Research Priorities as of 1988

Crop	Research Priorities	Institute responsible
Cabbage	-Agronomical trials, Disease/pest control -Seed production	-All except Makutopora -Uyole and Tengeru
Onions	-Seeds, Weed control, Spacing, Fertilizer -Purple blotch/Downy mildew -Thrips control	-All except Makutopora -Uyole -Tengeru
Tomatoes	Nutritional requirement Variety testing Seed technology Disease control Varieties Staking	All except Makutopora All except Makutopora All except Makutopora All except Makutopora All except Makutopora SUA and Uyole
Amaranthus	Plant density Fertilizer requirements	All except Makutopora All except Makutopora
Carrots	Seed technology	Tengeru
Okra	Seed technology Variety testing Fertilizer requirement	Tengeru Tengeru Tengeru
Citrus	Fertilizer requirements Variety trials Indexing for viruses Control of fruit flies Rootstock testing	SUA, Tengeru, Uyole, KATRIN SUA, Tengeru, Uyole, KATRIN SUA and Tengeru All except Makutopora All except Makutopora
Avocado	Variety trials Rootstock trial Control of Phytophthora	All except Makutopora All except Makutopora SUA, Uyole, Tengeru
Mango	Variety trials	Uyole, SUA, Tengeru, KATRIN
Temperate fruits	Variety trials	Uyole, Tengeru
Grape vines	Agronomical trials Control of downy and powdery mildew Variety trials	Makutopora Makutopora Makutopora

Source: Swai R.E.A. (1988) **In:** F.M.Shao et al, 1988 (eds.) Proceedings of the National Workshop on National Agricultural and Livestock Research in Tanzania.

3.4.2 Current research

Horticulture research still is limited by some constraints of the 1990's, the situation only grimmer. Only donor funded research projects such as TARP II ARF, ZARF are ongoing. For horticultural crops, this could be a reflection on the current National Research Policy approach of Client-Oriented-Demand-Driven-Research (described in detail in Chapter 2).

3.4.2.1 KATRIN

The Institute is currently involved mostly with rice research. The only horticultural activity surviving is propagation of fruit varieties (mangoes and citrus) that were introduced at the research station before the discontinuation. The budwoods are collected

from trees that occasionally have to sustain fire attacks due to mismanagement. Of recent, the MAFS has initiated a collection and an observation grove of spices (mostly cloves) for future distribution in the valley.

3.4.2.2 SUA

Major mandate is on training (manpower output) of a 4 year BSc.Degree in Horticulture and Postgraduate studies. Research activities done with students depend on the interest of the undergraduates as well as postgraduates and their sponsors, clients and contract research.

- There are 3 projects under TARP II namely a Banana research as part of the income generation and food security strategy for Morogoro rural areas, a project to promote home gardening as well as a research on Papaya basic morphological studies.
- Crop Science Dept which houses the Horticulture research project is a collaborator in studies conducted by the Center for Sustainable Rural Development (SCSRD) sponsored by JICA. SCSR D picked where UMHODEP left off and extended the zone of activities emphasizing on local participation through PRAs, training of smallholders in carrying out developmental activities that support farmers well being, sensitization of farmers on the need to invest into profitable production technique, collaborate with other NGO and CBO such as UMADEP to develop sustainable production ventures, market centers, initiation of simple processing plants and road repairs to horticultural growing points in the project area.

The Department has now new functional greenhouses and a biotechnology laboratory earmarked for banana tissue culture propagule multiplication and related studies. Production has yet to take off for lack of chemicals and reagents. Contract research is ongoing when researchers are called upon to undertake specific studies on horticultural crop or discipline.

3.4.2.3 ARI-Uyole

Still conducting research on horticultural crops. Vegetable and fruits research gearing at dissemination of improved varieties has been accorded priority No.1 and banana accorded priority No 2 under TARP II that emphasizes on Zonal priorities. Under National prioritization fruit research, spices and floriculture do not feature and yet are important researchable areas to tap into the growing local and export demand.

Current research include:

- On-farm cultivar evaluation and seed production of tomatoes (Rossol, ARP365-3 and CL 5915-206D4-2-1-0) and onion (Indian Khaki).
- On station germplasm collection, evaluation for high yield potential and disease resistance in tomato, onion and cabbage as well as improvement of shelf life of tomato.
- Development of IPM strategy for common diseases and pests attacking vegetable crops incorporating natural products (botanicals pesticides).
- On farm evaluation of avocado varieties for adaptability and acceptability.
- On-station avocado and banana evaluation and propagule multiplication there-of.

- Post-harvest handling involving pretreatment and solar drying techniques for vegetables and fruits.

Constraints

Horticulture research project at Uyole is massively under-staffed to carry out research in all four regions of the Southern Highlands therefore there is a need for recruitment of BSc. Horticulture graduates from Sokoine University of Agriculture. There is also a need for rehabilitating the irrigation system if horticulture research is to be done off-season.

Vegetable development in the zone appears to be hampered by inappropriate use of inputs (cost effectiveness), high incidences of pest and diseases aggravated by continuous cropping of Solanaceous crops in the same area, lack of good quality seeds and lack of post harvest management technologies. District Councils need to earmark client-oriented demand driven research for these bottlenecks in the Zone.

3.4.2.4 HORTI-Tengeru

Vegetables

Tomato- Crop improvement, Pest management, Seed production

Cabbage-Pest management, Variety improvement

Onion – Variety evaluation, Pest management, seed production

Indigenous vegetables (amaranthus, collards, nightshade, african eggplants, pumpkins)–
Germplasm collection, maintenance and On-farm seed production

Fruits

Banana-Germplasm maintenance, multiplication

Mangoes, temperate fruits and citrus- Germplasm maintenance

Constraints

Apart from maintenance of germplasm and propagation, active fruits research has been shelved due to lack of researcher(s).

The Institute has a Biotechnology laboratory but rapid multiplication of banana has not taken off yet due to lack of chemical supplies and trained technician(s) for routine operations.

Post harvest handling research (Processing) has also been shelved for lack of resources and trained personnel.

Separation of MAC into Ministry of Agriculture and Food Security and the Ministry of Water and Livestock Development and the mandate of MATI-Tengeru as a livestock training institute is likely to affect the efficiency of HORTI-Tengeru as a horticultural crops research and training centre.

The Institute houses the lead scientist for horticultural crops research/National horticulture research coordination. On the other hand, the Institute is under the Northern Zone with HQ at ARI-Seliani. This placement seems to mask the National coordination of horticulture research. Given the delicacy of horticulture

development and horticulture research in Tanzania The Institute needs special support from the Ministry to enable it to perform its mandate.

3.4.2.5 ARI-Makutopora

The station is invaluable for further promotion of grape/winery development in Tanzania. There is a high potential for grape production (table grapes and wine making) in Dodoma and Iringa regions and other drier areas of Tanzania. Understaffing needs to be addressed for the Institute to function.

Recommendations to improve horticulture research

Recruit/train qualified researchers

Horticultural research should be given preferential research funding and facilities by both MAFS and Donors/Private sector so as to improve quantity and quality of research conducted.

DRD to define coordination of Horticulture Research. The role of lead horticultural research Institutions such as HORTI-Tengeru, SUA and ARI-Uyole in relation to National Coordination of Horticulture research should be defined.

3.4.3 Inputs

3.4.3.1 General

Horticultural crops production is an intensive culture using high-level input. Tanzanian horticulture industry has not been free from this dilemma as shown in Table 10.

Table 10. Input usage and input availability in the studied districts

District	Usage				Availability (% of respondents)							
	Ferti lizer	Insect cides	Fung icide	Seed	Fertilizers		Insecticides		Fungicides		Seed	
					Easy	Diff	Easy	Diff	Easy	Diff	Easy	Diff
Arumeru	75	88	88	100	50	25	37	50	37	50	50	50
Hai	88	100	100	100	87	12	75	25	62	38	75	25
Iringa	100	100	100	100	100	0	88	12	88	12	100	0
Kibaha	100	71	57	71	57	43	57	29	43	14	57	14
Lushoto	87	87	87	87	62	38	100	0	100	0	87	12
Mbeya	100	100	100	100	62	38	62	38	63	37	62	37
Morogoro	37	12	0	100	37	-	12	-	-	-	75	25
Muheza	12	0	0	100	0	0	0	0	0	0	75	25
Temeke	100	100	86	100	71	29	86	14	86	0	86	14

3.4.3.2 Usage

All farmers and DALDOs/SMS/Extension officers interviewed contented to using inputs notably all farmers in Mbeya and Iringa. More than 80% of respondents in Hai, Lushoto, Arumeru used fertilizers and pesticides (fungicides and insecticides). Except for seeds, farmers in Morogoro and Muheza registered the least use of fertilizers followed by Kibaha probably because most farmers interviewee in these districts were fruit growers which in Tanzania seems to be a low input crop.

The heaviest input users were in districts that registered vegetable crops as their major priority. At least 30% of farmers in Kibaha and Lushoto acknowledged to using saved seeds from the previous cropping while in the rest of the districts farmers acknowledged to purchasing seeds from stockists

3.4.3.3 Availability

More than 50% respondents in all the districts except Muheza and Morogoro thought it was easy to get fertilizers. The response to availability of fungicides and insecticides was variable between respondents in different districts. It was easier to purchase insecticides in Lushoto, Iringa, Temeke, Mbeya in that order while it was difficult in Muheza, Morogoro, and Arumeru in that order. Fungicides availability followed more or less the same trend. Arumeru and Kibaha registered difficulty in availability of seeds. None of the respondents used weed killers. Use of pesticides in horticultural crops is becoming a major concern not only for product quality but also for health and environmental concerns. Horticultural crops production is one the few areas in Tanzania that are using pesticides heavily and indiscriminately with no due attention to safety of the products or the farmers themselves. Rates, stage of application and spray withhold periods before harvest are not followed.

Trade liberalization also has had its negative effect on pesticide market. There is a high risk of importing ineffective, experimental chemicals or chemicals that have long expired or banned in the industrialized World. The chemical overflow is likely to confuse farmers some of whom cannot even read. There is therefore need to provide education on proper use or non-use of pesticides and to monitor adherence to set standards.

The plant protection Act of 1997, the principal legislation law on pesticide use has yet to come into force but it has the responsibility of assuring that all plant protection measures are implemented towards sustainability and environmental protection (ENVIROCARE, 2000). This study suggests districts that are major horticultural crops producers should enact some by-laws on pesticide use to ensure that produce have no pesticide residues at harvesting. This is crucial now that we are craving for the export market that will most likely reject commodities having pesticide residues.

KIHATA is a Non-Government Organization promoting organic farming based on holistic resource management. It provides education on farming with its main goal being to balance between population, natural resources and environment i.e. preventive approach by adherence to the Precautionary Principle which is also advocated by IPM program of the Ministry of Agriculture but whose enforcement and effectiveness have yet to be realized.

3.4.4 Horticultural Production under Irrigation and recommendations

Whereas the predominant farming system in Tanzania is subsistence agriculture under rain fed conditions (about 90%) irrigated agriculture present a minor part of the agricultural scene. Viewed from the economic standpoint irrigated agriculture has played

an important role in the peoples' livelihoods because it includes export cash crops and traditional staples, and now gaining importance due to the emerging high value horticultural crops.

Irrigation as an age-old art (Israelsen, et al., 1962) has been important in some parts of Tanzania for many decades. Traditionally developed irrigation systems date back as far as 200 years (FAO, 1994). They are still of considerable importance in many parts of the country particularly in Arusha, Iringa, Kilimanjaro, Mbeya Morogoro and Tanga Regions. These systems are often referred to as 'Traditional Irrigation Schemes' which were basically diversions from river sources developed by local users for their needs. Although they may appear inefficient by the modern perspective of irrigation science they have been most enduring form of irrigation systems owned and run by the local people and constitute about 90% of total irrigated land in the country.

Investment in large irrigation schemes in Tanzania has been considerable, but basically for rice production (constitutes about 10% of the irrigated land). These costly projects have not been accompanied with the anticipated modern farming techniques and service support associated with large irrigation schemes and are still to prove their worthiness.

The Government's current plan is to concentrate on improvement of existing irrigation schemes with an approach to achieving low cost irrigation farming systems that can be operated by the smallholder farmers with limited external support (National Irrigation Plan, 1994). In this approach rehabilitation and support of farmer managed irrigation schemes receive highest priority countrywide. It happens the areas earmarked for irrigation development are also the traditionally important and potential horticultural production areas.

The Traditional Irrigation Improvement Project (TIIP) that is a component of the ASPS financed by the Danish Government through DANIDA is in response to this government call to invest in this area. The programme is tailored to capacity building and empowerment. Five schemes are included in the programme and implementation is demand driven, based on farmer participation and commitment. Support is limited to increasing productivity in the selected traditional smallholder irrigation schemes (ASPS/MAFS, 2000). The schemes are located in Mbeya, Iringa and Morogoro Regions, with over 5,000 farmers benefiting on about 2,000 ha of irrigated land; growing cereals and horticultural crops. Our field survey indicates the majority of farmers grow about 0.5 to 1.0ha of irrigated mixed vegetables on the average. However many reported greater potential for expansion up to 3.0ha (Iringa and Mbeya), but limited expansion in the northern (Arumeru, Kilimanjaro and Lushoto) and Uluguru mountain areas where land and water availability are limited. Price improvement and stable markets dictate expansion in the potential areas.

Practically all areas of Tanzania are subject to a dry season when rain fed production is not possible. It happens that at this time pests and diseases incidences are lower and roads accessibility in the most difficult locations is better at this time. Vegetables particularly tomatoes and onions are usually grown in the middle or end of the wet season hence

major part of the growing period is during the earlier part of the dry season. Where supplementary irrigation is available, and provided sufficient household needs have been met sufficient quantities are available for sale. Table 11 lists the planting and harvesting periods of tomatoes and onions in the Northern Highlands, Southern Highlands and Morogoro areas. Generally it is during the dry season that the vegetable production is at its peak as indicated in the table and prices are at their lowest level.

Table 11. Major planting and harvesting seasons for tomato and onions in three Zones of Tanzania

Zone	Season	Tomato	Onion
Southern Highlands	Planting	June to Aug	May to June
	Harvesting	Aug to Nov.	Sept. to Nov.
Northern Highlands	Planting	July to Feb.	June to March
	Harvesting	July to Sept.	Oct. to Dec.
Morogoro/Coast	Planting	Mar. to May	May to July
	Harvesting	May to Aug.	July to Sept.

An efficient irrigation system at the drier periods would help to stagger the production (Vakis, 1998) to either delay harvest or facilitate earlier harvest when prices are better, this simultaneously reducing the volume of harvest during the seasonal peak.

Table.11 shows a summary of characteristics associated with irrigated smallholder farms in the most important horticulture districts that were visited during the field study.

Table 12. Characteristics of village-irrigated horticulture in nine districts of Tanzania

Irrigation water sources	*	Irrigation constraints	*
River diversion/canal	30	Small stream flow during dry season	8

Spring	4	High system losses	2
Small dam/man-made pond	1	Long distance conveyance/Distant source	2
Shallow wells	7	Steep canal terrains/Land slide damage	1
Tap water	2	Poor distribution/low irrigation efficiency	2
(Rain water - no irrigation)	26	Leveling/Terracing required	13
Method of irrigation		Water not reaching higher ground/poor design	2
Furrow	15	Irrigation water strong competition/many users	7
Flooding	10	No enough land	9
Sprinkler/garden hose	1	High costs of improved irrigation equipment	3
Sprinkler/foot pump	1	High operational costs of powered equipment	1
Spot irrigation/hose/can	3	No reliable market for increased production	4
Watering cans	14	Lack of capital/credit facilities	5
Area irrigated		Potential for area expansion	
		Not possible	22
Area Irrigated 0.2 – 0.5ha	20	Up to 0.5ha	9
Area Irrigated 0.6 – 1.0ha	17	Up to 1.0ha	7
Area Irrigated 1.1 – 2.5ha	5	Up to 2.5ha	4
Area Irrigated 2.6 – 3.0ha	2	Up to 3.0ha	2

* Number of respondents out of 70 farmers interviewed

Source: Horticulture Development study; field survey results

The main sources of water used for irrigation in the visited districts is rivers and nearby springs (77% combined). Conveyance to the farms is through open furrows many of which are not lined and prone to erosion and breakage by landslides on sloping terrain. This causes great reduction of the water conveyed per season and losses up to 37% (FAO, 1994). This source forms part of the traditional systems now under rehabilitation and new diversions completed. In these areas furrow and flood irrigation methods are commonly used. Shallow wells accounted for 16%. It is noted that a good number of irrigators are using watering cans (14 respondents out of 44) depicting low level of adoption of modern irrigation technology. More improved technologies are available to irrigate small plots using hand or foot operated pressure pumps (e.g. “Super Money Maker” by AproTech) connected to a ground source and hooked to several sprinkler irrigators through hosepipes. Such a system may improve the efficiency of irrigation by 100 fold. Most irrigated horticultural plots are small ranging from 0.2 – 0.5 (45%) and 0.6 – 1.0 ha (39%) in size. In the areas of study possibilities of future expansion are limited. Reasons given include limited land, competition for irrigation water, not enough water and competition with other crops (cereals). The small sized irrigated individual plots should not be taken for lower potential. For horticultural production usually under intensive cultivation the area sizes are considerable for smallholder capacity. Coupled with this the number of farmers is great (most of the potential areas have high population densities).

Among major irrigation constraints cited include poorly leveled land, limited land, and not enough water particularly during the dry season. Construction of small temporary water reservoirs may improve the low irrigation efficiency associated with small stream flows.

Urban vegetable production has absorbed quite a number of youth and women groups through production for municipal consumers, taking advantage of the ready market. This activity contributes substantially to the livelihoods of the producers and sellers. However from the standpoint of irrigation two aspects are of concern. One is the fact that the water required to raise the vegetables is surface water sometime originating from seepage of sewage facilities or oil waste, thus prone to both biological and chemical contamination. Where this water source has gone through waste water treatment pods the amount of biological contamination is considerably reduced and the chemical contamination lowered to safe levels through biological and solar degradation (except heavy spills). Thus direct use of effluents from sewers should not be used for irrigating vegetables. Also vegetables grown using such water sources should never be eaten raw. The second aspect is the competition with domestic water supplies. In some locations the only available water is from the tap and when this expensive water is used for irrigation and when the supply system is already over-stretched the activity will greatly compound the under-capacity problem.

Fruit trees are often not irrigated. In isolated cases they benefit from irrigation of another target crop since fruits are often intercropped; except for the recently planted crop with outlook for export market (few farms).

The total area under irrigated horticulture is not easily determined because in most circumstances the land is also grown with other non-horticultural crops. The total irrigated land in Tanzania has been estimated to be about 190,000ha (FAO, 1994). A good estimate of total area under horticultural production may be 39,000ha (20%).

Recommendations for horticulture production under irrigation.

Smallholder irrigated programmes in areas of horticulture importance should be revived and improved

Private sector should be encouraged to adapt simple high technology drip irrigation systems in intensive horticultural production particularly in urban centers.

3.4.5 The Importance of Field Management in Horticulture Production

Field Management includes agronomic, cultural and mechanical operations that are done to the crop to enhance its proper growth. These operations include planting, weeding pests and disease control, fertilizer application, water application (irrigation), mulching to conserve moisture, etc. The operations are carried out to improve the health and therefore productivity of the produce harvested. Healthy plants have the capacity to resist environmental constraints more effectively, respond better to inputs than weaker plants and produce more and of good quality. Weeded crop has less competition for nutrients, water and light and the harvested product is not contaminated with other plants, thus improving the quantity and quality attributes.

In horticulture production the quantity and quality attributes are very important. Good quality fruit or vegetable will have better nutritive value, sells better and yields much higher output in the case of processed products. It is for these reasons and other related advantages that it is very important for the horticultural producer to ensure proper field

management. The benefits are great and worth the decision to engage in the production of these crops.

3.4.6 Status of trained manpower

Horticulture is a science of its own kind demanding intensive care and inputs as well as careful handling of the crop and/or product. Besides this it utilizes other sciences such as genetics, physiology, and other physical sciences to cater for improvement be it provision of elite varieties/ cultivars or growing technique for higher yield and superior quality.

Tanzania has strived to invest in preparation for this manpower but much still needs to be done. Table 12 indicates the horticulture manpower available in the country. Generally the manpower handling horticultural aspects (research, training, extension and industry) is meager and needs to be increased. There is high occurrence of General Agriculture certificate and diploma holders catering for horticulture extension or holding horticulture-subject-matter-specialist positions. Likewise, the few trained horticulturists in the country are used for other non-horticultural-agricultural extension activities in some districts, institutes and NGOs. General BSc. holders who may have had a chance to do a special project in horticulture for their MSc degree handle a good number of horticultural research and training activities. This could be one of the reasons the Biotechnology laboratories at **HORTI- Tengeru** and **HORT- SUA** are idle because they need special training.

Capacity building Tanzania has a training Institute at Tengeru offering Diploma in general horticulture. It also boasts a 4 -year BSc Degree in Horticulture offered at SUA Morogoro. As of 1998 AVRDC Regional center for SADC countries located in Arusha offers some short retraining courses in vegetable production on a need basis

3.4.6.1 MATI Tengeru used to have an output of up to 25 horticulture graduates per year until 1994 when the Government ceased to sponsor students. As of year 2000, the Government under NAEP II resumed sponsoring General Agriculture certificate holder extension officers for Diploma courses. Unfortunately horticultural crops do not fall under the mandate of NAEP so intake for a Diploma in horticulture has dwindled to at most 5 private candidates per year. This will have a marked impact in the near future when older cohorts of horticulturists retire from Government service.

Currently the horticulture training at MATI-Tengeru is in need of a trainer in floriculture as well as replacement for trainers who are about to retire.

3.4.6.2 HORT-SUA

It has an output of about 20 BSc horticulture graduates a year since 1997. There are plans to expand the degree programme to match with the increasing market demand in horticulture particularly in the area of floriculture and landscaping horticulture. Most of the **SUA** graduates in horticulture are absorbed by the NGO's and farms that produce high value crops. Recruitment by the Government is on hold except for the in-service graduates who have to return to their former employers including the Ministry of

Agriculture. HORT- SUA also offers postgraduate degrees (MSc. And PhD) including specialization in Horticulture. As for BSc. holders, absorption of these graduates by the Ministry of Agriculture is minimal unless they are returnees. The programme at HORT-SUA lacks floriculture specialist(s).

3.4.6.3 AVRDC Africa Regional Programme

The center caters for horticulture development in the SADC countries so trainee intake is limiting considering the demand for retraining of horticulturists in this country. Only a total of 30 Tanzanian horticulturists have gone through AVRDC training during the period of 1994-1997. The courses offered include:

Vegetable training program offered to selected vegetable researchers and extension specialists to create a critical mass of olericultural experts

Research internship offered to researchers who are already engaged in specific fields in vegetable research and production

Short-term courses of 1-4 weeks duration offered to specific field of vegetable research and development.

With proper planning and support by the Ministry of Agriculture, retraining of horticulturists can also be accomplished at the other horticulture training institutes.

Table 13. Horticulture Manpower Disposition

(a) Extension Services

District	Graduate		Diploma		Total	Remarks
	Male	Female	Male	Female		
Arumeru	0	0	0	4	4	Staffing adequate
Hai	0	0	0	1	1	Adequate staffing is 12 (1 BSc. Horticulture, 1 BSc. Food Science and 10 diploma)
Iringa	1	1	2	1	3	DEO is also the Seed Co-ordinator. Adequate staffing is 25
Kibaha	1	0	0	0	1	4 Generalist attached to Horticulture. Needs retraining in Horticulture
Lushoto	0	0	2	1	3	One generalist engaged in horticulture; several In-house trained VEO and WEO
Mbeya	0	0	0	0	13	Need retraining in horticulture
Morogoro	0	0	1	3	4	All engaged in activities other than Horticulture
Muheza	0	0	?	?	6	Engaged in other crops as well
Tembeke	0	1	0	1	2	Other generalists as well

(b) Research activities (Research stations and Universities)

District	Graduate		Diploma		Total	Remarks
	Male	Female	Male	Female		
HORTI-Tengeru	11	3	6	1	22	2 Seconded elsewhere 2 on study leave
ARI-Uyole	0	2	2	1	5	1 BSc. General recently

						recruited for fruit program, needs training in Horticulture
HORTI-SUA	5	0	1	0	6	Floriculture trainer needed. Discipline overlap with other depts.

(c) Horticulture Training

District	Graduate		Diploma		Total	Remarks
	Male	Female	Male	Female		
MATI-Tengeru	4?	1	?	2	?	Overlap with researchers at HORTI-Tengeru
HORTI-SUA	See under research. Horticulture trainers also part-time researchers.					

²Database on horticulture specialties required

3.5.0 Post-harvest handling

3.5.1 Post-harvest handling on-farm

Farm level post-harvest handling begins with harvesting of the produce. Unlike cereals and grain legumes, horticultural crops have relatively large size (surface area), are soft textured, have high water content of up to 98% for herbaceous leafy vegetables and most fruits, and high rates of respiration which makes them highly perishable and therefore more prone to deterioration soon after harvest. The field losses data from the developing countries are estimated between 20-50% (LaGra, 1970 See appendix 5). Table 13 from Lushoto confirms the statement.

Table 14. The fate of fruits and vegetables produced in Lushoto District

Item	Fruit kg (%)	Vegetables kg (%)
Total production	183,170 (100)	102,390 (100)
Home consumption	11,470 (20)	9,292 (9)
Sold	106,555 (58)	60,574 (59)
Loss	40,110 (22)	32,524 (31)

²(Numbers in brackets are percentages)

Source: DALDOs office

Horticultural produce should normally be harvested at the right stage of maturity with adherence to cleanliness, packed in appropriate shallow cushioned/smooth containers and immediately cooled to at least 5°C in storage rooms before being sold, transported or processed. If no such storage is available then horticultural crops should be harvested early in the morning or late in evening when the ambient temperatures is cool. Wet periods should be avoided as it increases humidity and therefore high incidences of moulds. Likewise, no dirt/soil/debris should be left clinging on to the produce as they may increase infection and bruising.

There are huge losses in the field that cannot be easily documented without carefully planned field studies. This was one of the reasons this study could not get enough data on horticultural waste because substantial losses occur in the field before and during harvesting. Yield data estimated are of the good produce while what is left in the field is unaccounted for. Losses are accrued due to pest and disease infection coupled with inadequate sorting to remove defective produce, rough handling during harvesting, and lack of cooling immediately after harvesting. Use of inappropriate packing materials (deep baskets ‘matenga’) account immensely to losses because the produce is piled in several layers resulting in bottom ones being squeezed.

Quality control procedures should start right from the plantation stage first by use of seeds of acceptable quality. At harvesting stage, stringent measures need to be observed to increase the shelf life of the product. At post harvest stage, care needs to be taken to ensure the product sustains its freshness and careful planning to reduce delays from the farm to the consumers and or storage warehouses. Therefore, farmers needs to be trained on how to handle harvesting and handling of their produce before, during and after harvesting.

3.5.2 Post-harvest handling from farm to market

Horticulture production is very much dependent on markets. Only when the markets are well developed that will provide a stable economic environment that can lead to the process of specialization in agriculture will enable horticulture to flourish and gain the required quality standard and productivity.

The market for horticulture products is very large, domestically and worldwide; but are selective particularly now when consumers in foreign markets are sensitive to pesticides used in agriculture and therefore very strict to set standards.

3.5.2.1 Grading/Quality control

Quality control and grading are important elements in maintaining export markets in the comparative commodity world market. The introduction of liberalization of trade in 1993 has brought both positive and negative perception by traders to such an extent that in most cases deterioration of quality in some of the commodities exported has damaged this Country’s reputation to the point of jeopardizing our export quotas. Grading needs to start at farm level, by use of proper seeds/propagules, adherence to good crop husbandry, proper harvesting and sorting as well as grading into different size categories.

As indicated in the study/survey, with an exception of tomatoes, oranges and potatoes, horticulture products for domestic market are hardly graded.

Grading is very significant to exporters, as they are required to export the products as per importers and buying agents’ specific standards. Foreign consumer demand is elastic, now with more emphasis on organic foods where by natural fertilizers and pesticides are used instead of industrial chemicals. To date, it is only green beans, and cut flowers, which are exported to European markets in substantial amounts to Tanzanian standards. Small amount of fruits, bananas and vegetables have found markets in the Gulf States.

3.5.2.2 Packaging.

In an effort to develop exports of horticultural products, packaging becomes such an essential element. It provides protection to the product against damage from weather, dirt and against pilferage. It provides information about handling, destination, contents and weight. Equally important, it provides promotion to draw customer's attention. It influences a turnover of a particular product. All inputs to the packaging are part of the final price of the product.

From this study/survey, with an exception of cut flowers, green beans and few fruits exported; packaging for domestic market is poorly done very if at all. Grass woven baskets or palm leaves are dominantly used to pack fruits, tomatoes and the like. These are unsuitable for transport packing as they cannot sustain crushing or bruising. The end result is for the product overheating due to long transit time. Polyethylene papers and bags are commonly in use in the domestic market.

Packaging for export market is done according to foreign market agent's requirements. Exporters conditionally use fiberboard paper boxes manufactured locally by Kibo and Twiga Paper Products or imported from neighboring country.

There are minimum standards for fiberboard boxes, although they are in most cases not adhered to because of lack of raw materials experienced by the manufacturer. The outcome to using poor packaging materials is damage of produce in transit. Venders / Sellers are very price/cost sensitive when it come to packaging. It was found that, they use the least expensive materials e.g. plastic bags old newspapers etc to pack the customers' purchased goods.

Processed products, e.g. tomatoes, fruit juices, and mango pickles packaging is done to conform to the TBS set standards. The study found that only few tomatoes processors sauces have managed to get TBS Certificates, which allows them to export the product.

3.5.2.2 Transportation:

This study revealed that most transportation of the produce from farmyards is done manually. At least 18% of farmers interviewed physically carried their produce on their heads, 71% use hired motor vehicle (generally open trucks some of which may even be carrying some non-compatible goods such as petroleum products). None of the interviewed farmers used animal transport facility. Of those hiring motor transport, none were refrigerated trucks. These means of transport exposes the produce to heat, dust, rain etc. that provokes quality deterioration and therefore the actual volumes sold. Major road networks to horticulture growing areas seem to be better served. All three major growing areas namely, North Eastern Highlands, Southern Highlands, Central and Eastern Cost Regions are saved by tarmac roads either leading to Dar Es Salaam or to neighbouring countries (Kenya, Zambia, Malawi or DRC via Zambia). The biggest problem is with feeder roads from collecting towns to the farm producing areas/plots.

Products for export market should be handled by experienced people to ensure that quality of the goods are maintained from farm centres to the point of discharge – namely at KIA and DIA or at JKIA – Nairobi.

3.5.2.3 Storage

Horticulture crops/products are very delicate and very sensitive to weather conditions. They need special attention from when they are harvested, stored or transported to final consumer. There are no appropriate storage facilities for horticulture products at farm level. Harvested products are left in the open under the shade of trees (oranges, mangoes, papayas, pineapples, tomatoes) in big piles until a trader transports them to the market.

Only Floriculture products destined for export seem to be handled properly. They are normally cooled accordingly direct after harvest, on the farm premises and during transportation to the airports, KIA or DIA or JKIA. The rest of horticultural products should follow suit. Cooling Capacity at DIA is inadequate, but at KIA is enough to cater the current requirements.

3.5.3 Marketing

3.5.3.1 Marketing of fresh produce

3.5.3.1.1 Local Marketing

Tanzania is producing a variety of horticulture products most of which are consumed locally. Production is scattered all over the country and is done predominantly by small-holder farmers. The nature of the product, climate and economic welfare of the area characterize the availability of respective horticulture produce in the markets.

Domestic marketing of horticulture products involves various activities, which should facilitate smooth and fast movement of the product from the producer to the final consumer. The study has shown that traders prefer to use the least expensive packing materials. Grass and palm leaves woven baskets are predominately used to carry/pack the products ready for transportation. Products like fruits, vegetable (cabbages) banana etc are normally transported on open trucks. The study has shown that none of the smallholder farmers and middlemen owned trucks to haul produce to final selling points.

3.5.3.1.2 Grading.

As pointed earlier, very few farmers and sellers graded their produce before bringing them to the market. Only a negligible size of respondents (13%) did grade their produce by sorting. The minimum activity done is of sorting to remove rotten and damaged produce. Traders pool lots from different farmers into one lot also with minimum sorting/grading.

3.5.3.1.3 Storage.

There are no proper storage facilities as from village/farm yards to the final markets. None of the surveyed smallholder farmers, individual sellers or middlemen in the domestic market had storage facilities for their products.

At farm level, harvested products are left in the open under shade trees. Vegetables are brought early in the morning to the market where they are openly displayed for sale. If not sold in time even at a throw away prices, they deteriorate and get thrown away as waste or are used to make local wines and spirits.

3.5.3.1.4 Distribution.

Majority of traders handle their produce individually from collecting point to the intended markets. In few occasions, traders form a group that hires a truck to transport the cargo, to the auction centers, where selling is done individually. Between the farmer and the final consumer in urban areas (the market) there exist a number of middlemen and sellers. According to this study, few individual farmers did market their own produce at the auction market. Sellers and the middlemen (83%) deal directly with individual customers, only (6%) sold the produce to institutions or were contracted to supply under special tenders.

3.5.3.1.5 Pricing

At farm level, prices are set in accordance with their immediate needs. A number of horticulture products traders set prices of their goods based on the cost of procuring the produce (45%). Other seller/middlemen (29) considered profits as determinant of pricing while 16% of sellers attested pricing to transport cost. The proportion of spoiled produce was considered by 4% of the sellers during pricing. Consumers purchasing power also have an influence on price determination. Same products distributed to different locations are priced differently.

3.5.3.1.6 Facilitating Functions

3.5.3.1.6.1 Financing

The study shows majority sellers/middlemen depended on their own capital to set up and run their business. None of them got credit/loan from financial institutions be it Banks or MFIs. Most interviewee thought that the lending conditions and procedures were very cumbersome and some of these services were not available in rural areas.

The processors, mostly women/youth groups (75%) have benefited financial assistance in terms of soft loans from SIDO/UNIDO and FINCA Tz. Ltd. special fund for promotion of small-scale agro processing industries. Only 43 % of individual small processors, from the survey, benefited from MFIs.

3.5.3.1.6.2 Extension/Expertise Services

Few sellers/middlemen received extension services and/or expertise services (30%). This was in the form of short training programmes facilitated by various NGOs and SIDO/UNIDO.

3.5.3.1.6.3 Constraints

3.5.3.1.6.3.1 Credit

Access to credit was the major constraint identified in the study particularly for traders who wanted to expand the scope of their business. Access to formal credit facilities was very difficult hence the tendency was to borrow from informal credit facilities at a higher price, (18%).

3.5.3.1.6.3.2 Transport

Difficulties in obtaining regular and cheap transport appeared high on the list of constraints felt by traders in all categories but more so by small trader in rural areas, where fewer alternatives are available.

3.5.3.1.6.3.3 Information systems

Lack of effective market intelligence system hinders the access to market availability. There seem to be some information gap between large market boards (BET, TCCIA) and smaller market traders

3.5.3.1.6.3.4 Infrastructure

Proper market places, improved roads and storage facilities are inadequate leading to higher marketing costs. This has an effect of reducing the levels of commercialization. Traders pay levy/fees but the supposedly infrastructure services are not reciprocated back to improve the marketing channel.

3.5.3.1.6.3.5 Chemicals usage

Consumers from importing countries are very sensitive to chemical usage in horticulture production. The importers ensure adherence to Minimum Residue Limits (MRL) acceptable internationally. There is a general tendency on importation of organic products. Tanzania farmers are less aware of this trend therefore the country is likely to lose a large share of the export market. Few farmers have ventured into organic horticulture produce whose conditions and regulation are stricter as an importing agent is commissioned to inspect the farms before the products are harvested and exported. There is a trade off to go 100% organic hence observing the MRL may be the better alternative depending on prices.

3.5.3.1.2 External Marketing

Production of horticulture products in Tanzania is considered a non-traditional activity and therefore very scanty data documentation on production and exports. As pointed out earlier, very few products are exported. These include cut flowers and pulses (green beans) and some fruits (dessert banana, avocado). The volume of Tanzanian horticultural export is shown below in Table 14 and 15.

Table 15. Export of Horticultural crops in the last six years (metric tons)

CROP	1996	1997	1998	1999	2000	2001
Roses	-	-	-	7,465	7,478	4.9
Fresh cut flowers	1,348	3,534	3,554	3,287	2,993	3,953

Vegetables	95,739	3,639	4,430	4,125	3,718	1,820
Fruits	47,272	2,164	3,341	5,543	5,316	7,738
Spices	533	2,455	NA	NA	NA	NA
TOTAL	144,892	11,792	11,325	20,420	19,505	23,521

Sources: TRA DSM; Mwashu, 19983; Elsevier 2002

Table 16. Destinations of Tanzania horticultural exports (metric tons) between 1996-2001

Destination	Product			
	Roses	Cutflowers	Vegetables	Fruits
European Union	14,943	11,972	966	10
Rest of Europe	-	15	173	0.2
America (North and Central)	-	6	159	-
Gulf Countries	-	6	891	83
Countries of the Indian Ocean	-	-	12,456	-
East Africa (Kenya, Uganda, Ethiopia, Burundi and Ruanda)	-	1,689	8,624	21,595
SADC Countries (RSA, DRC, Comoro and Zambia)	-	66	421	2
Far East (Thailand, Japan, Singapore, HongKong)	-	32	60	-
Others	1.0	-	6	3.5
TOTAL	14,944	13,786	23,756	21,693.7

Source: Tanzania Revenue Authority, DSM.

Not all horticulture products grown in Tanzania are exportable due to poor quality. Products like mangoes, papayas, pineapples, bananas and various vegetables are produced in massive, but cannot penetrate foreign markets because they miss preferred standard specifications. The small quantities exported comes from big farmers and their contracted small holder farmers who produce according to the set standard. They provide them with seeds and extension services on husbandry. Included in the package is storage and handling in order to maintain the quality of the product. Farmers and their contracting agents handle the products tenderly from the time of harvesting to storage before being transported to the point of shipment. They have storage facilities at the farmyards and employ experienced staff for sorting/grading.

3.5.3.1.2.1 Grading/Packaging

Farmers and their contracted smallholder farmers do these activities themselves. Produce is sorted out to get the required standard, packed in the recommended materials and stored ready for transportation.

3.5.3.1.2.2 Transportation

Products for export market are transported in cooled trucks to maintain the quality of the products up to points of shipment. Two major International Airports of Dar Es Salaam and Kilimanjaro are facilitating the export business of horticulture products. Cooling

facilities are available at both airports and are served by British Airways and KLM respectively for European markets. Gulf Air/Emirates serves for the Gulf Arabic Kingdoms.

3.5.3.1.2.2 Pricing

Farmers serving for export market are conversant with pricing mechanism of their product. All the cost incurred in production and delivering to the point of shipment are well documented. The majority prefers to quote on FOB-basis, and rarely quotes on C&F or CIF basis. Prices for export products are very elastic controlled by demand and supply to that specific market.

3.5.3.1.2.2 Export Marketing Opportunities

Tanzania has a comparative advantage in horticultural production for export for the following reasons:

Agro climatic conditions

Tanzania can supply fresh ornamentals, fruits and vegetables during off-season in Europe and in Gulf countries.

Quality Products

Tanzania, according to various studies can produce high quality tropical fruits such as pineapples, mangoes, avocados, papayas, bananas etc.

Abundant Land

Tanzania has a vast under utilized land and less costly labour, which could be used for increased horticultural production.

Shipping points

There are two International airports with horticulture product handling facilities, namely KIA and DIA, these could be coupled to several regional airports such as Mwanza, Kigoma, Mtwara and the new airport under construction in Mbeya to form network for fast handling of horticultural produce. Additionally, Tanzania has three under utilized seaports namely Dar Es Salaam, Tanga and Zanzibar whereby ships could ferry horticultural produce provided necessary facilities of cooling and appropriate storage are provided.

Major growing areas are well served with highways and railways, e.g.

Iringa/Mbeya - TAZARA and Dar Es Salaam/Tunduma Highway
Dodoma/Morogoro- TAZARA, TRC and Dar/Tunduma and Dar/Dodoma Highway
Tanga- TRC and a tarmac road to Dar Es Salaam and KIA
Arusha/Kilimanjaro - KIA and a tarmac road to Dar Es Salaam and Tanga

Organic farming

There is a growing demand for organically produced horticultural food products in industrialized countries over the intensive and high input produce currently produced World over. Tanzania has a chance to utilize such emerging opportunities. A bulk of our agricultural products, specifically fruits products are still produced naturally using very little or no fertilizers and pesticides. These have a comparative advantage over those in industrialized countries.

What needs to be done:

The government should stimulate organically produced commodities by creating conducive policies that will eliminate both marketing and technical barriers to improve its competitive ability.

Relevant information on organic farming should be made available to all small-scale farmers so that they become aware of what they ought to do and the benefits they can gain from such production. This can be done through extensive extension services to individual farmers, groups and co-operatives, etc.

Streamlining export procedures and taxes currently in existence.

Efforts should be made to install enough capacity of refrigerated and handling facilities at DIA and KIA as well as promote use of refrigerated trucks on road and refrigerated warehouse at the collection points. A lot could be learnt from the defunct NCCO.

Strengthen horticulture exporters association(s) so that they could work towards perfecting the market channel geared for export market.

Stakeholders should agree on issues pertinent to the growth of the horticulture industry.

3.5.4. Processing of horticultural crops

3.5.4.1 General

Processing is one of the three important post-harvest systems that allow efficient and adequate supply of food to consumers through ensuring physical access and enhancing household food security as well as stimulating income for the processors and markets for the producers (FAO, 1997). The other important systems include storage and transport that are necessary for the transfer of the food supply from the producer to the consumer. It is important that these systems operate efficiently at minimal costs to ensure the consumer gets the essential food supplies at affordable prices while the producer margins are maintained for them to continue producing.

Processing is done for various reasons and advantages and the methods employed depend on the type of crop produce in question and the product that will satisfy the consumer demand. Agricultural processing can be categorized into three stages, namely primary, secondary and tertiary. Primary processing refers to the immediate post-harvest handling activities, such as drying, shelling or threshing. Secondary processing is some type of transformation or alteration of the form of the foodstuff to facilitate its subsequent use, e.g. cleaning, tempered or parboiled, dehulled and polished, or split into portions, then dried and later milled, or sieved to give various grades of flour etc. Tertiary processing involves converting the uncooked food materials into products and food combinations for

human consumption. To protect the consumer, the Government put in place the Food (Control of Quality) Act, of 1978. It covers all foods including raw materials for manufacture of foods. Among other things, it regulates manufacture of foods through registration of food premises and licensing, importation, composition and labeling of foods, sale, and distribution, storage and food hygiene. The Act provides for enforcement and legal proceedings. Generally it provides for control from harvesting along the food chain to the consumer. Under the Act, the following regulations relating to processing of horticultural produce:

- Importation of food regulation of 1982 and Food hygiene regulation of 1982 that regulates registration of food premises and licensing of food manufacturing.
- The Food labeling regulations of 1989
- The Food additive regulations of 1998.

Processing takes various forms but in most cases one of four basic treatments is done on the produce or a combination. These treatments include:

Desiccation or drying to reduce the moisture content so that cell activity in the product is slowed down or stopped. Agricultural products dried to below 12% moisture content (by weight) store better.

Extraction and concentration of the nutritive ingredients in the food product, usually in liquid form to reduce solid and or liquid waste volumes and or removal of unwanted ingredients.

Addition of other substrates such as preservatives, flavours, enzymes to improve biological reactions or temporarily slow reactions (lower the pH), etc.

Fermentation or changing the form of the biological/nutrients in the product into intermediary forms that can store better and or changing the flavour, etc.

Many other treatments are done before or in between or after any of the above processes to improve the efficiency with which reactions take place, e.g. washing, chopping, grinding blowing, filtration, fermentation, etc. Finally the processed product is packaged in tins, bottles, aluminum foils, or other; and most important sealed to prevent reversal of the processes that have been induced in the product. The importance of proper sealing sometimes under vacuum or pressure, cannot be over emphasized. If this is carelessly done the outcome will be disastrous. It is also important that these operations are done in clean environment, observing proper hygiene and quality control.

3.5.4.2 Advantages of Processing

Processing enables extension of the availability of foods beyond the area and season of production, thus stabilizing supplies and increasing food security at national and household levels. A particularly important aspect of food processing is that it permits diet diversity, giving consumers access to a wider choice of products hence to better range of vitamins and minerals than they would otherwise consume. In many ecological zones crop production is seasonal. This means the off-season periods have limited or no fresh supplies to satisfy demand. On the other hand production areas may be located far away from the larger consumer markets (e.g. cities) and/or difficult places to reach during the wet seasons (poor access roads) thus requiring long distances of travel and time to reach the markets. Through processing much of the produce can be stored better and for longer

periods thus evening out the supply for the off-season periods and distant markets. Processing allows production of concentrated food products and sometimes fortification thus adding extra value to the product, customer convenience, and transport efficiency. Horticultural crops are prone to faster deterioration and rotting than other field crops. Unless they are consumed fresh and within time they are bound to rot very quickly, leading to heavy losses. Processing will help to preserve the produce that would otherwise rot thereby reducing the likely losses that could occur when the produce cannot reach the consumer in time.

3.5.4.3 Importance of Horticultural Food Processing in Tanzania

The extent and amount of horticultural production in Tanzania and the nutritional and economic value of these crops to feed the nation have been discussed under Section 1.2.2 of this report. Mention has been made that the most productive regions in Tanzania are widely scattered, long distance away from the areas of larger consumption and even remote from the main export routes.

Among the many constraints faced by the producer of horticultural crops (especially fruits and vegetables) is the enormous loss when there is oversupply, which is normally noticeable during the main season. Estimated losses for the various crops have been mentioned to be very high. A number of farmers interviewed during the field visits reported over 50% losses for tomatoes, oranges and others in some bumper seasons. To establish the accurate level would require a larger study.

Processed products are much more expensive than fresh supplies for justifiable reasons. Our survey shows that the factory price of mango juice canned in Iringa for example is in the range of TAS 1,250/= per liter and would sell at TAS 1750/ per liter as compared to about TAS 860/ per liter of fresh juice in a restaurant in Dar es Salaam.

Consumers often like to eat fresh fruits and vegetables but circumstances sometimes dictate what is available, when, where and in what form. In some cases processed product offers the better alternative. Despite the economic, quality, and other product advantages associated with processing the Agro-processing industry in Tanzania is still at a very low scale.

3.5.4.4 On-Farm processing

The most basic level processing is food preservation. Currently very little on-farm processing is done in Tanzania. The meager processing done is limited to drying of products for the market (spices) and for fruits and vegetables it is done to even out family supplies during off-season periods when there is no production. This is practiced by families to provide food when sources of fresh supplies are scarce. Traditional societies have practiced this for centuries but in recent years the methods are being refined to improve the methods employed and quality of products processed. This type of processing is limited to drying in the sun, smoking, or more recently using solar driers and mostly utilizing traditional vegetables like amaranthus, cassava leaves, okra, cowpea leaves, etc. An exception to this is the processing on a large scale taking place on the bigger farms, e.g. passion and rosella juice making in Iringa, Wine making at Bihawana

Dodoma and others for localized markets. Though done on-farm, this type of processing deserves grouping into the industrial processing category.

3.5.4.2.5 Small-scale Processing

Of recent, individuals and or groups of women entrepreneurs and youth have engaged themselves into dry processing of fruits and vegetables for niche markets. These groups have received basic training in food processing technology through research institutions (TFNC, SUA, ARI-Uyole, Horti-Tengeru, SIDO and NGOs working on community, nutritional and health improvement programmes. Such groups are engaged in drying of fruits like ripe bananas, pineapples, mangoes etc. and traditional vegetables such as amaranths, cassava leaves, okra, cowpea leaves etc. Other groups are engaged in making of jam, marmalades, pickles, tomato source, wines, etc. Volume records of processed product in this category are hardly available. Such processing can be done on individual or group basis, provides employment for thousands of people and is one of the sources of income for rural women. This also saves some of the fruits and vegetables that would otherwise rot. These small-scale simpler technology processors serve widely dispersed populations better than larger industries. However those who have ventured into the processing have sometimes run into marketing problems because of failure to research the potential markets adequately before production begins.

3.5.4.2.6 Industrial Processing

On a larger scale agro -industries convert commodities into processed foods that are usually more stable and more marketable than raw. Urban populations usually require processed foods in larger quantities; hence mechanized processes with high output capacities are generally more efficient and economic (economies of scale). The industrial processor utilizes more sophisticated technologies in the operations, process control and packing, most stages requiring some type of mechanical operation – man operated or automated. Few industrial processing plants in Tanzania are currently operational. These are located in strategic areas of high production and/or consumption like in Iringa-Dabaga (Fruit and Vegetable Canning Factory), Arusha – (Darsh Industries), Dar es Salaam- (Tangold) and others emerging in other areas as more investors venture into this sub-sector. They produce a range of products that include fruit juices of various kinds, tomato sources, pickles, wine, ketchup, and others.

The industrial horticultural processor is a potential market for producers assuming impeding problems with their establishment are solved. The industries could also pave way for the export market where raw products may not make it because of unmet and stringent standards. Export figure from these factories are not easily available, but not much has been achieved. The future outlook for export of processed horticultural products looks brighter than raw produce, but much needs to be done in terms of quality production and packaging, reduced operational costs so that prices can compete with other world producers and marketing strategies improved.

A number of fruit canning factories initially under government control in Korogwe and Dar es Salaam (TANGOLD) and now under private ownership have not performed after privatization. The former has not started production for more than half a decade. The later

has resorted to producing flavoured juices for the local market. High operational costs, competition with cheaper imported products dumped into the market and low consumer purchasing power are some of the reasons given that justified the move, but to the detriment of horticulture (fruits) development in Dar Es Salaam, Coast and Tanga Regions.

3.5.4.7 Quality Control in processing

Food quality control and safety is an essential component of any processing activity.

Factors that affect quality and safety include;

Poor physical quality (e.g. rotten raw materials)

Chemical contamination (accidental or mismanagement)

Parasitic or bacterial contamination; rodents and insects

Poor quality control of industrial or backyard-industry food products.

It is important that food entering into the market chain is safe, of high quality, and nutritionally sound. Implementing food control practices to ensure safety, quality and purity is of paramount importance. Food moving in international trade must meet international standards like those set by the FAO/WHO, 2000. In Tanzania TBS and the Food Control Commission set standards to protect consumers from getting unhealthy products. Much has to be done in the area of quality control if the market for industrial processed foods has to expand in the local and export market arena. The need for co-ordination and refinement of food control standards and regulations in Tanzania has been discussed under the policy issues. However much more remains at the processor level where discipline and integrity is required to ensure proper handling of the processed food. Neglect of this could be disastrous to consumers and the factory. This area must be guarded at all costs if the processing industry in Tanzania is to develop.

3.5.4.8 Packing and Storage

Packaging plays a very crucial role in preservation and market attraction. Various types of packaging are used to conserve horticultural products. They may be bottles, cans, plastic containers, aluminum foils etc. The main purpose is to maintain the product in the form it has been processed, hence extend shelf life. The second major reason for packaging is to facilitate handling and space convenience in storage and transport. Here the primary packages are repacked in cartons or crates, etc. The third purpose and which is very crucial is customer attraction. Human beings are choosy and for valid health and satisfaction reasons. Interviewed processors complained of poor quality or unavailability of good quality packing materials that necessitated reliance on importation even at extra cost. This is an area that requires improvement. Locally produced packaging materials if produced to satisfactory standards are likely to be cheaper and create local employment.

Storage of processed products is equally important. The storage facilities have to be clean, dry and free from dampness. High temperatures encourage molding particularly under humid conditions. Some products may require maintaining the temperature at a certain level to limit biological reactions (fermentation, rancidity, etc.). It is therefore crucial the processor is equipped with the knowledge and facilities to store the output until when ready to sell or when the price is right. This is however at cost and it is

important that these costs are balanced with the selling price. Where storage necessitates maintaining low temperatures costs tend to increase. In the case of Tanzania use of electricity to cool storage warehouses may culminate into large costs.

3.5.4.9 Constraints to processing

Problems mentioned as limiting the growth of the horticultural processing are many, but the study in the nine districts indicated the following constraints as persistent (in order of priority):

- (i) Lack of reliable market for the products processed
 - Local market swarmed with imported products at very competitive or cheaper prices.
 - Export market has not opened up for the Tanzanian processed food commodities (can not compete in the export market).

- (i) High operating costs associated with
 - Costly and not easily available packing materials of good quality (largely imported).
 - Preservatives/additives not easily available locally and when imported duties add on to the cost.
 - Poor infrastructure (roads) increase operating costs through transportation of raw materials to the factory and processed product to the market.
 - High energy costs especially electricity (sometimes fluctuating), which is important for temperature controls and mechanical operations in the canning factory.
 - High and stratified taxes collected/paid to many Government institutions and local governments, including licensing and fees.

- (ii) Processing machinery and equipment
 - Have to be imported and costly
 - Those existing are of low capacity and obsolete

- (iii) Supply of raw materials (produce)
 - Low quality produce from the farms
 - Seasonal availability in the strategic locations

- (iv) Economic limitations
 - Limited capital
 - Lack of credit facilities and high interest rates
 - Lack of collateral to small processors

- (v) Technical know how
 - Lack of proper training in agro-processing technology
 - Lack of aggressive marketing strategies
 - Poor dissemination of technical and market information

- (vi) Policy framework/Uncoordinated policies
 - Not harmonized between the different players in the agro-processing industry (e.g. land ownership, tax regimes, etc.).

3.5.4.10 Environmental concerns

Environmental concerns in and around factories is important considering the large amount of solid and liquid wastes resulting from the processing. Fast and efficient removal from the factories is essential to avoid rotting and accompanied smell as well as insect breeding environment. Current observation shows that wastes are disposed off in nearby farms or fed to livestock, particularly pigs. The hard solids like mango seed are currently burned on open ground outside the factory and liquid waste is emptied in nearby fruit orchards. These are short-term solutions that are not sustainable. Efficient disposal facilities are required to avoid accumulation of waste. Ventures such as installation of systems/plants that utilize the waste to produce by products such as biogas or thermal power may greatly reduce the costs of disposing the waste at the same time provide renewable energy to the factory.

3.5.4.11 Recommendations to processing

- The Government to review policy on imports of horticultural processed products dumped on to Tanzanian markets at the expense of locally processed products
- Processors to be given incentives to reduce operational costs e.g. utility tariffs, taxes on packaging materials, etc.
- Government to commit processors to using local fresh produce and not imported concentrates.
- Processors should enter into partnership/contract arrangements with growers (contract growers) to ensure availability of good quality products and fair prices.

3.6 Limitations encountered during the study

- Time limitation hindered coverage of all horticultural growing regions and districts such as the Lake Zone, Kigoma and Dodoma.
- It was difficult to obtain some data such as accurate production acreage, yields and sales, particularly export earnings.
- Some institutions were not reachable hence no comments were obtained from them e.g. TANEXA, TANHOPE.
- Due to scheduling difficulties during the project period it was not possible to get audience from a number of top officials in the Ministry of Agriculture and Food Security.

4.0 General Conclusions and Recommendations

The existing policy on horticulture development is still what is contained in the agricultural policies of 1983 and 1997. In view of the importance of this Sub-Sector, there is need for the Ministry of Agriculture and Food Security to formulate a horticultural policy to address aspects of production, processing, marketing, and support services (research, training, extension and regulatory services).

The most important technical constraint to horticulture development in Tanzania is availability of disease free planting materials adapted to various agro-ecological zones and high reliance on imported vegetable seed, some of which are of very low quality. There is need to encourage local horticultural crops seed producers through

provision of incentives such as in facilitating acquisition of land, taxes relief. The Ministry of Agriculture through its research Institutions should make efforts to develop new varieties that suit market changes.

Since horticulture demands specialized interventions, there is a need to spell out some specific strategies for its development. The following strategies are suggested:

Creation of marketing body that represent the interests of horticultural producers.

Since women are the key players in horticultural activities (growing, selling, extension services, utilization), provision of a range of training technical assistance services to women and youth groups in organization of their groups, in technical aspects of production, processing and marketing of their products is suggested.

Creation of enabling/favourable climate for horticultural related services and industry particularly land title deeds, water rights (irrigation) and taxes/tariffs on raw materials for horticultural crops processing and notably packaging materials.

It is evident that Client-Oriented and Demand-Driven Research is not very appropriate to horticultural research at this time of infancy, therefore the Government in partnership with other stakeholders should avail a preferential research support (financial and logistics) to horticulture research Institutes so that they can conduct basic and applied research necessary for this new industry i.e. variety introductions and evaluations, virus indexing, protocol testing for tissue culture of different propagules.

Considering the contribution of Horticulture to the export earnings and nutritional requirement of Tanzanian (domestic markets)(Table 1), there is need to strengthen the horticulture unit under the Crop Promotion Services Section so that it can cope up with and monitor the fast changes in horticulture industry both in the fields and marketing requirements.

The Agricultural policies have encouraged private sector participation in commercial horticultural crops production. The flower industry has been leading in this initiative and a few small and medium enterprises (SMEs) through efforts of some interested entrepreneurs have emerged, promoting production of tropical fruits and vegetable for the export market. In order to support these initiatives there is need to have a clear land policy and along with the policy of Government/Private sector partnership to support development of varieties of fruits and vegetables of export qualities, to reorient research and extension to be not only client oriented and demand driven but also to be market oriented.

There is a need for the Government to sensitize current and-to-be-marketing associations and other relevant authorities to invest in the establishment of cold/cool storage facilities throughout the marketing channel to minimize losses.

The Government in collaboration with the private sector (producers, processors, exporters) seriously undertakes studies and dissemination of marketing information for horticultural crops within the country (domestic markets) and outside (export markets).

Stakeholder's workshop is proposed to:

Discuss the recommendations emanating from this study e.g. initiation of a Tanzania Horticulture Development Authority (THDA) under the auspices of the Government Public Partnership to oversee the horticulture industry (production, research, marketing, capacity building, infrastructure).
To deliberate on the way forward in the form of writing a project proposal that will address horticulture development in Tanzania including incorporation of previously proposed horticulture development project proposals e.g. Irrigated horticulture development project undertaken by FAO (1994).
Stakeholder participation in the horticultural development process.

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Appendix 1. Gross Domestic Product by kind of Economic Activity (sectors) (At current prices Million TAS)

Economic Activity	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Agriculture	153335	255726	295011	349281	476387	612403	773470	955982	1318459	1658275	2003763	2294547	2694373	3019911	3400948
Crops	19257	175873	199692	231753	332999	450601	582152	710687	1013516	1288059	1539292	1769052	2071027	2309468	2638018
Livestock	34420	49805	58617	68603	81841	85774	96940	117929	145368	167966	213606	227910	277833	306383	329421
Forestry/Hunting	9149	11541	15356	23424	31627	409008	52576	71328	93772	120054	147666	168340	187815	208622	238416
Fishing	14509	18507	21746	25501	29920	35120	41802	56038	65803	82166	103199	129245	157698	179447	195093
Cntrbtn by non-agric	149345	212374	287155	410724	513207	663514	834293	1169342	1478183	1794283	2277837	2830764	3283329	3685223	4189817
Total GDP (factor cost)	302680	468100	582166	760005	989594	1275917	1607763	2125324	2796642	3452558	4281600	5125311	5977699	6705134	7590765
Crops cntrbtn to GDP (%)	6.4	37.6	34.3	30.5	33.7	35.3	36.2	33.4	36.2	37.3	35.9	34.5	34.6	34.7	34.8
Agric Cntrbtn to GDP (%)	50.7	54.6	50.7	46.0	48.1	48.0	48.1	45.0	47.0	48.0	46.8	44.8	45.4	45.0	44.8

Source: Planning Commission 2000; Planning Commission 2001

Appendix 2. Production trends of fruits and vegetables in twelve regions (Metric Tonnes)*

Crop/Year	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
(a) Fruits						
Oranges	38800	26135	57137	106910	113573	356004
Mangoes	61680	45850	154921	161919	165514	124227
Pawpaw	2036	1991	2275	6180	10644	5083
Pineapple	24306	27030	143070	142319	146512	51430
Banana	92885	55520	63105	119533	123078	268579
Guava	2470	2431	2550	2691	4582	3772
Lemon	2975	3453	4000	4454	8082	5684
Passion fruit	1043	1055	1583	1744	1783	2020
Tangerine	1963	2093	2223	3164	3680	3562
Avocado	497	603	2071	5484	5231	7016
Soursop	30	25	22	30	1318	353
Peaches	1919	2060	4819	5139	5200	5991
Plum	401	480	15331	16511	15677	16575
Peaches	186	243	161216	162147	162149	164089
Apples	76	91	3381	3196	3469	4226
Loquat	NA	NA	NA	NA	NA	453
Jack fruit	NA	NA	NA	NA	NA	365
Sub-Total	231267	582060	617704	741121	770492	1019429

(b) Vegetables and Spices	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
Tomato	37431	37502	80354	103811	140588	145919
Cabbage	16330	16866	76391	89578	101250	208623
Onion	32798	25255	30613	37407	41466	47483
Amaranthus	6850	7818	7831	8710	18011	17453
Chinese cabbage	2655	2693	2740	3032	3232	3093
Okra	277	295	306	328	387	891
Carrots	393	502	592	847	916	1733
Garden pea	132	134	136	208	290	24374
Swisschard	133	353	365	452	491	581
Garlic	13	22	19	22	39	48
Ginger	158	205	213	185	330	446
Cardamon	NA	NA	NA	NA	NA	2812
Egg plant	NA	NA	1500	1750	2283	682
Sweet paper	45	58	1585	3321	2836	1239
Cauliflower	NA	NA	NA	NA	NA	15
Sub-Total	97215	91703	202645	249651	312119	455092
Total All (Fruit & Veg.)	328482	673763	820349	990772	1082611	1474521

Compiled data from Mwanza, Kigoma, Mara, Iringa, Pwani, Ruvuma, Morogoro, Tanga, Arusha, Kilimanjaro, Lindi and Kagera Regions;

Source: Mwashu, A.M.; 1998

Appendix 3. Domestic Consumption of Horticultural Food Crops in 1993 and 2000. Per Capita Consumption in (kg per Person per Year) Total Consumption in ('000' Tons)

Food Product	Consumption 1993 (Population - 26.6 Million)		Consumption 2000 (Population - 32.3 Million)	
	Per Capita	Total	Per Capita	Total
Potatoes	7.1	188.9	7.3	235.1
Sweet potatoes	18.8	500.2	16.0	515.2
Cassava	228.0	6065.7	220.0	7084.0
Plantains	22.0	585.3	20.9	673.0
Pulses	13.8	367.1	73.8	445.7
Sub-Total	289.7	7707.2	338.0	8953.0
Vegetables	39.2	1042.9	41.4	1333.0
Bananas	21.1	561.3	22.0	708.4
Fruits	18.6	494.1	18.8	605.3
Sub-Total	78.9	2098.3	82.2	2646.7
Total All	368.6	9805.5	420.2	11599.7

Source: FAO, 1994

Appendix 4. Estimated production of fruits and vegetables in Morogoro district

Crop	1997/98		1998/99		1999/2000		2000/2002	
	(Ha)	(Tons)	(Ha)	(Tons)	(Ha)	(Tons)	(Ha)	(Tons)
Oranges	500	5,500	560	6,160	610	7,320	650	7,800
Tangerines	200	2,200	230	2,530	250	3,000	275	3,500
Banana	1,885	30,160	1,910	32,045	1,985	35,730	2,000	3,600
Pineapple	240	12,000	255	12,750	270	14,850	720	15,840
Mangoes	1,210	7,260	1,245	7,470	1,300	9,100	1,350	9,450
Jackfruits	90	1,800	99	1,980	105	2,625	120	3,000
Pawpaw	80	800	90	900	100	1,300	120	1,560
Peaches	180	1,800	187	1,870	200	2,400	207	2,484
Plums	139	275	148	296	155	465	160	480
Pears	20	300	25	375	31	628	47	746
Apples	9	135	12	180	15	270	20	360
Cabbages	240	5,280	265	5,850	270	6,750	281	7,025
Tomatoes	410	12,300	450	13,800	470	1,880	485	19,400
Peas	200	200	215	215	220	230	230	230
Onion	360	2,700	370	2,775	381	3,048	390	3,100
Amaranthus	148	2,220	152	2,280	161	2,898	169	3,042
Okra	65	65	71	71	80	80	88	88
Carrots	18	270	25	375	30	480	38	608
Ngogwe	40	400	46	460	51	765	60	900
TOTAL	6,034	85,665	6,355	91,982	6,684	93,589	6978	115,713

Source: DALDOs Office

Appendix 5: Losses of perishable commodities in Developing Countries

Comodity	Production ('000'tonnes)	Estimated loss (%)
Onions	6474	16-35
Tomatoes	12,755	20-50
Cabbage	18,301	37
Cauliflower	3,036	49
Dessert banana	36,898	20-80
Avocado	1,020	43
Stone fruits	1,831	28
Citrus	22,040	23-33
Grapes	12,720	27
Raisins	3,677	20-95
Apples		14

Source: National Academy of Science 1978. Food losses in developing countries

Appendix 6. List of persons contacted

MINISTRY OF AGRICULTURE AND FOOD SECURITY

Mr. A. S. Lamosai	ASPS Coordinator
Mr. Per Clausen	ASPS Financial Management Adviser
Ms. Britt Cranqvist	ASPS Seed Adviser
Mr. Lumbadia	ASPS Head of Seed Unit
Mrs. A. M Mwasha	Head of Horticulture Unit
Mr. Mtolera	ASPS Seed unit
Mrs. Simkanga	Acting Director of Policy and Planning
Dr. J. M. Haki	Director of Research and Development
Mr. P. L. Kinyawa	Principal Research Officer Division of Research and Development
Mr. Peter J. Zoutewelle	Irrigation Adviser, ASPS Irrigation Component
Mrs. H. J. Shimba	Acting Assistant Director Crop Promotion Services
Mr. W. Riwa	Plant Protection Division
Mr. John Mkamba	Senior Agricultural Officer Crop Promotion Services

Ministry of Cooperatives and Marketing

Dr. Ladislaus Komba	Permanent Secretary
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DITRICT COUNCILS

Arumeru

Mr. Rugangira	District Agricultural and Livestock Development Officer
Mrs. Rebecca Mongi	District Extension Officer
Ms Mary Lukas	District Subject Matter Specialist Horticulture

Hai

Dr. Edward Ulicky	District Agricultural and Livestock Development Officer
Mrs. Matilda Mfoi	District Subject matter Specialist Horticulture
Mr. Francis Mrawa	District Extension Officer
Mr. M. S. Marawiti	Plant Protection

Iringa Rural

Mrs Tatu Rutta	District Commissioner
Mr. N. Makembe	District Agricultural and Livestock Development Officer
Mrs. S. R. Natai	District Extension Officer and Seed Coordinator (ASPS)
Mr. D. I. Luvanga	District Subject Matter Specialist Horticulture
Mr. F. B Mpwehwe	Field Officer Crops
Mrs. R. P. Luvanga	Field Officer Horticulture

Kibaha

Mr. A. Kapama	Acting District Agricultural Development Officer
Mr. A. S. Mkungu	District subject Matter Specialist Horticulture

Lushoto

Mr. T. M. A. Kizuguto	District Agricultural and Livestock Development Officer
Mr. L. K. Mahoo	District Subject matter Specialist Horticulture
Mr. N. T. Pallangyo	Field Officer Horticulture
Ms M. H. Rimoy	Field Officer Horticulure
Mr. S. F. Msisiri	Field Officer Usambara Lishe Trust (ULT)

Mbeya Rural

Mr. Kapinga	District Planning Officer/Acting District Executive Director
Mr. L.M.E. Muliahela	District Agricultural Development Officer
Mr. Crispin Mtono	Field Officer. Crops/District Extension Officer
Ms Kazoba	F. O. Crops/Subject Matter Specialist Horticulture and Rice

Morogoro Rural

Dr. A. Hayghaimo	District Agricultural Development Officer
Mr. R. Masinde	District Subject Matter Specialist Horticulture
Mrs. Anna Ishuza	District Executive Director

Muheza

Mr. M. A. Musa	District Crops Officer
Mrs. N. H. Abdallah	District Subject Matter Specialist Horticulture

RESEARCH AND TRAINING INSTITUTIONS

Sokoine University of Agriculture

Prof. S. O. W. M. Reuben	Head Crop Science and Production Department, Faculty Of Agriculture
Dr. A. P. Maerere	Senior Lecturer Crop Science and Production Department, Faculty of Agric
Mr. J. J. Msogoya	Assistant Lecturer, Crop Science and Production Dept. Faculty of Agric.
Prof. A.Z. Matee	Director, SUA Center for Sustainable Development (SCSRD)

Northern Zone Agricultural Research and Development Institute Seliani

Dr. A. S. S.Mbwana	Zonal Director
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Horti Tengeru

Mr. Patrick S. N. Ngwediagi	Head National Vegetable Seed Programme and Horticulture Research Coordinator
Mr. I. S. Swai	Senior Plant Pathologist
Dr. M. L. Chadha	Director, AVRDC African Regional Programme
Mr S. N. Samali	Acting Director HORTI Tengeru
Mr. M. Chottah	MATI-Tengeru Horticulture Training Manager

Tropical Pesticides Research Institute

Dr. W. Y. F. Marandu	Ag. Director TPRI
Mrs Uronu	Plant Inspection and Certification
Mr. Mero	Plant Quarantine

Southern Highlands Zone-ARI-Uyole

Dr. M. Msabaha	Zonal Director of Research and Development
Dr. Mrs. Catherine Madata	Zonal Research Coordinator

SEED COMPANIES

Dr. H. O. Mongi	Advisor Alpha Seed Co. Ltd
Mr. Praful Gaglani	Director East African Seed (T) Ltd
Mr. Z. Owenya	Tanzania Rep. PANNAR SEED

PROCESSORS

Mr. Pandit	MD Darsh Industries Ltd
Mr. H. C. Lal	CEO Darsh Industries Ltd
Ms L. Kingarama	CELINE Food Group Mbeya
Mrs. S. Laiser	Presidents Choice Food and Beverages Company Arusha.

G. Cyril	Factory/Production Manager Dabaga Vegetable and Fruit Canning Iringa
Irente Farm	Irente Lushoto
Br. Selestine Rapp OSB	Sakharani Mission Lushoto
Soni Factory	Soni Lushoto
Sister Happy	Ubiri Lushoto
A. M. Makoye	Mufopa Muheza
Lyombo Group	Kurasini Temeke
Hawa Kimolo	Tesipe Food Mkuza Kibaha
Magesa Muna	Kim's Kibaha

INSTITUTIONS SUPPORTING SMALL SCALE PROCESSORS

SIDO/UNIDO Women Entrepreneurship Development Programme

Mr. Linus Gedi	Food Technologist
Mr. Peter Mhina	Ag. Zonal Manager, SIDO Mbeya (SIDO Workshop Manager)
Bahati Mlangalila	Training Officer, Zonal Office, SIDO Mbeya

REGULARORY INSTITUTIONS

Tanzania Bureau of Standards

Dr. C. J. S. Mosha	Chief Standards Officer
Mr. B. B. Matemba	Principal Quality Assurance Officer
Ms K.I. Mkassa	Principal Quality Assurance Officer
Mr. F. S. K. Masaga	Chief Standards Officer

National Food Control Commission (TUKUTA)

Mr. R. N. Wigenge	Food Technologist
Mr. Martin Kimany	Food Technologist

EXPORT SUPPORT INSTITUTIONS

Board of External Trade

Mr. K. S. Mwash	Director of Research and Planning
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Tanzania Chamber OF Commerce Industry and Agriculture

L. P. Accaro	Senior Chamber Development Officer
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Mushroom Growers

Ambassador Herman M. Mkwizu	Uyoga Mushroom Co. Ltd Kawe Dar es Salaam
Mrs. Judith Muro	Dar es Salaam Mushroom Growers Association
Mrs. N. A. Kaaya	HORTI Tengeru Plant Protection / Mushroom Expert
TWEDEA	Mbagala/Mangaya Temeke

Appendix 7: TERMS OF REFERENCE (TOR) FOR A STUDY ON THE HORTICULTURE DEVELOPMENT IN TANZANIA

BACKGROUND

The United Republic of Tanzania has an estimated population of over 30.0 million people out of which 85% are engaged in agriculture. Horticulture production normally generates higher earnings per unit area, although it requires more skill and care to produce; and is often an alternative to the farmer whose acreage is too small to provide adequate income from field crops. For a long time, however, Government has given priority to cereals production. Consequently insufficient resources were allocated to developing the “technical” know how in horticulture.

Tanzania has a large potential for the production of tropical, sub-tropical and temperate fruits, vegetables and flowers to cater for the largely growing domestic demand and eventually tap export market. At present it is estimated that less than 5% of the total horticultural potential is exploited. Variation in climate, altitude and land is favourable environment for production throughout the year.

Horticulture plays an important role in improving people’s diets and income-generation for farmers. Horticulture produce is widely used as source of raw materials for food processing factories and youths heavily rely on the sub-sector for employment. The country has high potential for production of temperate and tropical fruits for local and foreign markets. The average intake of fruits and vegetables in Tanzania is only 40 kg/year per person compared with an average of 370 kg/year in developed countries.

JUSTIFICATION OF THE STUDY

The need for improved performance of the horticulture sub-sector is based on the following facts:

Horticulture has a diversity of crops (vegetables, flowers, spices and fruits) that are able to provide the household a wider selection of food, thus achieving the nutritional needs.

Vegetables harvested as roots and seed provide a rich source of calories, as radishes, turnips, pumpkins, amaranths seed, etc.

Horticultural crops also provide protein, carbohydrates, minerals and vitamins.

Migration of people from the rural to urban areas has caused rapid increase of population of very low income in the cities. This has been accompanied by a simultaneous rise in the production of vegetables in home gardens creating job opportunities for youth and women. When compared to other crops horticultural crops produce more income per unit area.

Families tend to eat more fruits and vegetables when they are involved in producing them. This is why it is necessary to guide families to be involved in this production.

In households where the production is in excess of family need, the surplus is sold at the farm gate. The revenue accrued from such sales is used in purchasing other family needs including food.

Flowers and spices like vegetables and fruits are valuable crops, which if promotion and support towards increased production, productivity/consumption are enhanced; could significantly change the living standard and income of farmers and also improve the economic status of the country, as in for example in Kenya.

The Ministry of Agriculture and Food Security recognizes the importance of horticulture and for this reason has requested the Agricultural Sector Programme Support (ASPS) to assist in conducting a feasibility study which findings will give recommendations for future development.

OBJECTIVES

The objectives of the study are:

- To assess and map out constraints for the development of horticulture sub-sector and its potential
- To recommend measures/interventions for the revival and development of the horticulture sub-sector.

4.0 EXPECTED OUTPUT

The expected outputs for the study are:

- 4.1 Constraints and potential of the horticultural sub-sector identified
- 4.2 Recommendations how to address these constraints should be given
- 4.3 Draft report, outlining findings and recommendations to be presented
- 4.4 The findings of the report are presented for discussion to the stakeholders and the deliberations are made for future plans.

5.0 THE STUDY ACTIVITIES

The Agricultural Sector Programme Support (ASPS) on behalf of the Ministry of Agriculture and Food Security/Seed Unit is inviting competent local consultants to carry out a feasibility study on horticulture development in Tanzania with the following major activities:

Carry out a study to determine the potential and problems affecting horticulture development in Tanzania and identify the nature of the problems.

Provide recommendations for the improvement of the sub-sector in the areas of policy, production and marketing

Present the Draft report to the ASPS-Seed component and a copy to ASPS Programme co-ordination Unit (PCU)

- Present the report to the stakeholders' workshop.

The Specific Activities

1) Policy Issues

- Study Agriculture Policy, legislations, rules and regulations (e.g. Pesticide registration and use) to identify factors affecting the performance of horticulture.
- Identify strengths and weaknesses of the Agriculture Policy of 1997 and related documents (ASDS, ASDP) on horticulture development.

2) Production Issues

- Identify the existing diversity particularly in fruit production and explore marketing constraints, caused by it.
- Study the status of the publicly owned orchards of Mother trees and their contribution to the development of horticulture sub-sector.
- Identify factors limiting the availability of quality planting materials and varieties adapted to different agro-ecological zones.
- Identify factors limiting local production of horticulture seeds.
- Study on the status and potential of flowers and ornamental production and the role of the small scale producers.
- Identify factors hindering development of irrigation of horticultural crops.
- Identify limitations hindering new investments in production of horticultural crops.

3) Marketing Issues

Identify critical constraints hindering marketing of horticulture products (local and regional taxes, storage facilities, cold chain system, roads, communication systems, etc.).

- Identify problems facing export of horticultural crops indicating how export business is affected by the chemical residues on the crops; and investigate general awareness

of the farmers/exporters/policy makers on the International regulations such as Minimum Residue Limits (MRLs).

- Identify sources and availability of market information.
- Investigate other factors limiting marketing of horticultural produces.

6.0 APPROACH AND METHODOLOGY

Whenever required the consultant got information /data from various sources through review of documents, courtesy calls, visit and interviews with identified key stakeholders as: Ministry of Agriculture and Food Security Officials, Institutions, Districts, Seed Companies, Flower companies, Processors, Exporters and Farmers (Annex 1).

7.0 TIME SCHEDULE

The study will be carried out within 35 days of which 25 days for field work and 10 days for report writing and debriefing session. Within the overall timeframe the detailed planning for the assignment however can be adjusted following consultations between the consultant and client.

Officers, one from Horticulture Unit in the Ministry of Agriculture and Food Security and one from Seed Unit of HORTI Tengeru will participate in the study along with the consultant. The consultant will be the Team Leader. ASPS – Seed will provide transport for the field visit.

The assignment will commence from second week of May. A preliminary presentation of findings shall be prepared and forwarded to ASPS – Seed with a copy to ASPS-PCU not later than five days after the field visit. The final report shall be submitted not later than 10 days after debriefing session.

8.0 IDENTIFICATION OF THE CONSULTANT

Qualifications

The consultant shall have the following qualifications and experiences:

A minimum of M.Sc in Horticulture, Agronomy or related fields

- Working experience in horticulture or related fields for not less than 10 (ten) years.
- Has been involved in not less than 2 (two) studies of similar nature
- Working experience and knowledge in financial-economic analysis will be an added advantage.

Annex 1 (to the TOR)

E. KEY STAKEHOLDERS

Ministry of Agriculture and Food Security Officials: PS, DPP, CDC, DRD and DTI.

Research and Training Institutions: SUA, HOTI Tengeru and MATI Tengeru.

Seed Companies: Alpha Seed Company, East Africa Seed, Pop Vriend, etc.

Flower Companies: Continental Flowers, Kombe Roses, etc.

Processors: (large, medium and large scale): Dabaga Fruits and Vegetable Processing Co., Soni Mission, Tropical Foods Ltd., Mrs Laizer of Kijenge, Arusha, etc.

Farmers: Key farmers (producers, distributors of flowers, vegetables, mushroom, fruit and spices). Farmers' groups (TUIKINDE, MVIWATA).

Exporters: (fruits, vegetables, flowers, spices): NATURERIFE, TANEXA, TANHOPE, etc.

Agric. Officers (DALDO, SMS-Horticulture) and other officials (DED, Planning Officer) in some of these selected districts: e. g. Tanga Region: Tanga, Muheza, Lushoto; Kilimanjaro: Hai, Same; Arusha: Arumeru; Mbeya: Mbeya, Kyela; Iringa: Iringa Rural; Dar es Salaam: Temeke; Morogoro: Kilosa, Morogoro Rural; Mwanza: Mwanza Rural.

Other Institutions: TOSCA, TPRI, PSRC, TIC, TFNC, TBS, TUKUTA, CTI, TRA, Ministry of Co-operatives and Marketing, Ministry of Industries and Trade, BET, TCCIA, TFA, SIDO, TAFA, AMKA, NGOs, CBOs, etc.