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Egerton University

Tegemeo Institute of Agricultural Policy and Development

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IMPROVING KENYA'S DOMESTIC HORTICULTURAL PRODUCTION AND MARKETING SYSTEM: CURRENT COMPETITIVENESS, FORCES OF CHANGE, AND CHALLENGES FOR THE FUTURE

VOLUME III:
HORTICULTURAL RESEARCH AND INPUT SECTOR REGULATION IN KENYA AND TANZANIA

By

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LIST OF ACRONYMS

CIDA	Canadian International Development Agency
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
EU	European Union
FAO	Food and Agriculture Organisation
FPEAK	Fresh Produce Exporters Association of Kenya
GDP	Gross Domestic Product
HCDA	Horticultural Crop Development Authority
IBR	Institute for Biotechnology Research
ICIPE	International Centre of Insect Physiology and Ecology
IFAD	International Fund for Agricultural Development
IGAD	Inter-Governmental Authority
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KARI	Kenya Agricultural Research Institute
KBS	Kenya Bureau of Standards
KEPHIS	Kenya Plant Health Inspectorate Service
KFA	Kenya Farmers' Association
KFU	Kenya Farmers Union
KRA	Kenya Revenue Authority
KSC	Kenya Seed Company
MoALD	Ministry of Agriculture and Livestock Development
MRLs	Maximum Residual Levels
NCPB	National Cereals and Produce Board
NGOs	Non-Government Organizations
OPVs	Open Pollinated Varieties
PTA	Preferential Trade Area
QDS	Quality Declared Seed
SADC	Southern African Development Community
TAMPA I	Tegemeo Agricultural Monitoring and Policy Analysis
TFC	Tanzania Fertilizer Company
THRC	Thika Horticultural Research Centre
THRI	Tengeru Horticultural Research Institute
TOSCA	Tanzania Official Seed Certification Agency
TSC	Tanzania Seed Company
UK	United Kingdom
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WV	World Vision

Executive Summary

Kenya's horticultural sector (defined here to include fruit and vegetable production and marketing, but not flowers) has received a great deal of attention over the past decade due to the rapid and sustained growth of its exports to Europe. This impressive growth has undoubtedly contributed to increased rural incomes and reduced rural poverty in Kenya. Yet despite this growth, exports remain a small fraction of Kenya's overall horticultural sector. For the past decade, over 90% of all fruit and vegetable production was consumed domestically, and the domestic market accounted for over 90% of the total growth in quantity of fruit and vegetable production. While over 90% of smallholder farmers in all but the arid regions of Kenya produce horticultural products, fewer than 2% do so directly for export.

This overwhelming dominance of the domestic market, combined with slower growth experienced in the export sector over the past decade, the challenges that smallholders face to continue participating in the export sector, and the possibility of more rapid growth in domestic demand, all argue for a more active focus on the potentials and constraints of domestic horticulture in Kenya. Such a focus implies also the need to assess the competitiveness of local production and marketing against that of neighboring countries such as Tanzania and Uganda. This paper explores these key issues in three Volumes. The overall objectives of the three Volumes are to provide a broad diagnostic overview of the horticultural sector, to identify specific constraints that limit the system's performance, to make suggestions for selected policy and programmatic changes, and to identify key research that needs to be done to guide further investments to improve sector performance. Volume III – the present volume – focuses on horticultural research and input sector regulation, comparing and contrasting the system in Kenya with that in Tanzania. Volumes I and II focus, respectively, on horticultural production in Kenya and on domestic and regional marketing of horticultural products.

The paper is organized as follows. Chapter 1 provides background and briefly discusses the data and methods used in the report. Chapter 2 evaluates the market and regulatory system for vegetable seeds. Chapter 3 reviews the horticultural research and development systems in Kenya and Tanzania, while Chapter 4 looks at fertilizer and agrochemical inputs for horticulture. Finally, Chapter 5 presents conclusions and recommendations.

Market and Regulatory System for Seeds: Following liberalization in 1994, government in Tanzania has played a facilitating role in seed sector development, while the focus of Kenya's authorities is primarily on regulation and "policing". Community Based Seed Production, especially of the mang'ola red onion variety, and local varietal development more generally, appear to be major successes of this more flexible approach in Tanzania.

***Horticultural Research and Development*:** Horticultural seed research in Kenya is plagued by understaffing. While Tanzania's research center has five vegetable breeders, a number of seed technologists, and a fully operational seed production unit, Thika Research Center in Kenya has one full-time breeder, no seed technologist, and no operational seed production unit.

***Fertilizer and Agrochemical Inputs*:** Kenya Farmer's Association and National Cereals Produce Board (a parastatal) have both become active in the fertilizer sector since 2001. They charge lower prices than private companies and some suggest that their presence has reduced the prices these companies charge. This development needs to be watched quite

closely to ensure that unsustainable government subsidies to NCPB or KFA do not undermine the notable success of fertilizer sector liberalization in Kenya.

Conclusions and Recommendations: Fresh fruit and vegetable production and marketing value chains are becoming increasingly important to a broad array of Kenyan consumers. These also hold potential market opportunities for important segments of the smallholder farming community. Expanding domestic and regional markets for Kenyan horticultural produce and integrating the country's smallholder farmers into profitable supply chains that satisfy these markets will require investment in three key areas: technical production constraints, "hard" and "soft" market infrastructure, and the legal and regulatory environment. Recommendations regarding the legal and regulatory environment (the focus of this Volume) touch on the current revision of the Seed and Plant Varieties Act of 1991, on the Horticulture Bill, and on issues of quality and food safety, farmer organizations, and intellectual property rights in seed varieties.

Improving Kenya's Domestic Horticultural Production And Marketing System: Current Competitiveness, Forces Of Change, And Challenges For The Future

Volume III: Horticultural Research and Input Sector Regulation in Kenya and Tanzania

1. Introduction

1.1 Background and Objectives

Kenya's horticultural sector has received a great deal of attention from local and international researchers, government, and donors over the past decade, due to the rapid and sustained growth of its export sector (Jaffee 1994, Jaffee 1995, Swernberg 1995, Kimenye 1995, Stevens and Kennan 1999, Dolan et al. 1999, Kamau 2000, Thiru 2000, Harris et al. 2001, Minot and Ngigi 2002). From a very low base, Kenya's horticultural exports (defined here to include fruit and vegetables but not flowers) grew 9% per year in the first decade after independence, then 17% per year from 1974-1983 (Minot and Ngigi 2002). Growth slowed over the 1980s and 1990s, but still averaged about 4% per annum over the past decade. By the year 2000, fruit and vegetable exports amounted to US$270m, or 15% of Kenya's total export economy. This impressive growth has undoubtedly contributed to increased rural incomes and reduced rural poverty, through both direct production effects and linkage effects, as horticultural incomes from export are re-spent in rural areas.

Yet despite its rapid and sustained growth, exports remain a small fraction of Kenya's overall horticultural sector. For the past decade, over 90% of all fruit and vegetable production was consumed domestically, either on-farm or through domestic markets. Despite higher percent growth rates in the export sector, the absolute amount of growth has come overwhelmingly from the domestic sector: between 1992/93 and 2000/01, the domestic market accounted for 98% of the total growth in quantity of fruit production and 91% of the total growth in vegetable production. Even allowing for higher prices of export commodities, the dominance of the local market is clear.

This dominance is reflected at the farm level. While over 90% of smallholder farmers in all but the arid regions of Kenya produce horticultural products, fewer than 2% do so directly for export (Bawden et al, 2002). Kenyan smallholders who have succeeded in producing for the export market also face a daunting set of challenges if they are to maintain their participation in the sector. These challenges are driven by increasing consumer demand for quality and food safety in the UK and continental Europe, and by the related rise of supermarkets in these areas. By the late 1990s, supermarkets' share of the fresh fruit and vegetable market in the UK had surpassed 70%, and the share of *chains* among supermarkets had increased to nearly 80%. Consolidation in the retail sector has led to increasing market power for large retail concerns, and much more control by them over production practices. A focus on Maximum Residue Levels (MRLs) of pesticides on fresh produce, and the need to ensure that exports do

not exceed these, has led to an increasing emphasis on the *traceability* of horticultural production; exporters want to be able to trace production back to the specific farm from which it came in order to ensure quality and safe production and handling procedures.

Researchers, development practitioners, and governments are concerned that these changes in international supply chains for horticultural and other high-value agricultural products will make it increasingly difficult for smallholders to maintain their position in this trade (Dolan *et al.* 1999; Dolan & Humphrey, 2001; Dolan & Sutherland, 2002; Harris et al, 2001; Jaffee 2003; Kamau and Sisule 2001). Estimates of changes in Kenyan smallholders' share of the fresh horticultural export market vary widely. Most researchers seem to agree that shares were as high as 75% in the early 1990s (Harris 1992). The most optimistic current estimate is by Kenya's Horticultural Crops Development Authority (HCDA), which places smallholder export market shares at 40% for fruit and 70% for vegetables, implying an overall horticultural share of 55-60%. Dolan and Sutherland (2002) provide the lowest estimate. Based on interviews with four leading exporters, they suggest that smallholder shares fell to 18% by 1998 and 11% by 2001. Minot and Ngigi (2003) suggest that this figure is probably too low, based on the small number of firms interviewed and on the tendency of exporters to underestimate smallholder shares "to satisfy European buyers who are suspicious of smallholder quality control." Minot and Ngigi cite Jaffee (2003) as perhaps the most reliable current source. Based on interviews with several dozen exporters, he estimates smallholder export market shares of 27% for fresh vegetables and 85% for fresh fruit, for an overall horticultural share of 47%. Part of the reason for this much smaller estimated decline in smallholder participation in the export market (compared to Dolan and Sutherland) is that about 60% of Kenya's fresh horticultural exports are sold, not to UK supermarkets, which have the strictest food safety and quality requirements, but to UK wholesalers and other European countries, whose standards are not as strict.

Thus, outright pessimism about continued Kenyan smallholder participation in fresh horticultural export markets does not seem warranted. Yet their share does appear to have fallen substantially over the past 10 years, from about 75% to under 50%. In addition, Kenya's horticultural export sector as a whole faces increasingly stiff competition from other African countries such as Cote d'Ivoire, Morocco, Zimbabwe, South Africa and Cameroon. Kenya's horticultural export expansion has been aided by the country's preferential duty-free access to EU markets under the Lome Agreement, which currently runs through 2008. If this agreement is not renewed, or if other developing countries obtain similar benefits, Kenya can expect to face even stiffer competition in these markets. Finally, food safety standards in Europe, with emphases on *traceability* and *process standards*, are set to become much more strict in January 2005 under EUROPGAP, implying even higher barriers to smallholder participation. Thus, the continued growth of Kenya's horticultural exports, and the ability of smallholder farmers to participate in any growth that does occur, cannot be taken for granted.

Kenya's economy is also changing, with continued high rates of urbanization expected to drive increases in demand for horticultural products. If the new government is able to reverse the country's economic decline and stimulate private investment to generate renewed growth in per capita incomes, then the increase in domestic demand for horticultural products will accelerate.[1] Responding to this growing demand will require increased productivity in both the production and marketing parts of the value chain; if productivity and quality remain low

[1] Income elasticities of demand for fruits and vegetables are generally high.

in either part of the chain, poor consumers will be faced with increasing prices, and small farmers may see little effective growth in the demand for their output.

All of these factors – the overwhelming dominance of the domestic market, the slower growth experienced in the export sector over the past decade, the challenges that smallholders face to continue participating in the sector, the possibility of more rapid growth in domestic demand, and the need for productivity growth in both production and marketing to meet this demand and protect the real incomes of poor consumers – argue for a more active focus on the potentials and constraints that the domestic horticultural market faces in Kenya. A focus on the domestic market implies also the need to assess the competitiveness of local production and marketing against that of neighboring countries such as Tanzania and Uganda. In this paper we explore these key issues in three Volumes. The overall objectives of the three Volumes are to provide a broad diagnostic overview of the horticultural sector, to identify specific constraints that limit the system's performance, to make suggestions for selected policy and programmatic changes, and to identify key research that needs to be done to guide further investments to improve sector performance. Volume III – the present volume -- focuses on horticultural research and input sector regulation, comparing and contrasting the system in Kenya with that in Tanzania. Volumes I and II focus, respectively, on horticultural production in Kenya and on domestic and regional marketing of horticultural products.

The specific objectives of this volume are to compare the influence of input systems on the performance of the horticultural sectors in Kenya and Tanzania, and to recommend steps that should be taken to place Kenya's domestic horticulture in a position to compete favorably in local and regional markets.

1.2. Data and Methods

To undertake this study, primary data were obtained from interviews with horticultural input suppliers (i.e. seed, fertilizer and chemicals) in Kenya and Tanzania regarding the structure of input systems, sources and prices of inputs, the current policy environment on horticultural inputs and the challenges input suppliers are facing in both countries.

Secondary data on various aspects of domestic and export horticulture were gathered from Kenya Revenue Authority, Horticultural Crop Development Authority, Ministry of Agriculture Livestock and Rural Development-Horticulture Division, Ministry of Trade and Industry, Central Bureau of Statistics and various horticultural input suppliers.

The paper is organized as follows. Chapter 2 evaluates the market and regulatory system for vegetable seeds. Chapter 3 reviews the horticultural research and development systems in Kenya and Tanzania, while Chapter 4 looks at fertilizer and agrochemical inputs for horticulture. Finally, Chapter 5 presents conclusions and recommendations.

2. Market and Regulatory System for Vegetable Seeds

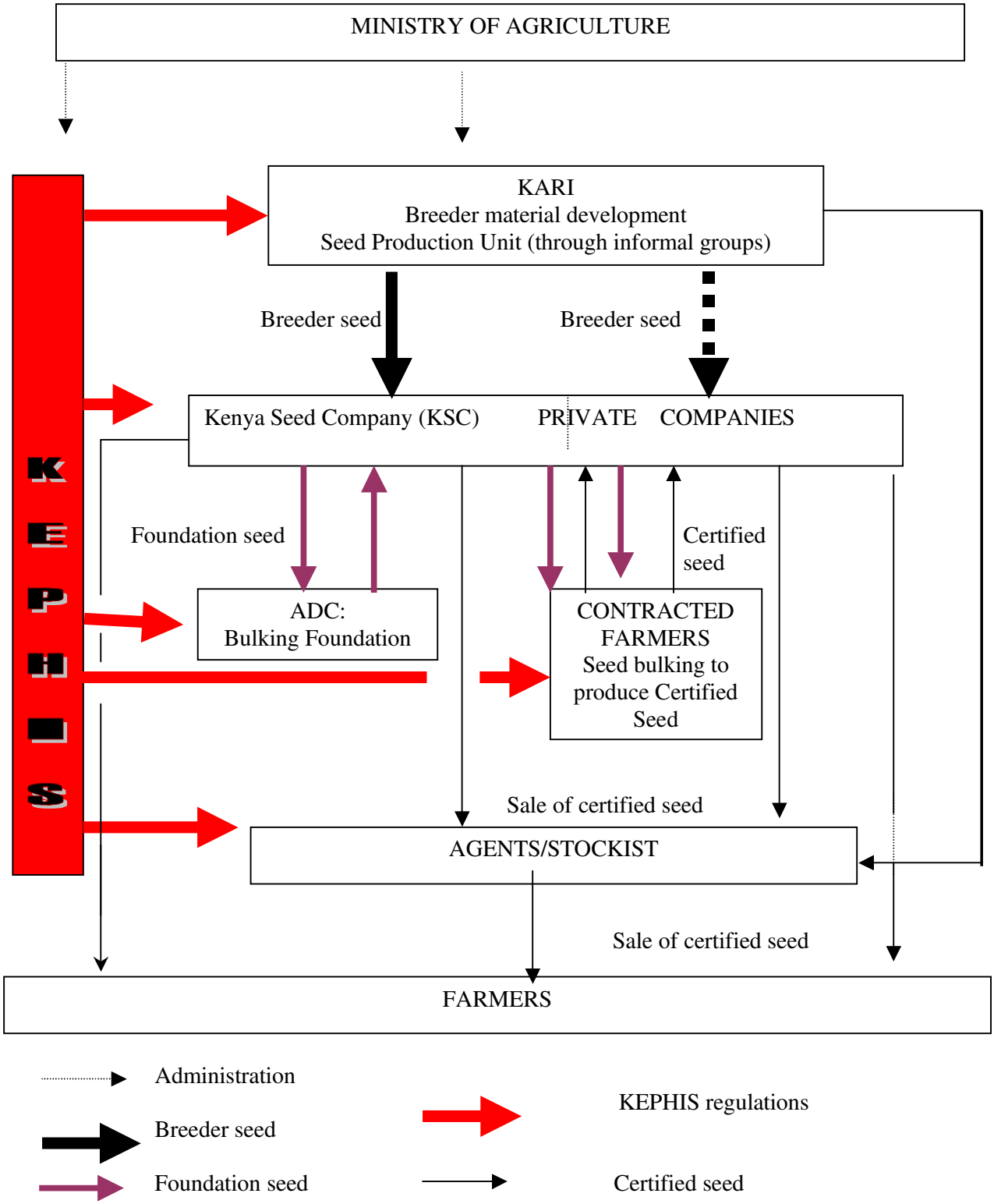
The Kenyan and Tanzanian governments have not intervened to any significant degree in horticultural output markets to buy, sell, export, or set prices. The main regulatory body of the horticultural sub-sector in Kenya is the Horticultural Crop Development Authority (HCDA), which was established in 1967. HCDA was originally given authority to fix prices, regulate trade, and operate processing facilities and market horticultural goods. For example, HCDA maintained a monopoly on onion marketing and export briefly, then competed with private onion traders and finally, by 1986, withdrew its buying and selling functions from the market. Based on unsuccessful experiences, these functions were pared back to regulation, provision of market information and advisory services. Hence, horticultural commodities are bought and sold in a private, competitive market environment with very little government regulation and no direct government participation in commercial activities (Dijkstra, 1999).

Horticultural input markets, on the other hand, have faced various types of interventions in each country. This chapter explores the policy environment and how it has shaped the system of input markets for horticultural commodities in each country, ultimately resulting in a greater competitive advantage of horticultural commodities in the regional markets for Tanzania than for Kenya.

Vegetable seed production and distribution in Kenya is governed by the Seed and Plant Varieties Act of 1991. Under the Act, Kenya Plant & Health Inspectorate Services (KEPHIS) is the main regulatory body of the seed industry. KEPHIS is a parastatal in which Ministry of Agriculture (MoALRD), Kenya Agricultural Research Institute (KARI), Kenya Seed Company (KSC), Horticultural Crop Development Authority (HCDA), Kenya Forestry Research Institute (KEFRI), Kenya Farmers Association (KFA), Kenya Farmers Union (KFU) and a member who may be co-opted to represent interests of the industry sit in the Seed Regulation Committee (SRC). The SRC is mandated to formulate and recommend developmental policies for the growth of the industry. It is also supposed to make standards, recommend registration of seed merchants, recommend certification fees and act as moderator in cases of appeals by aggrieved industry players. KEPHIS has the responsibility of administering the Act and is empowered to inspect, test, certify, control imports and enforce the seed law. Figure 2.1 shows the structure of the seed industry in Kenya.

The seed law in Kenya is comprehensive and very stringent, and KEPHIS has concentrated most of its efforts on enforcing this law -- policing the activities of the private sector -- rather than acting in their interests to offer quality, timely and satisfactory services. The private sector has complained of the way KEPHIS has adopted an attitude of 'policing' the industry and exercising regulatory monopoly powers over the private sector rather than providing services, co-ordination and leadership in the seed industry. They suggest that this approach has been an impediment to private sector innovation & growth and has usurped the developmental role in the industry.

FIGURE 2.1: STRUCTURE OF THE SEED INDUSTRY IN KENYA



In light of these difficulties, the recent process of reform in the Tanzanian seed industry may hold some useful lessons for Kenya. The Tanzanian seed sector had also been tightly controlled particularly for cereals. Figure 2.2 shows the seed industry structure before liberalization. The main regulatory body of the Tanzanian seed industry was the Tanzanian Official Seed Certification Agency (TOSCA). Its mandate was to ensure that seed produced in the country met the required standard of quality and the rules and regulations were followed. It was empowered to inspect, test, certify and control seed imports. Breeding of plant varieties, production of the seed and seed treatment was mainly done by the Government. The law mandated the research stations to do the breeding work, then to pass the pre-basic seed to five Government seed multiplication farms under the Ministry of Agriculture, which were required to multiply and produce foundation seeds that would be sold at a very cheap price to the Tanzania Seed Company (TSC). TSC was a Government parastatal and was mandated to take all the foundation seeds that the five farms in the country multiplied. It then contracted farmers to grow the certified seed, which the company would process, package and then sell to companies/stockists for distribution to farmers. Retail sales prices were heavily subsidized. This put the company in a difficult financial situation since it could not raise enough operational funds. Thus, due to lack of capital and the Ujamaa policy and government price controls, TSC collapsed in the early 1990's. By then, farmers had also lost confidence in the quality of hybrid seeds that the company was selling and turned to Open Pollinated Varieties (OPV's) or imported hybrid seeds.

In 1994, the Tanzanian Government liberalized the economy and the seed industry took a different structure and operations (see Figure 2.3). TOSCA and the five state farms remained, but government monopolies were eliminated. Research stations are now free to sell breeder seed to private companies or to the government seed multiplication farms, or to contract capable farmers to undertake multiplication of foundation seeds for them. They can also do seed bulking to produce certified seeds or contract farmers to do this. The five state farms took over the place of TSC. They can sell certified seed directly to the farmers or sell the foundation/certified seed to the private companies. Currently the research stations and the state farms are supposed to partially fund their programs from profits accrued from their operations. The current system appears to be competitive and dynamic.

Following liberalization in Tanzania, the Seed Act was reviewed to reflect the current government policy of a free economy, and is currently pending in Parliament. A key innovation in the Act is that it allows seed to be produced at village level as Quality Declared Seed (QDS), which has its rules and regulations printed and applied by TOSCA. This process of village level seed production is operationalized as Community Based Seed Production (CBSP). The Tanzanian Parliament passed the Plant Breeders Rights Bill in 2002 and this was seen as a positive move for the seed industry.

Liberalization of the seed industry in Tanzania had major impacts on the vegetable seed industry. Prior to liberalization, permits and licenses were difficult to obtain for importers. Large amounts of vegetable seed were brought in through the Ministry of Agriculture by NGOs for sale to farmers at subsidized prices. Some few established private companies (Pop Vriend, Sluis Brothers, Rotian Seed, and others) were given permits to import vegetable seeds, but the process was quite tedious and the quantities imported were relatively small. Competition from NGOs undoubtedly hindered the development of a competitive private industry. Liberalization streamlined the import process, and now most vegetable seed imports in Tanzania take place through commercial channels (see Figure 2.4

FIGURE 2.2 STRUCTURE OF THE SEED INDUSTRY IN TANZANIA BEFORE LIBERALIZATION

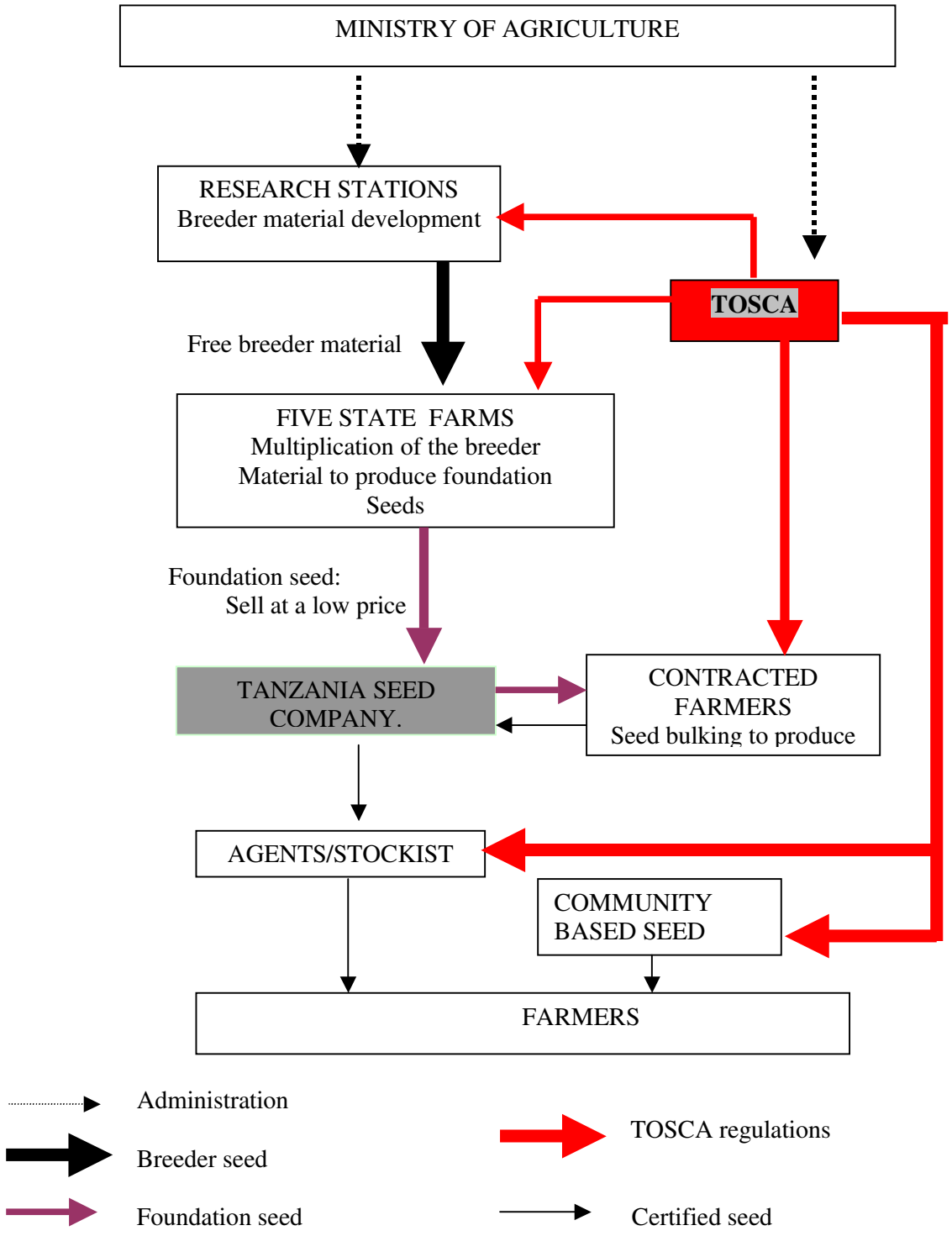
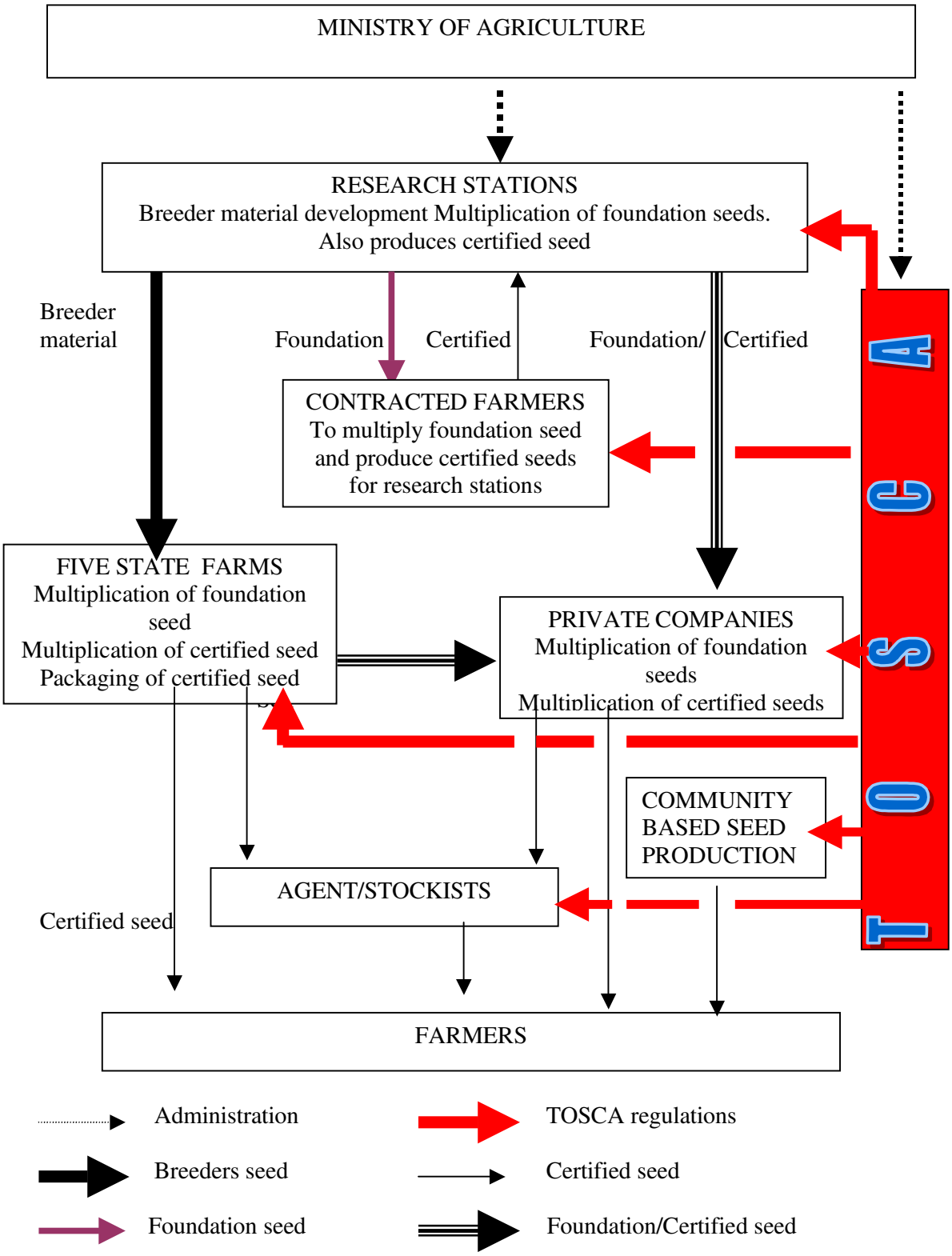


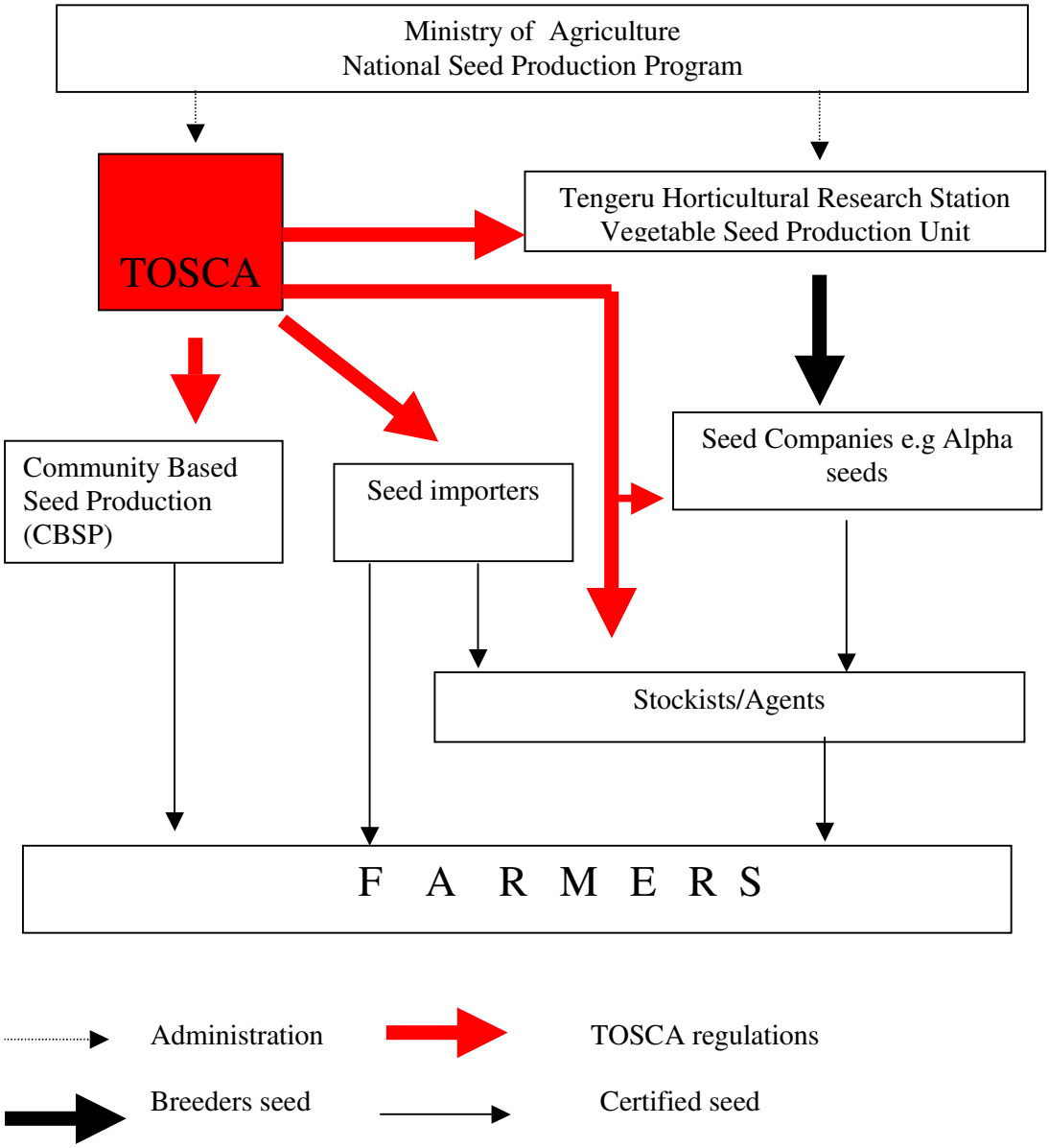
FIGURE 2.3. STRUCTURE OF THE LIBERALIZED SEED INDUSTRY IN TANZANIA



for the current structure of the vegetable seed industry in Tanzania). Testing for seed viability remains quite stringent, to avoid dumping.

Local vegetable seed production is also very active in Tanzania. This began prior to liberalization, but has taken on a new dynamic since that time. The Ministry of Agriculture recently started a seed production unit under the National Vegetable Seed Program. The unit is situated at Tengeru Horticultural Research Institute (THRI) and is mandated to produce vegetable seeds for the country. It has joined with companies such as Alpha Seeds to help in distribution of the seeds produced locally. FAO started a vegetable seed-producing program that has been handed over to locals and is functioning successfully. There is also an on-farm

FIGURE 2.4 STRUCTURE OF VEGETABLE SEED SUB-SECTOR IN TANZANIA SINCE SEED SECTOR REFORMS



seed production program in which extension agents train farmers in the production of quality-declared seeds, and inspect the seeds for quality. This is done on about seven vegetable crops. There was a similar program in Mangola where farmers were trained to produce quality onion seeds for themselves and for companies. This program developed the Mangola Red variety from Bombay Red, with higher yields and a longer storage period – a key characteristic for onions.

To determine the status of vegetable seed markets a survey of the major horticultural seed companies was undertaken in Nairobi, Kenya and Arusha, Tanzania. Table 2.1 shows the sources of the seed inputs sold by these companies.

Table 2.1 Sources of Vegetable Seed Inputs Sold by Various Companies in Kenya and Tanzania

Source of seeds	Kenya	Tanzania
Number of Main Companies selling horticultural seeds	6	7
Imported seed only	3	1
Local seed only	0	1
Both local/imported	3	5
Overall local seed share	5%	8%

Source: Authors computation

In Tanzania only one of the seven companies interviewed operated exclusively with imported seed. In Kenya, three of the six companies interviewed do so (Table 2.1). One company in Tanzania trades exclusively locally produced vegetable seeds while in Kenya no firms operate in this way. Five of the seven companies in Tanzania and three of the six in Kenya deal with a mixture of both local and imported seeds. Over all companies and all types of vegetable seeds, the share of local seeds in Kenya is 5%, and in Tanzania is 8%. Table 2.2 shows the vegetable seeds that are produced locally, the percentage production and the number of companies doing it.

Table 2.2 Vegetable Seeds Produced Locally And The Approximate Percentage Of Production By Companies

Company	**Commodity**	**Local Seed Share (%)**
Kenya		
Simlaw, E.A seed (2)	Pepper, okra, beans	5.0
Tanzania:		
Suba Agro Chem	Watermelon, okra, eggplant	2.5
E.A seed, Kibo (2)	Pepper, okra, beans	5.0
Pop Vriend Ltd	Cabbages, tomatoes	80
Alpha Seed Ltd	Black night shade, okra, cucumber watermelon, amaranthus	100

Source: Authors' Interviews with Seed Comp anies.

Table 2.3 shows prices per kg of various vegetable seeds in Kenya and Tanzania. Neither country has systematically lower prices than the other. The results show that there is no clear-cut trend in price differences between companies in Kenya and Tanzania. However, for those seeds produced locally (either in Community Based Seed Production programs or by private companies), the prices are relatively lower. The most notable price difference is the very low price for Mang'ola red variety of

onion in Tanzania produced under CBSP, whose price is one-third and 40% that of the Red Bombay in Tanzania and Kenya, respectively.

Table 2.3. Average Prices of Various Vegetable Seeds in Kenya and Tanzania.

Seed Variety	Kenya	Tanzania	
	Imported Seed	Imported Seed	Locally Produced Seed (CBSP and private Companies)
	---------- Ksh/kg ----------		
Onions			
Red Creole	2958	3250	
Red Bombay	1500	1813	1250
Mang' ola red	-		600
Tomatoes			
Cal-J	4700	4580	
Money Maker	1550	4200	2500
Cabbages			
Gloria	1869	1392	
Copenhagen	1309	1755	
Drumheads	-	1321	
Kales			
Thousand headed	1350	1189	
Eggplant	2000	1667	1667
Amaranth	800	-	740
Watermelon	1500	1800	1250

Source:Authors' Interviews with Seed Companies

Table 2.4 shows the various seed import charges in Kenya and Tanzania. Though neither country has an import duty on seed, other charges substantially increase prices in each country. Overall, these charges add about 18% to the CIF price of seed in Kenya; they add about 15% in Tanzania, plus a fixed charge of TzSh10 per import. Thus, financial costs of importation in Tanzania are slightly lower; combined with the greater bureaucratic difficulties placed on imports in Kenya, seed importation becomes a somewhat more costly and time-consuming activity in Kenya than in Tanzania.

Table 2.4. Seed Import Charges in Kenya and Tanzania

Charges	Kenya (Kshs)	Tanzania (Kshs)
Clearing charges	Negotiable (5 %)	6.50%
Inspection fees	6.4 %	1.7%
Import Declaration Form (Plant Import permit-TZ)	2.75%	$10
Port charges	2.25%	4%
Agency fees	1%	1.5%
Import cargo handling	1%	1.5%
Total Charges	18.4%	15.2% + $10

Source: Authors' Interviews with Seed Companies

The Tanzanian experience would seem to hold at least two lessons for Kenya. First, a heavy focus on policing by the seed regulatory body is likely to hinder the development of a flexible system capable of providing quality seed from a variety of sources to farmers. Thus, the on-going review of the Seed Act in Kenya should as a matter of necessity address the issues of how KEPHIS and the regulation committee can play a facilitating role to coordinate the development of a seed regulatory framework, which can spur innovation and growth without necessarily compromising the integrity of the industry.

Second, community based production of Quality Declared Seed can be a cost effective way of making more seed of higher quality available to many small farmers at more affordable prices. Tanzania's strong support to local seed production, and the emergence of the much improved Mang'ola Red variety of onion from one of these efforts, appears especially noteworthy.

3. Horticultural Research and Development in Kenya and Tanzania

3.1. Vegetable R&D

Horticultural research in Tanzania is mainly done in Tengeru Horticultural Research Institute and to some extent in Sokoine Agricultural University. Research is almost entirely on breeding and other farm-level technical issues. Post harvest handling, packaging, and storage, receive little if any attention.

Tengeru is one of the two research institutes in Northern Zone. The institute began work in the 1980s, and was mandated to do both research and training in horticulture. After 1996, the training role was withdrawn to enable the institute to concentrate on research. The Government and donors such as World Bank fund the institute. It is also involved in collaborative research work with other organizations. The research work undertaken is driven by the needs and challenges that farmers and NGOs are facing, and includes vegetable breeding, mushroom growing, banana research, root and tubers, flower pest control and fruit trees among others.

The vegetable seed production unit, which is part of the National Vegetable Seed Program under the Ministry of Agriculture, is also based in Tengeru Institute. The unit is mandated to produce vegetable seeds in the country. The unit has plant breeders who have specialized in vegetable seed breeding and has seed production technologists. There is seed production for indigenous vegetables also but very few are purified and the process is on-going. Research work in this area is at the initial stages of collecting germplasm for the various indigenous vegetable varieties. There is also a regional research program of indigenous vegetables in Tanzania carried out multilaterally for Southern Africa Development Community (SADC) countries. Through research, the institute is trying to enhance production and utilization of quality vegetable seeds. The farmers' response to the new seeds has been good. Most farmers like the indigenous vegetables especially women as it forms a good source of income. The crops are commonly referred to as "women's crops". Most people h ave accepted the indigenous vegetables as a rich diet hence the demand is growing.

So far, the vegetable breeding section in Tanzania has developed fourteen varieties, which are commercially produced for the market by the Seed Production Unit. They are shown in Table 3.1 below. The Seed Unit has forward linkages with some companies e.g. Alpha Seeds to help in marketing and distribution of the seeds produced locally.

In Kenya, vegetable research work including breeding is undertaken by the Thika Horticultural Research Centre (THRC). The centre carries out basic and strategic research while other centers specialize in adaptive horticultural research work. The institute is a parastatal funded mainly by the Government though it has also received funding from organizations such as UNDP, FAO, USAID, CIDA, JICA, Netherlands Government and World Bank. The private sector has supported THRC on pest control research. Some of the work has been undertaken on tomatoes, French beans, runner beans, some Asian vegetables and indigenous vegetables. Research work on fruits has been mainly on citrus and bananas.

Table 3.1. Crop and Seed Varieties Produced in Tanzania

Crop	Varieties
Tomatoes	Tengeru 97, Money Maker (Roma), Tanya
Onion	Red Bombay, Mang'ola Red
Okra	Pusa Sawani
Cucumber	Ashley
Cabbage	Sugar Loaf
Water Melon	Sugar Baby
Amaranth-Mchicha	Wa-Unga and Nyeupe,
Black Nightshade	Mnavu
Loshuu	Local
Ngowe	Tengeru White
African Eggplant	Black Beauty.

Source: Tengeru Horticultural Research Intitute.

Early 1990s the Center started involving stakeholders in planning research programs at the beginning of each year. With this participation in planning, it is now easy to approach the private sector for research funding. The institute hopes that by and by the private sector will support research in horticulture. KARI has developed an Agricultural Research Investment Scheme (ARIS), which has a Business Development Unit that publicizes research activities to the industry and finds out ways through which they can play a role in research programs. It has produced a brochure detailing the various research activities and services that can be offered. It is hoped that in the long run, up to 30% of research funding will come from the private sector through the Business Development Units.

Understaffing seriously limits the scope of what THRC can do. While Tengeru in Tanzania has five breeders, a number of seed technologists, and a fully operational seed production unit, THRC has two breeders (one of whom is the Director and thus has little time for breeding work), no seed technologist, and no operational seed production unit. The Centre developed and released the Kutuless variety of French beans, but focuses most of its breeding work on maintaining the varieties already bred. There is no strategic basic breeding research being done to develop new varieties. THRC purchased a seed production unit but has not installed it due to lack of personnel in the area of seed technology. As a further point of comparison, there are eight maize breeders in KARI distributed in various research centers and targeting different agro-ecological zones in the country.

3.2. Fruit R&D

3.2.1 Citrus Fruits

Citrus yields in East and Southern Africa range from 10-40 tonnes per hectare (Kolade and Olaniyan, 1998), while potential is up to 75 tonnes per hectare under high density planting. In Kenya, yields between 1992 and 2001 averaged from 8 to 11 tonnes/ha. As early as the 1970s it was noted that citrus production in Kenya was declining. Consequently, in 1982 the Director of Agriculture formed a committee to investigate the status of citrus production in

the country and the constraints that farmers were facing. It was expected to highlight and give recommendations on how to eradicate and/or control the citrus greening disease, which caused low yields in orchards. It was realized that the disease was caused by a Citrus Psyllide;- *Trioza erytrae* vector, prevalent in the highlands. It was also observed that the disease was prevalent in most of the citrus growing areas in Kenya and that most nurseries in the high and midlands where the pest is rampant were diseased. The committee noted that the disease could be controlled through citrus tissue culture to produce disease free planting materials, but stressed that the vector Citrus Psyllide must be controlled to avoid contaminating disease free materials once they are planted in the field.

Following these recommendations, University of Nairobi and Thika Horticultural Research Centre started programs in an attempt to combat this disease. THRC identified Matuga, Kibwezi, Garissa and Pekerra as sites that were not prone to the greening disease. The sites were mostly below 800m where the Citrus Psyllide does not thrive.[2] Disease free planting materials from Corcocica in USA and France were introduced in these areas.

In 1997, University of Nairobi received full funding from Biotechnology Trust Africa for a tisuse culture project for citrus. As a result, a tissue culture laboratory was set up in the Department of Crop Science and research work has been going on ever since. The scientists have managed to produce disease free planting materials, which have been adopted by farmers. The department currently sells about 20,000 seedlings per year at Kshs. 60 and Kshs. 100 per seedling to project and non-project farmers respectively. However, the current level of supply is far below the quantities demanded by farmers. Most farmers who receive the plantings are developing new orchards since they can start with disease free planting materials.

A key potential problem is that the insect vector has not yet been controlled and can still infect disease free biotechnology seedlings in the field. This problem is especially serious in the midlands and highlands where the vector thrives. University of Nairobi has been working to find ways of introducing Integrated Pest Management (IPM) to bring this vector under control. The vector has several endemic parasites that can be used to control it. However, funding for this initiative has been the main bottleneck. As a result, most nurseries and orchards in the high and midlands where the *Trioza erytrae* is rampant continue to be diseased.

Research work on fruit planting materials in Tanzania especially for citrus fruits is carried out in Sokoine University of Agriculture. Because most citrus production areas in this country are in low altitudes, and officials there – as well as in coastal and other low-lying areas of Kenya -- report no problems with the disease. Research in Tanzania can thus focus on other issues. The Horticultural Department has a supply of good quality mother plants and has a commercial nursery that can supply high quality young trees. Citrus fruits are mostly grown in Tanga and Morongoro regions. Some farmers in these areas have mastered the budding (grafting) technique for the vegetative propagation of citrus. Young trees for replacing old or diseased trees as well as trees required for expanding orchards are either produced by the farmers themselves or purchased from other farmers that have small nurseries. Local orange

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[2] The citrus greening disease is of two types; the African and Asia greening disease. The African greening is prevalent in areas above 800m elevation while the Asian greening is prevalent from sea level up to 800 meters. It is most common in South East Asia. However, the vector can transmit both diseases.

varieties are raised from seedlings. Unlike in Kenya, Tanzania's competitive advantage in citrus lies in maintaining relatively large potential areas that are free from diseases and relatively high yielding varieties that have been developed.

3.2.2 Bananas

The Banana industry in Kenya faced major challenges that led to reduced yields, widespread loss of banana orchards and lack of expansion in the 1970s and 1980s. The main difficulty in the industry was lack of clean planting materials (Kahangi 1996). The conventional method of generating banana planting material through suckers is not able to produce enough for sustained expansion of existing varieties or new improved clones, and also contributes to the spread of disease such as Sigatoka and Panama wilts and pests such as banana weevils, nematodes, and streak virus. As a result, yields in Kenya between 1992 and 2001 ranged between 10 and 15 tones per hectare as opposed to a potential yield of over 40 tonnes/ha (Kahangi 1996). Many farmers in Kenya have had to uproot their plantations due to disease epidemics.

These problems caused a major decline in the banana industry in Kenya and in the late 1980s there was a public outcry to do something to save the industry. The decline in production resulted in high banana prices in the local markets as well as attracting imports from Uganda and Tanzania. It was against this background in 1987 that Jomo Kenyatta University of Agriculture and Technology (JKUAT) through Institute for Biotechnology Research (IBR) started research in tissue culture of bananas. The Institute submitted a proposal to establish a pilot commercial tissue culture laboratory to UNESCO and the World Bank. The overall aim was to enable multiplication of adequate disease free seedlings for the small-scale farming sector. A banana tissue culture laboratory was set up and IBR started by producing 10,000 biotechnology suckers per year which it sold to farmers at Kshs. 60 per sucker. UNESCO funding helped expand this capacity to 500,000 plantlets per year. Following this technology breakthrough in bananas and adoption of clean planting materials by farmers, there was an observed upward swing in the quantities produced from 1995 and an increase in the area under bananas from 1996 (see Figure 2.1 and Appendix A, Figure A.1). Note that because there is no vector transmission of the banana diseases, the problem could be solved by progressively introducing clean planting material, which did not face the risk of infection through vector transmission. In citrus, vector transmission of the citrus greening pathogen makes the challenge much greater. See section 2.4 for more on this issue.

4. Fertilizer and Agrochemical Inputs

In 1993, the Kenya Government withdrew from fertilizer distribution and since then, it has relied on the private sector and cooperatives to meet the fertilizer needs for farmers (Wanzala *et al*, 2001). Approximately 95% of the fertilizer consumed in Kenya is imported and distributed by the private sector. The remaining 5% is donor-sourced by the Ministry of Agriculture-KRII program, which imports fertilizers, and sells to private traders via an open tendering system. After the revival of Kenya Farmers Association (KFA), it also joined the market. In the 2001/2 financial year, National Cereals and Produce Board (NCPB) also entered the market to supply fertilizers to farmers. Hence, Kenya's fertilizer and agrochemical industry is quite competitive.

The use of inputs such as fertilizers and agrochemicals contribute significantly to increased horticultural output. The cost of these inputs makes up a sizable component of the cost of horticultural production. In the case of onions, the cost share of fertilizers and other chemicals was 17%, 34%, 21% and 15% in Mang'ola -Tanzania, Oloitoktok, Narok/Laikipia /Meru and Taveta in Kenya respectively (see Appendix C). In a bid to lower the cost of inputs, the Kenya Government in 2002/03 eliminated duties on all raw materials not produced locally (previous duties were from 3% to 5%). The agricultural sector is now able to obtain all capital goods, fertilizer and chemicals, and other input requirements duty free. However, interviews with seven agricultural input companies indicated that the tax concession benefit was not passed over to farmers. Some companies indicated that the tax exception was too minor to be passed over. Others reasoned that since they are incurring some costs to provide extension services to farmers, this exception boosts their agricultural service provision budget. Hence the need to reduce the cost of these inputs for farmers persists.

Interviews with public institutions, producer organizations and private sector companies supplying chemical inputs other than fertilizers indicated that the prices for chemicals tended to be higher in Tanzania than in Kenya and it is only the private sector which imported and supplied these inputs in both countries (Table 4.1).

However, in both countries, public companies (such as NCPB in Kenya and Tanzania Fertilizer Company in Tanzania) and producer associations (KFA in Kenya and various associations in Tanzania) import and supply fertilizers at slightly lower prices than the private Sector (Table 4.2). At the present time, fertilizers appear to be more available through this channel in Tanzania than in Kenya, and the price difference between this channel and private traders is also larger in Tanzania.

Table 4.1. Average Sales Price (Kshs) of Common Chemicals Among Private Sector Companies in Kenya and Tanzania.

Chemicals	Units	Kenya	Tanzania
Ambush	Liter	1296	1280
Sancozeb	Kilogram	159	485
Foliar Feed	Liter	145	152
Dimethoate	Liter	378	620

Sources: Authors' Interviews with Chemical Suppliers in Nairobi and Arusha.

There is some evidence that the entrance of NCPB and KFA into the fertilizer input markets in Kenya has been associated with price reductions by private companies (Table 2.7). KFA and NCPB appear to be selling at about 10-15% less than previous private company prices in many areas of the country, and indications are that these private prices have come down in the past year. Although KFA and NCPB started with the commonly used fertilizers i.e. DAP and CAN, there is a plan to expand and supply all other fertilizers used in the country. The main objective of KFA and NCPB is to provide "one-stop" agricultural input shops for farmers and to supply quality inputs at competitive prices.

Table 4.2. Average Sales Price (Kshs) of Fertilizer (50 kg Bag) for Public Companies/ Producer Organizations and Private Sector Companies in Nairobi (Kenya) and Arusha (Tanzania) in 2003.

	Kenya		**Tanzania**	
Fertilizer Type	Public Companies and Producer Organizations	Private Sector	Public Companies and Producer Organizations	Private Sector
DAP	1131	1150	880	1116
CAN	1050	990	920	948
TSP	-	1190	880	1024
NPK	1120	1180	1302	1308
UREA	-	1050	840	1004

Sources: Authors' Interviews with Fertilizer Suppliers in Nairobi and Arusha.

To achieve the objective of lowering fertilizer costs for farmers, these institutions have undertaken following business plans:

i) To negotiate for large volumes of fertilizer consignments so as to realize purchase economies and ultimately lower prices;
ii) Negotiate with shipping and transport companies so as to realize shipping and transportation economies;
iii) Form a closer working relationship with companies (both local and international) who supply these institutions with fertilizer and
iv) Start dealing with fertilizer future markets.

This initiative needs to be watched very closely and also better understood. Current market share and level and type of government support need especially to be established. In recent years Kenya has registered one of the few fertilizer market liberalization success stories in SSA, with availability to farmers increasing after liberalization. In many countries, elimination of large subsidies but only partial liberalization of the sector has resulted in decreased fertilizer use. It is imperative that NCPB and KFA activities in the fertilizer market not undermine private sector profitability through unsustainable subsidies in its sales of fertilizer.

Table 4.3 Average Price (Kshs/50 kg Bag) of DAP for Public Companies/Producer Organizations in Various Towns in Kenya, compared with Previous Private Sector Prices

Town Depot	Public Institution/Farmer Association Prices	Previous Private Sector Prices	% Reduction
Nakuru	1,090.00	1,200.00	9.2
Nyahururu	1,118.00	1,200.00	6.8
Kipkelion	1,118.00	1,250.00	10.6
Fort Ternan	1,118.00	1,300.00	14.0
Narok	1,110.00	1,250.00	11.2
Ziwa	1,110.00	1,300.00	14.6
Moi' s bridge	1,120.00	1,250.00	10.4
Kitale	1,120.00	1,250.00	10.4
Kipkarren- Salient	1,110.00	1,300.00	14.6
Lugari	1,120.00	1,250.00	10.4
Meru	1,120.00	1,250.00	10.4
Maua	1,120.00	1,350.00	17.0
Kibwezi	1,090.00	1,350.00	19.3

Source: Interviews with Public Institutions & Farmer's Association.

5. Conclusions and Recommendations

This report has shown that, despite very high growth rates in export horticulture in Kenya, the domestic market continues to absorb at least 4-5 times more produce, by value, than does the export market. We have also shown that value added after the farm gate is at least three times greater in the domestic than in the export supply chain. At the same time, the domestic horticultural system is relatively uncompetitive in regional markets: while the country imports a substantial share of some horticultural crops, its exports of fresh produce to the region are negligible. We have thus referred to the dualistic nature of the current system, with an export sector of commercial farmers and some organized smallholder farmers closely linked to export companies, competing successfully in the highly competitive and quality conscious European market, while the domestic sector is dominated by smallholder farmers receiving little if any assistance and struggling in some instances to compete with imports.

The domestic horticultural system is also subject to strong forces of change at the present time. Continued high rates of urbanization are expected to drive increases in demand; if per capita incomes begin once again to rise, total demand growth in the domestic market could exceed 5% per year. Satisfying such increases in demand year after year would be a major challenge for any commodity supply chain.

Expanding domestic and regional markets for Kenyan horticultural produce, integrating the bulk of the country's smallholder farmers into profitable supply chains that satisfy these markets, and ensuring consumers of a growing supply of horticultural produce with falling real prices and improving quality will require investment in three key areas: technical production constraints, "hard" and "soft" public market infrastructure, and the legal and regulatory environment. In this Volume we focus on the legal and regulatory environment. Volume I deals with technical production constraints, while Volume II deals with hard and soft public market infrastructure.

Addressing the horticultural sector's critical constraints will require government to adopt an overarching vision of partnering with private sector and donors to expand demand and value added within the horticultural sector and facilitate greater smallholder farmer participation in this growth. Government must see its role as a *facilitator* and not a controller of economic activity.

5.1 Seed Legislation

The seed sector is a clear example of the need for updating government's view of its proper role in development. Kenya's seed input sector is still strictly regulated when compared to its liberalized output markets. In Tanzania, liberalization of output markets was followed by revisions to the Seed Act to harmonize it with the new policy approach. The Tanzanian law allows and encourages seed to be produced at village level under what is termed Quality Declared Seed (QDS). This approach appears to have resulted in lower prices to farmers for some horticultural seeds, greater availability, and in at least one case (Mang'ola Red onion variety), development of a variety that has substantially improved Tanzanian competitiveness in regional markets.

Kenya's present seed legislation, the "Seed and Plant Varieties Act of 1991", is undergoing review to harmonize it with a liberalized environment and also with regional and international treaties. However, the current draft bill may increase controls and rigidities in

the regulatory environment by proposing to pass over the functions of the Seed Regulation Committee to KEPHIS Board of Management (see Section 2.1 for more detail on KEPHIS and the SRC). By so doing, the Act risks excluding private sector and farmer stakeholders from industry decision making, precisely the opposite of what the sector needs to do. There is need therefore for revisions based on more feedback from stakeholders before the bill is finalized. The objective should be to broaden the decision making process in the industry by allowing greater participation and representation of the private sector and farmers. The bill should also allow and encourage broader participation in seed production. KEPHIS and the industry players can learn from the experiences of the Tanzanian Official Seed Certification Agency (TOSCA) in coordinating and regulating the production of Quality Declared Seed (QDS) at the village level.

5.2 The Horticulture Bill

In the view of many stakeholders, the 2001 Horticulture Bill is not well conceived to help the industry face its main challenges. One option which should be explored is shifting Thika Horticultural Research Centre from its present location in KARI to a position within the industry. This approach would be consistent with that in other sub-sectors of agriculture e.g. Tea Research Foundation of Kenya (TRFK), Coffee Research Foundation of Kenya (CRFK) and more recently Kenya Sugar Research Foundation (KSRF). The objective of moving the Centre out of KARI would be to give it greater flexibility and incentives to conduct responsive research in both domestic and export horticulture. Workable mechanisms to finance its activities, possibly including In levies on local markets, processors, exporters and importers, need to be established.

5.3 Quality and Food Safety

Future growth in the size and value of Kenya's domestic horticultural sector requires ever greater attention to improving quality and food safety at reasonable cost. Traditional wholesale and retail markets currently pay almost no attention to quality and safety issues, and thus limit their ability – and that of smallholders – to contribute to and participate in future growth. Government can play a key role in this area if it works collaboratively with private sector traders and farmers to establish commonly accepted and workable "rules of the game". Quality grades and standards and food safety regulations need simultaneously to recognize a) the constraints that the traditional system faces in adhering to rigorous standards and b) the increasing need for it to do so if it is not to be marginalized. Grades and standards and food safety regulations thus need to be flexible enough to acknowledge the diversity in the sector while encouraging all actors progressively to adhere to improved standards.

5.4 Farmer Organizations

Smallholder farmers have both advantages and disadvantages in competing with larger growers for agricultural markets. Smallholders' primary advantage is that, by using primarily family labor, they face negligible labor monitoring costs. Larger commercial farms which depend primarily on hired labor often have to incur substantial monitoring costs to prevent shirking. Also, because smallholder farmers tend to have fewer economic alternatives than large farmers, they will accept lower returns to their labor than will those larger producers. Both these factors tend to reduce smallholder production costs. Yet these advantages come at the cost of a small scale of operation, which increases marketing costs either for the farmer or for the trader purchasing at the farm gate. Smallholder farmers also tend to be spatially dispersed, which further increases marketing costs. Finally, the sheer number of smallholder

farmers that a large enterprise such as a supermarket would have to deal with to satisfy its needs creates major logistical and informational challenges for the buyer, especially if they are focused on quality and food safety. To reduce these costs and allow smallholder farmers to better exploit their labor advantages, government must work collaboratively with donors, civil society, and private firms to enhance smallholder farmer ability to act cooperatively in response to commercial opportunities. Partnering with supermarkets to create more groups able to meet these firms' increasingly stringent quality and food safety requirements could be especially valuable. Government need not and probably should not be directly involved in creating farmer organizations. It does, however, need to ensure that its legal and regulatory framework facilitates commercially oriented cooperation among smallholders; this cooperation can range from formally constituted groups to more strategic collaboration that may fall short of the creation of self-governing farmer organizations.[3] Government could also support NGOs that have a comparative advantage in creating viable farmer groups.

5.5. Intellectual Property Rights (IPRs) in Seeds

Kenya signed the 1978 International Convention for the Protection of New Varieties of Plants (UPOV), but has not signed the 1991 convention. The stated purpose of UPOV is "to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society" (UPOV 2003). UPOV pursues this goal by working through the WTO and WIPO (World Intellection Property Organization) to promote IPRs focused on plant breeders. This approach has been criticized by some for not recognizing farmer and community rights to plant varieties that they have developed through traditional means over many years.[4] Kenya needs to move ahead carefully in this arena to encourage farmer access to improved seed varieties while protecting farmer rights to save and replant seeds as they have for many generations.

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[3] The literature on farmer organizations is vast and cannot be summarized here. However, one key criticism of devoting large amounts of public and donor resources to forming autonomous, self-governing farmer organizations is that many of the governance costs associated with such organizations do not contribute directly to exploiting commercial opportunities, and farmers thus have few incentives to bear them. On the other hand, farmers do have incentives to cooperate selectively and strategically to take advantage of commercial opportunities. The implications of this view need to be carefully considered in the design of legislation affecting smallholder organizations.

[4] See, for example, Grain 2003, Business Line 2002, and Krishnan 2002.

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