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Are Horticultural Exports a Replicable Success Story? Evidence from Kenya and Côte d'Ivoire

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ABSTRACT

Kenyan horticultural exports are often cited as a success story in African agriculture. Fruit and vegetable exports from Côte d'Ivoire have received less attention, but the export value is similar to that of Kenya. This paper focuses on three questions. First, do the horticultural sectors of Kenya and Côte d'Ivoire constitute valid success stories? Second, what factors have contributed to the success (or lack thereof)? And third, to what degree can the success be replicated in other African countries?

The paper finds that Kenyan horticultural exports are indeed a success story: horticulture has become the third largest earner of foreign exchange, more than half the exports are produced by smallholders, and smallholders gain from producing for the export market. At the same time, the total number of smallholders producing for export is relatively small, and trends in European retailing may shift the advantage to larger producers. Côte d'Ivoire is not as clearly a success story because the most of the exports are produced on large industrial estates and because growth has been uneven. Ivorian exports rely on preferential access to European markets relative to Latin American exporters, raising doubts about sustainability.

Factors in the growth and success of horticultural exports include a realistic exchange rate, stable policies, a good investment climate, competitive international transport connections, institutional, and social links with markets in Europe, and continual experimentation with the market institutions to link farmers and exporters. Smallholder participation is encouraged by farmer training and extension schemes, investment in small-scale irrigation, and assistance in establishing links with exporters.

Many of the lessons of Kenyan horticulture can be applied elsewhere in Africa. Indeed, Kenya faces increasing competition from neighboring countries trying to replicate its success. At the same time, market institutions take time to develop, and demand constraints probably prevent other African countries from achieving the same level of success as Kenya.

Keywords: horticulture, exports, Kenya, Côte d'Ivoire

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ARE HORTICULTURAL EXPORTS A REPLICABLE SUCCESS STORY? EVIDENCE FROM KENYA AND CÔTE D'IVOIRE

Nicholas Minot[1] and Margaret Ngigi[2]

1. INTRODUCTION

In a recent survey in which experts were asked to identify successes in African agriculture, horticultural exports were the third most common commodity-specific citation. About half of the respondents who listed horticulture mentioned Kenya by name (Gabre-Madhin and Haggblade 2001). It is not difficult to see why Kenyan horticulture is considered a success story. First, the sector has grown significantly over the past several decades (Figure 1). The fruit and vegetable exports from Kenya have increased four-fold in constant dollar terms since 1974, reaching US$ 167 million in 2000. In fact, horticulture has become the third largest source of foreign exchange after tourism and tea[3]. Second, small farmers have participated significantly in the growth of the sector. It is estimated that about half of Kenyan horticultural exports are produced by smallholders. Although less well-documented, fruit and vegetable exports in Côte d'Ivoire have also expanded rapidly, rising 4.4 percent annually over the 1990s to match the value of Kenyan fruit and vegetable exports. Smallholders have also played an important role in exports from Côte d'Ivoire. After South Africa, Kenya and Côte d'Ivoire are the largest fruit and vegetable exporters in sub-Saharan African.

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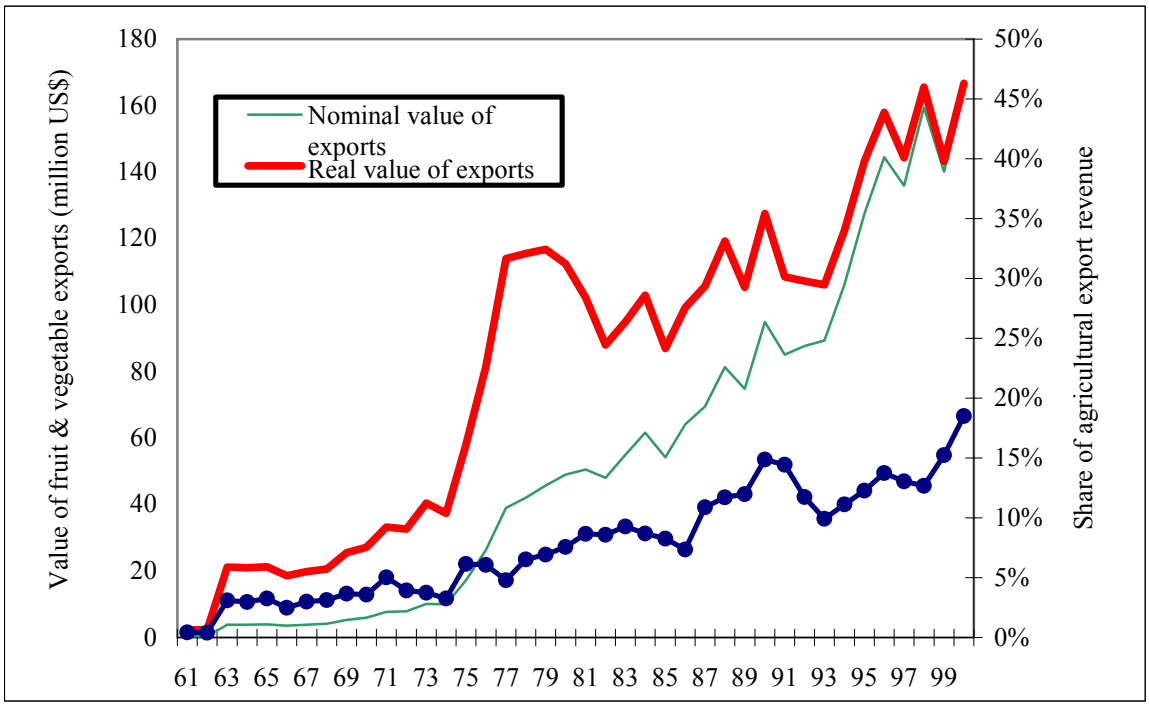
[3] Coffee and tea have been the main export commodities of Kenya for decades. However, as a result of recent declines in world coffee prices, the export revenue from horticulture passed that of coffee in 2000 (FAOStat 2002).

Figure 1--Value of Kenyan fruit and vegetable exports and share of agricultural export revenue



Source: FAOStat for agricultural statistics and U.S. Department of Commerce for U.S. consumer price index.

This paper uses the cases of Kenya and Côte d'Ivoire to examine the question of whether horticultural exports represent a replicable success story. This question can be divided into three parts:

- Do the horticultural sectors of Kenya and Côte d'Ivoire constitute valid success stories in terms of its sustainability and their impact on rural incomes and poverty?
- What factors have contributed to the success (or lack thereof) in the horticultural sector?
- To what degree can the positive aspects of horticultural sector be replicated in other African countries?

In spite of the rapid growth of the horticultural sector in Kenya, the answer to the first question is not obvious. First, some observers see a trend toward consolidation, in which small farmers are gradually being squeezed out of the lucrative export market for horticulture. The argument is that increasing concentration in European retail markets and

rising concern over the environmental and labor conditions at the farm-level are pushing exporters to work with larger farmers, who can more easily document their production practices (Dolan et al. 1999). Second, it is not clear whether trade liberalization under the World Trade Organization will benefit African horticultural exporters, by further opening European markets, or hurt them by eroding some of the preferential access to the European market that they currently enjoy (Stevens and Kennan 1999). And third, the fact that small farmers produce most of the exported fruits and vegetables certainly suggests a poverty-reducing impact, but it is difficult to make any definitive statement without better information on the number of beneficiaries, the characteristics of the growers, and the size of the gains.

Even if we assume, for the moment, that the horticultural sectors in Kenya and Côte d'Ivoire are success stories in terms of growth, poverty impact, and sustainability, an important question is whether there are lessons that can be applied to other African countries interested in helping small farmers participate in profitable export markets for horticultural goods. In other words, are the factors behind their success related to public policy and investment that other countries can emulate? Or is the success based on historical, climatic, and geographic factors that cannot be replicated elsewhere? To answer these questions, it is necessary to understand the historical development of horticulture. We are particularly interested in the role of policy, the regulatory environment, and public investment in facilitating the growth of the sector over time.

This paper discusses the case of Kenya in some detail because it is the most widely recognized success story in horticulture, because the growth of its horticultural sector in Kenya is well documented, and because we have access to recent household data that shed

light on the characteristics of horticultural growers in Kenya. The case of Côte d'Ivoire is discussed more briefly, mainly to provide a basis of comparison with the Kenyan case. Some of the similarities between the two countries serve to reinforce the assessment of factors behind success, while the contrasts demonstrate the diversity of experience across countries.

Horticulture is generally defined to include fruits, vegetables, flowers, and ornamental plants. In this report, we focus on the fruit and vegetable sector. Although cut-flower exports account for about half of Kenyan horticultural exports (see Table 1) and are growing rapidly in Côte d'Ivoire, the cut-flower sector is dominated by large-scale capital-intensive operations[4].

Table 1--Export values for fresh fruits, vegetable, and cut-flowers 1992-1999 (Million Kshs)

Year	Fruits	Vegetable	Cut-flowers	Total
1992	358	909	1,247	2,512
1993	489	1,700	2,482	4,672
1994	536	1,797	2,637	4,971
1995	617	2,204	3,642	6,464
1996	769	2,577	4,366	7,701
1997	805	3,116	4,887	8,809
1998	819	4,052	4,856	9,728
1999	1,256	5,713	7,235	14,204
2000	1,098	5,293	7,165	13,557

Source: HCDA.

Thus, the fruit and vegetable sector is a more promising topic to understand the challenges of involving (and keeping) smallholders in an expanding export sector. Definitions of "fruits and vegetables" also vary. The statistical database of the Food and Agriculture Organization (FAO) uses a broad definition that includes nuts (including cashew nuts), legumes, starchy root crops, and sugar crops such as sugarcane. Other studies focus narrowly on fresh fruits and vegetables. In this study, we exclude nuts, legumes, starchy root crops, and sugar crops,

[4] Kimenye (1995) reports that just 10 percent of Kenyan flower production for export is carried out by smallholders.

but include both fresh and processed fruits and vegetables. Nonetheless, because we use data from various sources, some discrepancies in definitions are unavoidable.

The paper is divided into seven sections. Section 2 examines the historical background of horticultural development in Kenya, attempting to identify the driving forces behind the growth of this sector. In Section 3, we examine the economics of horticultural production and marketing in order to assess the impact of horticultural on the livelihoods of growers. Section 4 examines the characteristics of fruit and vegetable growers, using survey data and case study interviews. Section 5 summarizes the channels used in marketing fruits and vegetables in Kenya. Section 6 examines the fruit and vegetable export sector in Côte d'Ivoire in order to provide a point of comparison with the Kenyan case study. And Section 7 summarizes the results and draws some lessons for policy.

2. HISTORICAL BACKGROUND OF KENYAN HORTICULTURE

The growth of the Kenyan fruit and vegetable sector has not been a smooth, continuous process. Rather, the sector has expanded in fits and starts, with numerous changes in the commodity mix, the role of the state, the types of marketing institutions, and the characteristics of the participating farmers. Any division of this complex process is somewhat arbitrary, but for the purposes of presentation it is useful to divide the evolution of the sector into five periods: the pre-war colonial period, the post-war colonial period, the early independence period, from 1974 to 1990, and since 1990.

PRE-WAR COLONIAL PERIOD

Kenya was made a protectorate of Great Britain in 1895 and a British colony in 1920. Kenya's commercial horticultural production started taking root during this period.

According to Hill (1956), the Imperial British East African Company was experimenting with temperate fruits and vegetables as early as 1893. In 1901, colonial white settler farmers founded the East African Agricultural and Horticultural Society (presently the Agricultural Society of Kenya). At the same time, Indians recruited to construct the Kenya-Uganda railway had introduced Asian vegetables[5], which today accounts for about 10% of the total volume of the country's fresh horticultural exports.

The beginnings of Kenya's formal horticultural research activity also traces to the period. According to M'Ribu et. al (1993), the colonial government was, by 1911 experimenting with tropical fruits at Matuga along the Indian coast (this later became the Matuga Agricultural Research Station). Later in 1920, a second experimental site for tropical fruits was established close to where the National Agricultural Laboratories is currently located. In 1931, the Department of Agriculture embarked on a plant introduction service to facilitate the adoption of and expansion of area planted with crops developed in the experimental stations.

According to Martin (1973, cited in Jaffee 1995), trade in small quantities of vegetables and tropical fruits already existed along the coast with Arab and Indian traders exporting the produce to Zanzibar. In the 1930s, low commodity prices motivated some European farmers to grow passion fruit. Four small factories were constructed to produce passion fruit juice for export to South Africa and Australia. A Passion Fruit Board was created by the colonial authorities to provide technical assistance and regulate trade. However, the quantities were modest, and both production and processing collapsed with the disruption of trade during World War II (Jaffee 1994).

[5] "Asian vegetables" include eggplant, chillis, *dudhi, karela,* okra*,* and other vegetables used widely in South Asian cooking

Thus, the roots of the commercial horticultural sector were established during this period. Lack of official attention to marketing of horticultural produce resulted in a situation in which any impetus for expanding the production or commercialization of horticulture came from the private sector. However, given the limited domestic market and the high costs of transportation to external markets, it is debatable whether more supportive policies and public investment would have stimulated more rapid development of the sector.

POST-1940 COLONIAL PERIOD

World War II stimulated the development of horticultural production and processing in two ways. First, regular trade flows were disrupted by hostilities, reducing the availability of imported horticultural goods. Wartime regulations meant tight controls on imports, particularly on commodities not considered essential to the economy. As a result, domestic producers and processors benefited from a larger domestic market, even if consumers were paying higher prices for the goods.

Second, faced with high wartime-demands, especially for provisions to the Allied forces in North Africa and Middle East, the authorities launched a project to produce dehydrated vegetables. As part of this project, dehydration factories were constructed in Kerogoya and Karatina. Some of the raw materials were supplied by large "nuclear estates" managed by the processors. Much of the raw material supplies, however, was sourced from small-scale African farmers in the surrounding areas. To boost production, irrigation schemes were developed in swampy areas for collective farming by African. These farmers were organized to supply potatoes, cabbage, carrots, and other vegetables to the factories. They were given improved seed, technical assistance, and a guaranteed market for their output. In spite of initial problems, the project eventually expanded to process 22,000 tons of produce

sourced from 13,500 small-scale farmers. After the war, the demand for dehydrated vegetables by the military dried up. Although there was some consideration of the option of maintaining the two factories, there was opposition from settlers who had established their own canneries during the war. By 1947, both plants were dismantled.

As Jaffee (1995) notes, the scheme was relatively short-lived, but was a pioneering effort in several ways. It demonstrated that African farmers could be mobilized for commercial agricultural production of new crops if inputs, technical assistance, and a stable market could be provided. This model was later adopted in various cash-crop programs such as the one implemented by the Kenya Tea Development Authority. In addition, it represented one of the earliest large-scale irrigation schemes, again serving as an example to be followed later, most notably in the Mwea Irrigation Scheme.

This period also saw the expansion of experimental works started in the previous period. By 1946, experimentation with tropical zone fruits had expanded to Tigoni (now the location of the Potato Research Centre), Molo and Kitale agricultural research stations and in 1955, the Perkerra Irrigation Research Station started work on hot season fruits and vegetables. The National Horticultural Research Center was started in 1957 at Thika.

In the late 1940s, two British companies built pineapple-canning factories in Kenya to supply the United Kingdom. When they started operations, both factories sourced their raw material from large-scale settler farms. In 1954, the Swynnerton Plan called for government assistance to increase the participation of smallholders in the production of cash crops such as coffee and tea. Part of this plan was to increase the role of smallholders in supplying raw materials to the pineapple processing plants. Smallholders were subsequently provided with planting materials, technical assistance, and a guaranteed market. Early efforts suffered a

number of serious problems including under-staffing, production in inappropriate zones, and violence associated with the independence movement. In spite of these problems, smallholders accounted for 75 percent of the supply of pineapples to these factories by the early 1960s (Winter-Nelson 1995; Kimenye 1995; Jaffee 1994).

Thus, during the post-war colonial period, horticultural development was still very limited. At independence, in 1963, fruit and vegetable exports were just US$ 3.8 million (or US$ 19 million in 1995 dollars), representing less than 3 percent of agricultural exports (see (Figure 1). Nonetheless, the wartime dehydrated vegetable scheme demonstrated the feasibility of engaging smallholders in commercial horticultural production, given the right institutional support. And the Swynnerton Plan provided further support for the concept of smallholder production of commercial crops, even if the implementation was plagued with difficulties.

EARLY INDEPENDENCE

Independence brought three significant changes to the horticultural sector in Kenya. First, the new government came into power giving higher priority to improving conditions for the African majority. A land reform program was launched in which the government purchased most of the land farmed by Europeans (particularly in the western highlands) and distributed it to tens of thousands of African smallholders. Because of the relatively good soils and location of this region, this program expanded the opportunities for smallholder to become involved in horticulture and other forms of commercial agriculture. Furthermore, social considerations weighed heavily in public investment and regulatory decisions. A series of state enterprises were created (some from analogous colonial organizations) to implement the development goals of the government.

The second change was the creation of the Horticultural Crops Development Authority (HCDA) in 1967. Although the marketing boards for other crops generally played a direct role in buying and selling agricultural commodities, often with a legal monopoly on marketing, the HCDA played a more facilitative role, attempting to coordinate various participants in the industry[6]. This was partly a matter of practical necessity, since HCDA had limited staff and resources. Even with a larger budget and staff, however, state enterprises rarely have the agility and skills necessary to deal with the diversity of the sector and the perishability of the product. Several researchers have noted that the fact that the HCDA did not attempt to directly manage and control horticultural trade probably allowed the sector to develop more rapidly (Kimenye 1995; Djikstra 1997; and Harris et. al 2000).

The third change in the post-independence period is the growth of international investment in the Kenyan horticultural sector. The most important example of this was the entry of Del Monte into the Kenyan pineapple sector. In 1965, one of the two pineapple factories, Kenya Packers, came under the control of Del Monte (then called the California Packing Corporation), the largest fruit processor in the world. Although Del Monte invested in the factory and applied its technical and marketing expertise, the sector grew slowly and remained only marginally viable. According to Del Monte:

In spite of a Government-sponsored drive to encourage quality pineapple production by smallholders, it soon became clear that these smallholders could not provide the necessary quantities on a regular basis to keep the canning plant consistently and profitably in operation. Many outgrowers chose instead to sell their crop to the local fresh fruit market

[6] Initially, the HCDA was given a legal monopoly on onion exports, but this proved unsuccessful and was abandonned in 1986.

where they could fetch better prices, while much of the locally grown fruit was not of a quality suited to the demands of Del Monte's stringent standards (Del Monte, 1988).

In 1968, Del Monte arranged to lease 9000 hectares of land from the government to develop a nucleus estate to produce pineapple for the factory. This would insulate Del Monte from changes in pineapple supply due to farmers selling on the fresh market or switching to coffee when world prices were high. Furthermore, mechanization and hormone applications allow the estate to spread production over much of the year, keeping the plant in operation longer. The capacity of the processing plant and the nucleus estate were expanded over time and, by 1974, purchases from smallholder outgrowers was discontinued.

In addition to Del Monte, other international companies came to invest in Kenya. A joint venture was formed between Cottees, an Australian firm, and a government parastatal. Kenya Fruit Processing (KFP) developed processing facilities and tried to stimulate local production. The Horticultural Crop Development Authority (HCDA) assisted by providing seedlings, sprayers, chemicals, and other inputs on credit. By the early 1970s, KFP was one of the largest exporters of passion fruit juice in the world (Jaffee 1995).

Not all of the foreign investment projects were successful. A joint venture between a British company and a Kenyan parastatal established a vegetable dehydration plant in Kinangop, a cool, highland area with a new smallholder settlement scheme but relatively low agricultural potential. The government's interest in the scheme was to provide a marketing outlet for resettlement farmers in Kinangop, while the foreign partners were attempting to develop a viable commercial operation. Conflicts between these two objectives occurred often and by 1968, the company was close to bankruptcy. The government purchased the plant and paid off debts to protect the interests of smallholders in the area, but the factory

continued to incur losses. In 1973, a new joint venture with a German firm was implemented with a more commercial orientation. The scheme did well in the mid-1970s, but eventually closed in 1982. The international market for dehydrated vegetables had contracted, while the local market for fresh vegetables had expanded and resulted in significant "leakage" that the company could not control.

Thus, the early independence period was characterized by more active support for the incorporation of smallholders in commercial agriculture, the formation of the Horticultural Crops Development Authority, and increasing investment in horticulture, including international investment. The processing sector was dominated by joint ventures between foreign companies and state enterprises, often working toward different objectives. Between 1963 and 1974, fruit and vegetable exports grew from US$ 3.8 million to US$ 10 million, representing a growth rate of 4.4 percent per year in real terms. The contribution of fruits and vegetables to total agricultural exports remained at slightly less than 3 percent because other agricultural exports grew at a similar rate (see Figure 1).

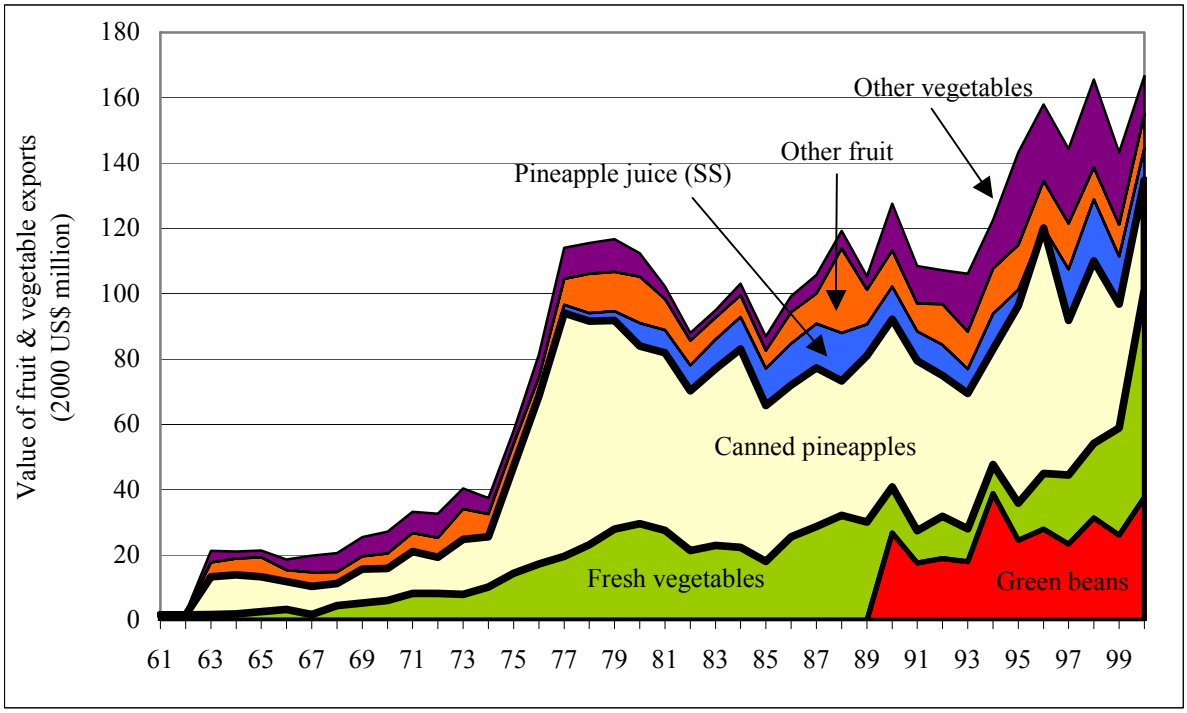
TAKE-OFF (1974-1990)

Starting around 1974, Kenyan fruit and vegetable production and exports began to grow more rapidly. Overall, fruit and vegetable exports rose to US$ 95 million in 1990 or 8.0 percent per year in real terms over the period 1974-90. The importance of fruit and vegetable exports in overall agricultural exports increased dramatically during this period. Whereas fruits and vegetables accounted for about 3 percent of agricultural export earnings in the 1960s and early 1970s, by 1990 its contribution had reached 14 percent (see Figure 1).

In the mid-1970s, this growth was driven by investments that increased the capacity of the Kenyan pineapple processing industry, led by Del Monte. Between 1974 and 1977,

pineapple product exports grew more than six-fold, so that, by 1977, they accounted for 65 percent of Kenyan fruit and vegetable exports. In contrast, the growth in the late 1970s and 1980s was driven by the growth in exports of fresh vegetables and, to a lesser degree, fresh fruit (see Figure 2). The diversification into fruits and vegetables was partly motivated by world commodity prices. After peaking in 1977, coffee and tea prices fells sharply in the following years, forcing many farmers to look for alternative income-generating crops.

Figure 2--Trends in the composition of Kenyan fruit and vegetable exports



Source: FAOStat for agricultural statistics and U.S. Department of Commerce for U.S. consumer price index.

At the same time, export demand for vegetables grew in the 1970s as an indirect effect of the expulsion of the South Asian community from Uganda under the regime of Idi Amin. Many of these refugees resettled in the United Kingdom, contributing to the growing Asian community there and a demand for Asian vegetables. Kenya offered several advantages as a source to meet the growing demand for Asian vegetables. It could supply

Asian vegetables throughout the year instead of on a seasonal basis. In addition, Kenyan smallholders already had experience growing Asian vegetables for the local Asian community. In fact, there were small exports of Asian vegetables to the UK as early as 1952 (Kimenye 1995). And finally, the presence of an Asian community in Kenya meant that there were family and social ties between Asian traders in London and those in Nairobi, reducing the risk and transaction costs in expanding this trade (Djikstra 1997).

Another factor in the growth of fresh fruit and vegetable production is the growth in the Kenyan tourism industry. By 1980, Kenya was receiving 372 thousand international tourists per year, more than any other African country after South Africa (World Bank 2002). Although canned goods can be transported by ship from Africa to Europe, fresh produce generally must generally be air-freighted[7]. When export volumes were too small to justify a charter cargo jet, the cargo capacity of passenger jets provided a means of air-freighting Kenyan produce to Europe (later, as volume increased, cargo jets were used more widely). In addition, the tourism industry increased the demand for high-quality fruits and vegetables by hotels and restaurants, giving Kenyan farmers more experience in horticultural production and an outlet for produce not meeting export standards. Thus, the horticultural sector in Kenya has benefited from the development of Nairobi as a regional hub and as an important tourism destination.

The growth in Kenyan horticultural exports is also linked to the increasing involvement of smallholders in the sector. In the early 1970s, no more than several hundred smallholders were producing for the fresh fruit and vegetable export market, accounting for just 10-20 percent of the total volume. As mentioned above, low international prices for

[7] A major exception is bananas and pineapple. As discussed in Section 6, Côte d'Ivoire exports bananas and fresh pineapple to Europe on specially-designed refrigerated ships. In fact, bananas are transported from Latin America to Europe by ship.

coffee and tea made it economical to involve smallholders in export horticulture. Coffee prices boomed again in the 1980s, but by then many smallholders had acquired skills in horticultural production. At least as important, exporters began to recognize the potential of smallholder to meet the growing European demand. By the mid-1980s, Jaffee (1995) estimates that there were 13-16 thousand smallholders involved in growing fresh produce for export. They accounted for 40-65 percent of the supplies of French beans, Asian vegetables, mango, avocado, and passion fruit for export.

The learning process required to organize smallholder production for export is illustrated by the history of Yatta. Yatta has an irrigation scheme built in the 1950s and a resettlement community dating from the 1960s. Vegetable marketing was limited, however, until the road connecting it to Nairobi was paved in 1980. Yatta farmers formed a self-help group to find a reliable market for their vegetables. The group linked up with Kenya Horticultural Exports, one of the largest fresh vegetable exporters. Initially KHE contracted the group to provide vegetables, supplying seed and inputs on credit. The system worked until other buyers began entering the region and "poaching" the output committed to KHE, allowing farmers to avoid repayment of loans. Drought and non-repayment caused the collapse of the input supply system, but KHE continues to buy from the region, competing with many other traders (Jaffee 1995). The export of fresh vegetables other than French beans was US$ 63 million in 2000 (see Table 2). Although, it is difficult to document, much of these exports are thought to be Asian vegetables.

Table 2--Composition of Kenyan exports of fruits and vegetables (2000)

Type of Fruits	Value (1000 US$)	Percent
Fruits	53,569	100.0
Canned pineapples	33,383	62.3
Pineapple juice	9,853	18.4
Fruit tropical fresh	5,153	9.6
Mangoes	2,556	4.8
Prepared fruit	821	1.5
Fresh fruit	595	1.1
Fruit juice	448	0.8
Pineapples	255	0.5
Apples	125	0.2
Citrus	102	0.2
Others	278	0.5
Vegetables	113,100	100.0
Fresh vegetables	63,827	56.4
Green beans	37,584	33.2
Prepared vegetables	10,495	9.3
Frozen vegetables	504	0.4
Green peas	276	0.2
Leeks & other alliac. veg	183	0.2
Cabbages	155	0.1
Others	76	0.0
Total	166,669	

Source: FAO Stat.

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Smallholders also play an important role in growing French beans for export. Fresh and canned French beans have become one of the most important horticultural exports from Kenya. Although Kenya has long exported French beans to Europe, the volume began to increase in the 1970s. Initially, exports were limited to the winter-spring months when European producers cannot supply. However, the advantages of lower labor and land costs, combined with the rising need for suppliers that can provide produce throughout the year resulted in a shift toward sourcing French beans and other vegetables in North Africa and sub-Saharan Africa. This growth was the result of continuous experimentation by farmers and traders with alternative institutional arrangements. Jaffee (1995) describes the tumultuous history of Njoro Canners and Hortiequip as they tried alternative institutional arrangements to provide inputs on credit, obtain reliable high-quality supplies, and ensure

repayment of loans. At its peak, in 1990, this scheme had 24 thousand contracted smallholder farmers growing French beans and other vegetables.

Not all fruit and vegetable production for export is grown by smallholders, however. Del Monte had been expanding its nucleus estate pineapple capacity for some years when, in 1974, it stopped purchasing pineapples from smallholders and began relying entirely on its own production. Technological change in production and increasing international competition were encouraging larger-scale operations and vertically integrated producer-processor operations. According to Jaffee (1994), the trend toward large-scale production of pineapple was occurring in other exporting countries such as the Philippines, Thailand, and Taiwan. Del Monte canned pineapple exports increased by a factor of five between 1974 and 1977, reaching 45 thousand metric tons. Currently, Kenya exports US$ 33 million in canned pineapple, making it the most important horticultural export. In addition, pineapple juice exports are in the range of US$ 10 million, making them the fifth largest horticultural export (see Table 2).

Thus, this period was characterized by impressive growth in the production and export of fruits and vegetables, particularly pineapples, Asian vegetables, and French beans. By 1988, Kenya was the main supplier of fresh and chilled vegetables to the 12 countries then in the European Union (Dolan et al 1999).

NEW CHALLENGES (1990 TO THE PRESENT)

According to the FAO, the growth of Kenyan fruit and vegetable exports slowed in the 1990s. The export value rose from US$ 95 million in 1990 to US$ 167 million in 2000, representing an annual growth rate of 2.7 percent in real terms. Similarly, its share in overall agricultural exports remained in the range of 10-15 percent, though it rose to 18 percent in

2000 (see Figure 1). On the other hand, statistics from the Horticultural Crop Development Authority (HCDA) show strong growth, at least in volume, during the 1990s (see Tables 4 and 1). The discrepancy may be related to different definitions of horticulture. The FAO

Table 4--Export volumes for fresh fruits, vegetables, and cut-flower 1992-2000

Year	Fruits	Vegetable	Cut-flowers	Total
1992	11,232	26,323	19,806	57,363
1993	11,697	26,765	23,635	62,119
1994	13,079	26,878	25,121	65,178
1995	13,865	32,126	29,373	71,758
1996	16,869	32,742	35,212	84,523
1997	17,450	30,880	35,850	84,180
1998	11,350	36,800	30,220	78,370
1999	15,595	46,377	36,992	98,964
2000	14,669	43,400	36,480	94,550
Annual growth rate	3.4%	6.4%	9.0%	6.4%

Source: HCDA.

data refer to fresh and processed fruit and vegetables exports, while the HCDA figures include cut flowers, which have grown rapidly, and exclude processed fruits and vegetables, which have declined in the 1990s. The difference may also reflect changes in the composition of horticultural exports or declining prices.

Although revenue growth has slowed, fruit and vegetable exports have become more diversified. The importance of canned pineapple in fruit and vegetable export revenue fell from 40 percent in 1990 to 20 percent in 2000 (see Figure 2). This is partly due to the decline in canned pineapple exports (under pressure from Thailand and other exporters) and partly due to the expansion in fresh fruit and vegetable exports over this period. Although French beans, Asian vegetables, canned pineapple, and avocados dominate exports, Kenya now exports 30 different fruits and 27 vegetables (Thiru 2000). In spite of increased

competition from Côte d'Ivoire, Morocco, Zimbabwe, South Africa, and Cameroon, Kenya continues to be the most important supplier of vegetables to the European Union.

Nonetheless, Kenya and other horticultural exporters face new challenges related to changes in the structure of consumer demand and to the transformation of the food retail market in Europe. Kenya's ability to maintain and strengthen its role in horticultural exports will depend on its ability to adapt constructively to these changes.

Rise of supermarkets In 1989, 33 percent of the fresh fruits and vegetables in the United Kingdom were sold by supermarkets. By 1997, this share had increased to around 70 percent (Evans 1999). Furthermore, even among supermarkets, chains have increased their market share. According to Dolan et al (1999), UK supermarket chains increased their market share in fresh fruits and vegetables from 63 percent in 1994 to 76 percent in 1997. This trend is also occurring in continental Europe. Increasingly, these supermarket chains are bypassing wholesalers to negotiate directly with exporters in Kenya and other countries. This creates a more direct link between consumer demand in the importing countries and producers in the exporting countries. In the interest of protecting their reputation, these supermarket chains are imposing new restrictions and even organizing production in developing countries. The managing director of Homegrown (Kenya) Ltd, one of the largest horticultural exporters, stated that "Rarely [does] Homegrown grow anything unless a supermarket has programmed it." (Evans 1999?).

Increasing concern over food safety. European consumers are increasingly aware of the health consequences of pesticide residues. Even consumers who are not part of the growing "organic food" movement (which is stronger in Europe than in the United States) are increasingly wary of agricultural chemicals. In 1990, the U.K passed the Food Safety Act

which obliged food retailers to demonstrate "due diligence" to ensure that the food they sell is safe. In practice, this means that supermarkets have become much more involved in imposing requirements on how food is produced throughout the commodity supply chain, even to the degree of monitoring and controlling horticultural production in developing countries (Dolan et al 1999). Minimum residue levels (MRLs) of pesticides have become a focal point for this concern. The Fresh Produce Exporters Association (FPEAK) has produced a 31-page Code of Practice for growers (FPEAK 1999). The Code covers employment practices, agro-chemical application procedures, land use guidelines, and so on. The last two pages provide a 14-step documentation procedure for ensuring the traceability of produce being handled by the exporter. This is an important step in establishing a common set of standards regarding safe handling of fresh fruits and vegetables and disseminating the information. However, some aspects of the Code imply significant costs and there are currently no enforcement mechanisms.

Increasing demand for convenience. European consumers, like those in other industrialized countries, are demanding some forms of prepared fresh fruits and vegetables. This preparation can includes washing, peeling, cutting, packaging in small units, pre-mixed vegetables, and so on. Because these activities are labor-intensive, they raise the opportunity for adding value in the exporting country.

Competition from other suppliers. Kenya horticulture currently enjoys duty-free access to European markets as a result of the Lomé Agreement, which was recently renewed for the period 2000-2005. Trade liberalization will, therefore, probably erode this preferential access. An analysis by Stevens and Kennan (1999) indicates that Kenya may

eventually face greater competition from Egypt, South Africa, Chile, Brazil, and Thailand if the EU liberalizes imports.

Even without trade liberalization, horticultural markets are highly competitive subject to rapid shifts in export competitiveness. Jaffee (1995) describes the turbulent history of attempts to expand exports of dehydrated vegetables, passion fruit juice, and pineapple products, including several bankruptcies and government buy-outs. Kenya lost the European fresh pineapple market to Côte d'Ivoire in the 1980s, it was squeezed out of avocado exports to Europe by the higher quality of Israeli and South African products, and it lost the European market for courgettes, sweet peppers, and other temperate vegetables by European and Mediterranean suppliers. Yet it has shown resilience in finding new markets and expanding its exports of French beans, Asian vegetables, and cut flowers. This experience suggests that it would be difficult for the government to "pick winners" in order to target assistance toward crops with high potential. Export comparative advantage evolves continuously in response to changes in markets, technology, and other competitors. A better strategy would be to provide infrastructure and other public goods and facilitate investment in general, allowing private firms to test the competitiveness of each sector.

How have these trends affected the participation of smallholders in Kenya's fruit and vegetable export sector? There is some concern that the expanding role of supermarkets and the increasing importance of food safety certification will result in consolidation of the fruit and vegetable export sector since only the larger exporters can provide the reputation, documentation, and volume that supermarkets are now demanding. Furthermore, these shifts may lead to consolidation in horticultural production for export. It is much easier for a supermarket or an exporter to verify that proper production practices are being followed on a

handful of medium- and large-scale farms than it is to monitor 100 or 200 small-scale growers. The concept of "traceability" has risen in prominence. Only if a given lot of produce can be traced back to its original producer can the producer be held accountable for problems with quality or pesticide residues (see Dolan et al 1999 and Dolan and Humphrey 2000).

Estimates from the early 1990s suggest that over half of the export fruit and vegetable production was supplied by smallholders (see Kimenye 1995 and Jaffee 1995). More recently, the Horticultural Crops Development Authority estimated that 40 percent of exported fruit and 70 percent of exported vegetables are produced by smallholders (Harris et al 2001). Given the greater importance of vegetable exports, this implies that 55-60 percent of fruit and vegetable exports are still produced by smallholders. Dolan and Humphreys (2000) make the case that smallholders are being squeezed out of export production because of the difficulty of ensuring compliance with food safety and quality requirements imposed by supermarkets and other buyers. They argue that these requirements are leading exporters to grow their own produce or purchase from large-scale commercial farms. According to their interviews with four leading exporters, just 18 percent of vegetables for export come from smallholders.

On the other hand, these four large exporters are probably not typical of other exporters. Furthermore, exporters may wish to under-report the share of their production that comes from smallholders to satisfy European buyers who are suspicious of smallholder quality control (Harris et al 2001). Jaffee (2003) interviewed several dozen exporters and estimates that smallholders account for 27 percent of exported fresh vegetables and 85 percent of exported fresh fruit, for an average of 47 percent of fresh fruit and vegetable

exports[8]. He points out that, although the dominance of U.K. supermarkets has increased, about 60 percent of the Kenyan fresh fruit and vegetable exports are sold to U.K. wholesalers and other European countries which have much less strict food safety and quality requirements.

3. FRUIT AND VEGETABLE PRODUCTION

Fruits and vegetables in Kenare grown on a wide range of different types of conditions, from small farms with less than two hectares using family labor to large-scale commercial farms with over 100 hectares and advanced technology. This section describes some of the main patterns found in Kenyan fruit and vegetable production based on findings from previous studies, case studies drawn from our own farmer interviews, and the results of the 2000 Rural Household Survey (RHS). The 2000 RHS was carried out by Egerton College, Tegemeo Institute, and Michigan State University. The sample included 1512 rural households designed to be representative of the agricultural regions of Kenya[9]. The RHS collected information on crop production and marketing, the use of inputs, access to credit, income, and farmer decision-making regarding maize marketing and storage. The income section gathered information on income from livestock operations, non-farm household enterprises, and wages. For our analysis, we focus on the 1482 households (98 percent) who were involved in crop production.

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[8] Neither Dolan and Humphry (2000) nor Jaffee (2003) provide the definitions used to classify farms as small, medium, or large, but Ngigi (2002) defines smallholders as those farming 1-2 acres (0.2-0.4 hectares) in high-rainfall zones and 5-10 acres (2-4 hectares) in semi-arid zones (Ngigi 2002).

[9] The sampling design excluded arid and semi-arid areas used primarily for extensive grazing. It appears that the sample was designed to include large-scale commercial farms since the largest farm in the sample has 82 hectares. Even so, the small number of observations for large-scale farms (there are eight farms with more than 20 hectares) makes it difficult to draw reliable conclusions regarding these farms from the survey data.

PRODUCTION TECHNOLOGY

Land As mentioned above, fruits and vegetables in Kenya are grown on everything from tiny garden plots of 50 m^2 to industrial plantations covering hundreds of hectares. The size of the farms varies across crops depending partly on the economies of scale in production and processing. Pineapples for canning are grown by Del Monte on vertically integrated pineapple plantations covering 4,000 hectares (Del Monte, 1988). The vertical integration allows Del Monte to stagger production using plant hormones, thus providing a steady supply of pineapples for processing. In contrast, mango and avocado exports are produced largely by smallholders. Jaffee (2003) reports that large-scale commercial growers have not been able to compete with smallholders who have lower labor costs and greater motivation to provide careful husbandry.

French beans are grown by both small and large farms. ECI (2001) distinguishes three categories of French bean grower. Large commercial farms have 50-100 hectares and grow various types of vegetables for export using hired labor and modern technology. They are either owned by exporters or have formal contracts with large exporters. Small- and medium-scale contract growers may have as little as 0.25 hectares of French beans, but the exporter provides seed and sometimes chemicals on credit. They hire about 15 laborers per hectare of French beans planted. The third category is independent smallholders who have 1-5 hectares but only plant a fraction of this with French beans. Without a contract, they use less purchased inputs, often recycle seed, and sell at lower prices due to differences in quality and/or variety.

One survey of farmers on a main road near Nairobi found that growers of horticultural export crops had owned an average of 2.7 hectares, compared to 1.2 hectares for other farmers in the vicinity (McCulloch and Ota 2003). Similar results are found in the

Rural Household Survey: French bean growers had an average of 2.9 hectares, of which 0.8 hectares were planted with French beans. Three-quarters of the French bean growers had less than three hectares of land and 86 percent planted less than one hectare of beans, but one farmer planted more than 10 hectares of French beans.

Irrigation An estimated 84 thousand hectares of Kenyan crop land are irrigated, representing about two percent of the total. Six large-scale public irrigation schemes account for 10 thousand hectares, most of which are devoted to rice and cotton production. These schemes are operated by the National Irrigation Board which supplies inputs, dictates cropping decisions, and controls the marketing of the output of the tenant farmers. The irrigated area under these large-scale schemes has remained stagnant over the last 30 years, and all have suffered problems of dependence on government subsidies, declining government services, and farmer complaints. Indeed, two of the six schemes are essentially non-operational, while the largest one, the Mwea Irrigation Scheme, faced a tenant rebellion in 1998 in which farmers refused to deliver their rice to the NIB[10]. The near collapse of the rice input delivery system has prompted many farmers in the Scheme to turn to horticulture (Ngigi 2002; Kabutha and Mutero 2002; Onjala 2001).

Another 40 thousand hectares are irrigated by large-scale private farms growing high-value crops such as flowers and horticulture for export. These farms use boreholds and water pumps, often distributing the water by drip irrigation.

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[10] The Mwea Irrigation Scheme (MIS) is the largest public irrigation scheme in Kenya, covering almost 6000 hectares and supporting 3000 families. Farmers in the scheme are tenants and are obliged to grow rice, following production methods specified by the National Irrigation Board (NIB). Horticultural production has developed both inside and outside the MIS, sometimes using water diverted from the canals. In 1998-99, the tenants rebelled against the NIB, refusing to sell their rice to the NIB and demanding better prices and more flexibility. The services provided by the NIB to rice farmers have deteriorated, and many farmers have turned to horticulture (Onjala 2001; Nguyo et al 2002).

Finally, about 35 thousand hectares are under small-scale irrigation schemes. Although this categories includes some schemes supported by the government, the fastest growing category is farmer-organized smallholder irrigation systems in which a group of farmers share the cost of a pump and/or the distribution system. In this system, only a small part of each farm, such as 0.25-0.50 hectares, is irrigated for high-value production, while maize and other staple foods are grown on the rest of the farm (Ngigi 2002).

The rapid growth of smallholder irrigation systems has been accompanied by new irrigation technologies. Small-scale drip irrigation systems have been introduced by missionaries, improved by the Kenya Agricultural Research Institute, and disseminated by local non-governmental organizations including the Fresh Produce Exporters Association of Kenya (FPEAK). These range from a bucket system to cover 15 m2, a drum system to irrigate 75 m2, and an "eight-acre" system to irrigate 450 m2. In addition, several types of pedal (treadle) irrigation pumps costing less than US$ 80 have been introduced. ApproTEC, a local non-governmental organization, reports that 24 thousand of these pumps are being used by smallholders in Kenya and Tanzania, mainly for production of vegetables and other high-value crops (ApproTEC 2003; Sijali and Okumu 2002).

According to the 2000 Rural Household Survey, described above, 12 percent of the 1498 farmers interviewed owned any irrigation equipment and 2 percent reported owning a water pump. Since 94 percent of Kenyan crop farmers grow at least some fruits and vegetables, it is clear that many farmers grow fruits and vegetables under rainfed conditions. Irrigation is, however, much more common among commercial vegetable growers, particularly among large-scale growers and those supplying export markets. For example, according to the RHS, half of the farmers growing French beans own irrigation equipment

compared to just 10 percent among other farmers. In their survey of 120 farmers along the Nairobi-Meru road (an area of very good market access), McCulloch and Ota (2003) find that 90 percent of smallholder growers of horticultural export crops had irrigation, compared to just 36 percent of non-horticultural producers. Without irrigation, smallholders are not able to produce a steady supply of vegetables throughout the year, making them less interesting to full-time exporters. Instead, they sell their output to traders for domestic sales or to brief-case (seasonal) exporters.

Seed The use of purchased seed varies across crops, depending on the quality and cost of purchased seed as well as the ease of saving seed from the previous harvest. Large commercial horticultural producers almost always use purchased seed or planting material, as do many small and medium contract growers. The use of purchased seed is less common among independent smallholders. Kimenye (1995) reports that imported vegetable seed is expensive for smallholders, while locally-produced seeds are of poor quality. She reports that lack of access to high-quality seed is an important constraint to smallholders.

Kenya has over a dozen seed companies, including both local and international companies. Among the international seed companies represented in Kenya are Pioneer, Panaar, Monsanto, and Seminis. The Kenya Seed Company is one of the largest and best-known African seed companies, having fostered the dissemination of hybrid maize seed in Kenya in the 1960s and 1970s. Formed as a private company in 1956, it became partly government-owned after independence, though it operates much like a private company. In 1979, the company purchased another seed company specializing in horticultural and flower seed. Today, it sells over 100 varieties of vegetables, legumes, and root crops under the name Simlaw (Kenya Seed Company 2003). The largest vendor of French bean seed is

Regina Seeds, a subsidiary of Seminis, the largest supplier of fruit and vegetable seed in the world. Regina distributes imported French bean seed and does not produce any locally. It is estimated that 70 percent of the vegetable seed sold in Kenya is imported, the remaining 30 percent being produced locally (Regina Seeds 2003)

ECONOMICS OF HORTICULTURAL PRODUCTION

In order to examine the impact of horticultural production on farm income, it is useful to examine the gross margins of fruit and vegetable production relative to the most common alternative. The gross margin is defined as the value of output minus the cost of variable purchased inputs such as seed, fertilizer, pesticides, and hired labor (the implicit cost of family labor and land are not deducted).

In this section, we provide a gross margin analysis of French bean production and maize-bean intercropping. French beans are one of the most important horticultural exports produced by smallholders, and maize-bean intercropping was chosen as the basis of comparison because it is the most common cropping system in Kenya and one used by less commercially-oriented farmers[11].

Table 5 shows the calculation of gross margins for maize-bean intercropping in Kirinyaga District. Each hectare produces Ksh 21,600 of maize and Ksh 19,200 of beans, so the total value of output is Ksh 40,800 per hectare per season (about US$ 510/ha) [12]. After subtracting the costs of land preparation, seed, fertilizer, and labor, the gross margin is Ksh 13,060 per hectare per season (US$ 163/ha). Kenyan farmers can often produce two maize-bean crops per year, one in the long rainy season (March-July) and one starting in the short

[11] It should be noted that maize-bean intercropping is also used by many commercially-oriented horticultural smallholders. Very few Kenyan smallholders are specialized in horticulture to the point of not growing some maize for own consumption.

[12] The exchange rate was about 80 Ksh per U.S. dollar when these data were collected.

rainy season (October-November). The yields are lower in the second season because of the lower rainfall. Thus, maize-bean intercropping generates gross margins of Ksh 20,000 to 25,000 per hectare per year (US$ 250-312/ha/year).

Table 5--Gross margin analysis for maize-bean intercropping

	Quantity	Price	Value per crop per hectacre
Maize yield	1620 kg	13 Ksh/kg	21,600
Bean yield	540 kg	36 Ksh/kg	19,200
Gross value of output			40,800
Land preparation	15 person-days	100 Ksh/pers.day	3,705
Maize seed	20 kg	270 Ksh/2 kg	2,700
Bean seed	48 kg	30 Ksh/kg	1,440
Fertilizer			
23:23:0	2 bags	1250 Ksh/bag	2,500
CAN	2 bags	950 Ksh/bag	1,900
Dust against maize borer	3 kg	150 Ksh/kg	450
Labor	187 person-days	80 Ksh/pers.day	15,000
Total variable cost			27,740
Gross margin			13,015

Source: Ministry of Agriculture & Rural Development, Kirinyaga District: 2002 Farm Management District guidelines.
Note: Typically, maize/bean intercropping allows one or two harvests per year depending on rainfall.

These results should be interpreted with some caution, however. Yields, prices, and costs vary widely across the country. In more favorable regions such as the Western Highlands, maize yields are often in the range of 3-5 tons/ha. At 4 tons/ha (and assuming other values are the same), the gross margin would be Ksh 43,460 per hectare (about US$ 540/ha). Second, the returns to the farm household will generally be higher than the gross margin, because will earn part or all of the "labor" budget, depending on how many of the tasks they carry out themselves. Third, these estimates were based on guidelines from the Ministry of Agriculture and Rural Development, but farmers typically use less fertilizer than is recommended by the Ministry.

Table 6 gives the gross margin for French bean production. The gross value of output is Ksh 445 thousand per hectare per season. This figure is much higher than that of maize-beans because the yield of French beans is higher and because the price is higher. After deducting the cost of inputs, the gross margin is Ksh 158 thousand per hectare. This estimate is somewhat higher than other estimates that the "profits" per farmer range between 62,000 and 124,000 Ksh per hectare (ECI 2000). In addition, these are margins *per season* and it is often possible to produce three crops per year under rain-fed conditions and even more under irrigation. Again, it is important to stress the variability in prices, yields, and costs. Kamau (2000) reports on a survey of the cost of producing French beans in five production zones. The estimated cost ranged from 18 Ksh/kg to 30 Ksh/kg.

Table 6--Gross margin analysis for French beans

			Value (Ksh)	
	Quantity	Price	Per acre	Per hectare
Gross value of output	4,000 kg	45 Ksh/kg	180,000	444,780
Seed bean	16 kg	700	11,200	27,675
Fertilizer				
23:23:0	4 bags	1,250 Ksh/bag	5,000	12,355
17:17:0	4 bags	1,250 Ksh/bag	5,000	12,355
CAN	2 bags	950 Ksh/bag	1,900	4,695
Fungicides			41,500	102,547
Labor				
Land preparation	15 person-days	100 Ksh/pd		
Planting	30 person-days	100 Ksh/pd	3,000	7,413
Harvesting	89 person-days	300 Ksh/pd	26,667	65,894
Weeding	75 person-days	80 Ksh/pd	6,000	14,826
Spraying	5 times	600 Ksh/time	3,000	7,413
Total variable costs			103,267	255,173
Gross margin (Ksh/season)			76,733	189,607

Source: Interviews with farmers.
Note: Up to three seasons of French beans can be harvested in a year under rain-fed conditions and up to five seasons under irrigation.

Accepting the gross margins estimated in the two tables, it appears that the returns per hectare per year are between 6 and 20 times greater for French beans than they are for maize-

bean intercropping. These results seem to imply that farmers should convert all their maize to French bean production. In fact, the gross margin analysis omits some important factors.

- First, the price used in the analysis is based on what existing French beans growers receive. The price faced by farmers in more remote locations could be much lower or even zero if vegetable traders do not come to the area and it is costly for the farmer to get the crop to market.

- Second, the analysis does not take into account the implicit costs associated with family labor. Vegetable production is significantly more labor-intensive than maize-bean production. French bean production requires 1300 person-days per hectare per year, and chili, okra, tomatoes, onions, and brinjal require 540-690 person-days, but maize and beans require just 175 person-days (Scheltema 2002). Given the seasonality of labor demand and the need to grow food crops, few households have sufficient family labor to grow more than 0.20 hectares of vegetables. For example, in the Egerton/Tegemeo/MSU Rural Household Survey (described in Section 4), the average plot of French beans was 0.15 hectares and, of the 78 farmers growing French beans, the largest plot was 1.2 hectares. This is also true for other vegetable crops and, to a lesser degree, for fruits grown by smallholders.

- Third, the water requirements of French beans (and horticultural crops in general) are much greater than those of maize-bean intercropping. If irrigation is required, the average investment cost ranges from US$ 1000/hectare for a gravity-fed, open-canal system to US$3100/hectare for a pump-fed, piped-distribution system (Ngigi 2002).

- Fourth, the analysis does not take into account the financial costs associated with much larger up-front variable costs. Compared to maize-bean intercropping, the per-acre variable cost of tomato production is three times a high, while those of French bean production are ten times greater. If the farmer has sufficient liquidity or access to credit, then the interest costs should be included in the analysis. If not, then horticultural production is simply not feasible.

- Finally, the analysis does not take into account risk. Most fruits and vegetables are subject to more production risk than staple crops, due to attack from pest and/or poor weather, as well as greater marketing risk, due to its perishability.

In summary, the gross margin analysis shows that when the right conditions are present in terms of rainfall, markets, family labor, and household ability to bear risk, French bean production can be much more profitable than maize-bean intercropping. At the same time, it is necessary to keep in mind that these conditions do not apply for all farmers.

4. CHARACTERISTICS OF FRUIT AND VEGETABLE GROWERS

To better understand the impact of horticultural production on small farmers in Kenya, it is useful to examine the characteristics of the growers. For example, the impact of horticulture on rural livelihoods will be more limited if fruits and vegetables are only grown in one small area or by a small number of farmers. Similarly, the impact on poverty depends on whether poor farmers are able to participate in the sector or whether richer, large-scale growers dominate it.

A recent study compared the characteristics of smallholders producing horticultural crops for the export market, farm workers on large horticultural farms, and smallholders not involved in horticulture[13]. It found that export horticultural smallholders were significantly better off than non-horticultural smallholders, even after controlling for household characteristics such as age, education, ethnicity, and ownership of land. The authors suggest that these farmers benefit directly from the higher income and indirectly through greater access to credit and extension services (McCulloch and Ota 2002). As noted by the authors, however, this study was based on a relatively small sample of 141 rural households in selected zones near Mt. Kenya.

This section sheds light on the characteristics of horticultural growers using two sources of information. First, we examine the results of the Rural Household Survey (described in Section 3) regarding the characteristics of fruit and vegetable growers and the contribution of this activity to household income. Second, to provide more concrete images of the potential impact of participation in the horticultural sector, we describe a number of case studies, based on interviews carried out by one of the authors.

[13] Another component compared urban households working in the horticulture packing houses with other urban households.

RESULTS OF THE 2000 RURAL HOUSEHOLD SURVEY

According to the Rural Household Survey, carried out by Egerton College, Tegemeo Institute, and Michigan State University, the average farm household has 6.8 members and 2.14 hectares of land. The level of schooling for the heads of household is relatively low: 6 years for male heads and 4 years for female heads (see Table 7).

Table 7--General characteristics of Kenyan farmers

Average age of head of household (years)	53
Proportion of households headed by women (percent)	14
Average amount of schooling completed by male heads (years)	6.4
Average amount of schooling completed by female heads (years)	3.7
Average cultivated area (hectares)	1.80
Average sown area (hectares)	2.14
Percent of farms with production in two seasons	65%
Land tenure	
Own land with title deed	52%
Own land without title deed	35%
Only work on rented land	17%
Only farmed on relative's land	19%
Farm government or communal land	3%
Family structure	
Children below 15 yrs	2.69
Household member aged >15 years ≤65	3.83
Household member aged > 65 years	0.26
Total	6.80
Land preparation methods	
Exclusively manual	55%
Exclusively oxen	5%
Exclusively tractor	3%
Manual and Oxen	17%
Manual and tractor	19%
Tractor and oxen	1%
Distance to a paved road	
Less than 1 km	17%
1 – 5 km	30%
5 – 10	25%
10 – 20 km	22%
More than 20 km	6%

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

The average farm is relatively small, with 1.8 hectares of land cultivated in the main rainy season. About two-thirds (65 percent) of the farmers in the sample were able to produce a crop in the short rainy season. Adding the areas cultivated in the main rainy season and in the short rainy season, the average sown area is 2.14 hectares. Slightly more

than half own land with a title deed, while another third have land but no title. Most of the remainder farm land rented from others or borrowed from relatives. With respect to technology, over half prepare their plots by hand, 19 percent combine manual preparation and rented tractors, and 17 percent combine manual preparation and the use of oxen (Table 7).

One measure of market access is the distance to a paved road. According to the Rural Household Survey, somewhat less than half the agricultural households in Kenya live within 5 kilometers of a paved road, while 6 percent live more than 20 kilometers from a road (Table 7).

In order to examine the patterns in fruit and vegetable production, we divide the sample into different types of households, defined by per capita income, farm size, and region. Table 8 shows the definitions used to create these categories. About two-thirds of the farms have less than 2 hectares of sown area (adding cultivated area over the two seasons), and less than 3 percent have more than 10 hectares. The poorest quintile of farms earn less than 8950 Ksh/person/year (roughly US$ 120), while the richest quintile of farms earn more than 65,150 Ksh/person/year (US$ 868).

Table 8--Definition of household categories

Type of category	Categories	Definition	Number of households	Percentage of households
Farm size	<1 ha	Less than 1 ha sown area	514	34.9
	1-2 ha	1-2 hectares sown area	475	32.3
	2-5 ha	2-5 hectares sown area	391	26.6
	5-10 ha	5-10 hectares sown area	58	3.9
	>10 ha	More than 10 ha sown area	34	2.3
Income per capita	Poorest	Less than 8950 Ksh	295	19.8
	2	8950 – 19,490 Ksh	294	20.3
	3	19,490 – 33,200 Ksh	295	20.2
	4	33,200 – 65,150 Ksh	294	20.2
	Richest	More than 65,150 Ksh	294	19.5
Province	East/Central/Coast	Lives in one of these provinces	465	31.6
	Rift Valley	Lives in Rift province	499	33.9
	West	Lives in West province	508	34.5

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

Table 9 provides a summary key indicators of the fruit and vegetable sector. The survey results indicate that almost all farmers (98 percent) grow fruits and vegetables. On average, they grow 3.5 different types of fruit and 3.3 types of vegetables. As a basis for comparison, the average number of different types of crops grown is about 12. The average value of fruit and vegetable production is Ksh 49 thousand per year (US$ 658), representing slightly less than one quarter of the value of crop production. More than one-third (35 percent) of fruit and vegetable production is sold on the market, though the share is higher for vegetables (49 percent) than for fruit (20 percent). Overall, fruits and vegetables production is equivalent to about 18 percent of household income[14].

[14] The contribution of fruits and vegetables to household income is somewhat less because this percentage compares the gross value of output with net income. The survey data do not allow the calculation of net income for each crop.

Table 9--Fruit and vegetable production by income category

	Income quintile					
	Poorest	2	3	4	Richest	Total
Percent of farmers growing						
Fruits	75	89	93	95	93	89
Vegetables	78	87	93	96	97	90
Fruits and vegetables	92	99	100	100	100	98
Average number of crops						
Fruits	2.6	3.3	3.7	4	4	3.5
Vegetables	2.3	2.7	3.1	3.9	4.4	3.3
Fruits and vegetables	4.9	6.0	6.8	8.0	8.4	6.8
Avg value of production						
Fruits	4,280	9,314	11,761	21,452	75,394	24,418
Vegetables	3,525	7,874	11,086	29,163	73,295	24,965
Fruits and vegetables	7,805	17,188	22,848	50,615	148,689	49,383
Value of production as % of total crop value						
Fruits	13	14	11	10	11	11
Vegetables	11	12	10	14	11	11
Fruits and vegetables	25	26	21	25	22	23
Value of sales						
Fruits	1,047	2,631	3,137	3,980	13,585	4,872
Vegetables	1,131	2,531	3,737	11,982	41,537	12,171
Fruits and vegetables	2,178	5,163	6,874	15,962	55,123	17,043
Sales as % of total crop sales						
Fruits	11	12	7	4	7	7
Vegetables	12	12	8	13	20	16
Fruits and vegetables	23	24	14	18	27	23
Sales as % of production						
Fruits	24	28	27	19	18	20
Vegetables	32	32	34	41	57	49
Fruits and vegetables	28	30	30	32	37	35
Value of production as % of household income						
Fruits	12	9	7	7	9	9
Vegetables	9	8	7	10	9	9
Fruits and vegetables	21	18	14	18	18	18

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

Poor and rich farm households differ somewhat in their production patterns[15]. Poor households are somewhat less likely to grow fruits and vegetables, but, even among the

[15] Income per capita is calculated by combining estimates of crop income, livestock sales, animal product sales, household enterprise income, and income from wages and salaries. In the case of crop income, we include the imputed value of home production as well as the value of crop sales. In the case of both farm-size and income per capita, the categories are quintiles. In each case (except for wages and salaries), the costs are production are subtracted from the gross sales.

poorest quintile, 92 percent do. Similarly, the average number of different fruit and vegetable crops is greater among the higher-income farm households. Even larger differences appear in the value of fruit and vegetable production: the richest quintile of farm households produces 18 times as much as the poorest quintile in value terms. However, this merely reflects the greater agricultural production of high-income households. The value of fruit and vegetable production as a percentage of total crop production does not vary appreciably across income categories (21-26 percent). Nor does the importance of fruit and vegetable production in overall income show a trend across income classes, remaining in the range of 14-21 percent (see Table 9)

Given their larger production, it is not surprising that the higher-income farm households market a larger share of their fruit and vegetable production. The percentage rises from 28 percent among the poorest quintile to 37 percent among the richest quintile. In fact, it is somewhat surprising that the share does not rise faster across income quintiles (see Table 9).

Similar indicators for households in different farm-size categories[16] are shown in Table 10. Many of the patterns follow those found in the previous table: larger farms are more likely to grow fruits and vegetables, they grow a wider variety of fruit and vegetable crops, and the marketed share is higher for large farms than small. On the other hand, the positive relationship between farm-size and the value of horticultural production is surprisingly weak.

[16] Farm size is calculated as the sum of the areas of the fields cultivated by the household, including land rented in and excluding land rented out. Double-cropped land is counted twice so it is, strictly speaking, a measure of sown area.

Table 10--Fruit and vegetable production by farm-size category

	Farm-size category					
	<1 ha	1-2 ha	2-5 ha	5-10 ha	>10 ha	Total
Percent of farmers growing						
Fruits	88	88	92	91	91	89
Vegetables	86	92	92	97	100	90
Fruits and vegetables	97	98	99	100	100	98
Average number of crops						
Fruits	3.2	3.5	3.7	4.1	3.7	3.5
Vegetables	2.8	3.3	3.7	4.6	4.6	3.3
Fruits and vegetables	6	6.8	7.4	8.6	8.3	6.8
Avg value of production						
Fruits	20,157	22,485	30,879	31,953	28,684	24,418
Vegetables	14,881	20,654	38,528	48,578	41,363	24,965
Fruits and vegetables	35,039	43,139	69,407	80,531	70,047	49,383
Value of production as % of total crop value						
Fruits	15	13	10	9	4	11
Vegetables	11	12	12	13	6	11
Fruits and vegetables	26	24	22	22	10	23
Value of sales						
Fruits	2,338	3,516	7,453	18,385	9,403	4,872
Vegetables	5,822	9,714	19,995	30,814	20,691	12,171
Fruits and vegetables	8,159	13,230	27,448	49,199	30,094	17,043
Sales as % of total crop sales						
Fruits	10	6	7	10	2	7
Vegetables	25	16	18	16	4	16
Fruits and vegetables	35	22	25	26	6	23
Sales as % of production						
Fruits	12	16	24	58	33	20
Vegetables	39	47	52	63	50	49
Fruits and vegetables	23	31	40	61	43	35
Value of production as % of household income						
Fruits	11	9	8	7	4	9
Vegetables	8	9	10	11	5	9
Fruits and vegetables	20	18	18	18	9	18

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

Furthermore, the importance of fruit and vegetable production (as a percentage of crop sales and as a percentage of household income) is actually greater among small farms than among large ones. For example, fruit and vegetable production represents about 20 percent of income among farms with less than 1 hectare compared to just 9 percent among those with more than 10 hectares. This is because large farms tend to be unirrigated and found in semi-

arid regions less favorable to horticulture. In addition, because fruit and vegetable production is labor intensive, it is better suited to farms with an abundant labor and small plots.

Table 11 examines the same indicators for three regions: the East, Central, and Coast provinces, the Rift Valley province, and the Western province. The East/Central/Coast provinces are characterized by the highest value of fruit and vegetable production per farm, two to three times as large as in the other two provinces. Not surprisingly, fruit and vegetable production in this region plays a larger role in crop production and household income than in the other two. In the Rift Valley, the average production levels are lower, but the degree of commercialization is higher. Almost half the fruit and vegetable output in this province is sold, according to the survey. The Rift Valley is also more oriented to vegetable production, while the Western province tends to concentrate on fruit production.

Table 11--Fruit and vegetable production by province

	Province			
	East/Central /Coast	Rift Valley	Western	Total
Percent of farmers growing				
Fruits	98	81	89	89
Vegetables	95	95	81	90
Fruits and vegetables	100	99	96	98
Average number of crops				
Fruits	4.5	2.6	3.6	3.5
Vegetables	4.3	3.7	2	3.3
Fruits and vegetables	8.7	6.3	5.6	6.8
Avg value of production				
Fruits	47,431	9,755	17,755	24,418
Vegetables	52,563	17,905	6,637	24,965
Fruits and vegetables	99,994	27,660	24,393	49,383
Value of production as % of total crop value				
Fruits	14	5	14	11
Vegetables	15	9	5	11
Fruits and vegetables	29	14	19	23
Value of sales				
Fruits	5,325	4,245	5,075	4,872
Vegetables	25,005	9,293	3,249	12,171
Fruits and vegetables	30,330	13,538	8,323	17,043
Sales as % of total crop sales				
Fruits	6	7	7	7
Vegetables	30	15	4	16
Fruits and vegetables	36	21	11	23
Sales as % of production				
Fruits	11	44	29	20
Vegetables	48	52	49	49
Fruits and vegetables	30	49	34	35
Value of production as % of household income				
Fruits	11	4	10	9
Vegetables	13	7	4	9
Fruits and vegetables	24	10	14	18

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

Since averages can hide wide variation across households, it is useful to examine the variation in several key variables. Table 12 shows the distribution of fruit and vegetable growers by the share of their fruit and vegetable output that they market. Almost one-quarter

has no sales of fruits and vegetables. An additional 20 percent less than 20 percent of their total output. On the other hand, 23 percent of Kenyan farmers sell over half of their fruit and vegetable output. The table also shows that the 6 percent of growers that market 80-100 percent of their output account for fully 44 percent of the total fruit and vegetable sales.

Table 12--Distribution of farmers by marketed share of fruit and vegetable production

Sales as a percentage of fruit & vegetable production	Number of farmers	Percent of all farmers	Percent of the value of F&V production	Percent of the value of F&V sales
No sales	347	24	18	0
1 - 10	288	20	22	2
10 - 20	162	11	7	3
20 - 30	112	8	5	3
30 - 40	92	6	8	8
40 - 50	121	8	6	8
50 - 60	93	7	5	9
60 - 70	70	5	5	10
70 - 80	66	5	6	12
80 - 90	51	4	10	24
90 - 100	23	2	7	20
Total	1425	100	100	100

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

As mentioned above, most growers have relatively small sales of fruits and vegetables, but a few farms have quite sizeable sales. Table 13 shows the distribution of farmers according to their fruit and vegetable sales. The average value of sales is relatively high, Ksh 17 thousand (US$ 226). On the other hand, more than half the farmers have sales of less than 2,500 Ksh. About 7 percent of them have sales of more than 50,000 Ksh (US$ 667). This group includes some quite large horticultural producers. Although they are a small proportion of the growers, they account for 72 percent of the sales.

Table 13--Distribution of farmers by the value of fruit and vegetable sales

Sales of fruits and vegetables (Ksh/year)	Number of farmers	Percent of all farmers	Percent of the value of F&V sales
No sales	394	27	0
1 - 500	167	11	0
500 - 1,000	110	7	0
1,000 - 2,500	208	14	1
2,500 - 5,000	142	10	2
5,000 - 10,000	131	9	4
10,000 - 50,000	218	15	21
Greater than 50,000	102	7	72
Total	1472	100	100

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

How much does fruit and vegetable production contribute to the incomes of growers? Table 14 suggests that fruits and vegetables are merely a supplement to income for most farmers, but that a significant minority of farmers relies on fruit and vegetables for a major share of their income. More specifically, over two-thirds of the farmers in the survey rely on fruit and vegetable production for less than 20 percent of income[17]. At the other extreme, however, 8 percent of the farmers earn over half their income from fruit and vegetable production.

Table 14--Distribution of farmers according to the value of fruit and vegetable production as a percentage of income

Value of fruit and vegetable production as a percentage of income	Number of farmers	Percent of all farmers	Percent of value of F&V production	Percent of value of F&V sales
0	38	3	0	0
0 - 10	648	45	11	11
10 - 20	304	21	13	11
20 - 30	160	11	11	10
30 - 40	107	7	9	9
40 - 50	51	4	12	15
50 - 60	48	3	10	14
60 - 70	25	2	10	15
70 - 80	19	1	7	5
80 - 90	19	1	5	3
>90	20	1	11	7
Total	1,439	100	100	100

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

[17] Because it is difficult to attribute all production costs to different crops, these figures compare the *gross* value of fruit and vegetable production and *net* income, defined as gross revenue minus the cash costs of production.

We now turn our attention to the production and marketing patterns for specific fruit and vegetable crops. Table 15 provides some indicators of the relative importance of each fruit and vegetable crop to Kenyan farms[18]. The first column shows the percentage of farmers growing each crop. Only bananas and sukuma wiki[19] (greens) are grown by more than half of Kenyan farmers (69 percent and 63 percent, respectively). Other crops grown by at least 30 percent of the farmers include avocados, mangoes, pawpaw (papayas), Irish potatoes, onions, pumpkin, and tomatoes. It may seem surprising that just 4 percent of the smallholders in the survey reported grown French beans, since this commodity is the most important vegetable export from Kenya. Since French bean production is concentrated in several production zones, the margin of error associated with French bean production estimates may be higher than for more widespread crops such as maize. It is useful to recall, however, that there are close to four million small farmers in Kenya, so 4 percent would represent around 150 thousand farmers. Since the local market for French beans is quite limited, it is likely that many of these farmers are growing, at least in part, for the export market.

[18] The table shows only fruit and vegetable crops that are grown by at least 40 households (about 3 percent) in the 2000 Rural Household Survey. Minor crops are included in the two "Other" categories.

[19] "Sukuma wiki" refers to collard greens, kale, and other greens. The literal translation from Swahili is "push the week", in reference to its ability to stretch the food supply to the end of the week.

Table 15--Summary of measures of importance of each crop

	Share of farms growing	Value of production		Value of sales		Share of output sold
	(percent)	(Ksh/year)	(percent of F&V total)	(Ksh/year)	(percent of F&V total)	(percent)
Bananas	69	6,223	12	3,166	15	51
Avocado	35	8,276	16	1,032	5	12
Mangoes	31	5,038	10	413	2	8
Pawpaws	30	2,459	5	487	2	20
Guava	27	279	1	30	0	11
Lemons	15	347	1	40	0	12
Oranges	15	922	2	300	1	33
Passion fruit	14	306	1	66	0	22
Lugard	14	340	1	16	0	5
Matomoko	6	374	1	35	0	9
Pineapples	5	167	0	70	0	42
Mero	3	51	0	14	0	27
Other fruit	6	620	1	530	3	85
Fruit sub-total	89	25,402	48	6,199	30	24
Sukuma wiki	63	4,608	9	1,326	6	29
Irish potatoes	38	5,602	11	2,694	13	48
Onions	35	1,961	4	934	5	48
Pumpkin	31	414	1	74	0	18
Tomatoes	30	4,533	9	3,371	16	74
Ndigenous vegetables	29	899	2	91	0	10
Cabbage	23	4,447	8	3,515	17	79
Spinach	11	591	1	39	0	7
Carrots	10	953	2	488	2	51
Peppers	10	253	0	39	0	15
Green peas	8	216	0	54	0	25
Green grams	7	291	1	23	0	8
Pumpkin leaves	7	26	0	1	0	4
French beans	4	779	1	732	4	94
Capsicum	4	326	1	252	1	77
Other vegetables	7	1,196	2	731	4	61
Vegetable sub-total	90	27,095	52	14,364	70	53
Fruit and vegetable total	98	52,497	100	20,563	100	39

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

The average value of fruit and vegetable production among Kenyan farmers is about Ksh 52 thousand (US$ 693), but this figure is heavily influenced by a small number of large growers. The median value of fruit and vegetable production is just Ksh 14,096 (US$ 188). The most important fruits and vegetables in value terms are avocados (16 percent of the fruit and vegetable value), bananas (12 percent), Irish potatoes (11 percent), and mangoes (10 percent). Tomatoes, sukuma wiki, cabbage, and pawpaw are also important, each representing at least 5 percent of the total value of fruit and vegetable production (see Table 15).

Fruit and vegetable sales average somewhat less than Ksh 21 thousand (US$ 274) concentrated in a smaller number of crops. Four crops (cabbage, tomatoes, bananas, and Irish potatoes) account for about 60 percent of the total value of fruit and vegetable sales (see Table 15).

The degree of commercialization varies widely across commodities. Some are grown almost exclusively for home consumption. For example, no more than 5 percent of the pumpkin leaves and lugard are sold, and less than one-third of the pumpkins, peppers, avocados, mangoes, pawpaws, and guava are. At the other extreme, more than 90 percent of the French beans (green beans) are marketed. This is not surprising given that French beans are the most important vegetable export from Kenya. Similarly, over half the output of bananas, tomatoes, cabbage, carrots, and capsicum are marketed. Overall, 39 percent of the volume of fruit and vegetable production is marketed, the percentage being much higher for vegetables (53 percent) than for fruit (24 percent). It is important to recognize however that this figure is weighted toward large farms that produce larger harvests. If we calculate the percentage of fruits and vegetables sold for each household and take the average (with each

household having an equal weight), the result is 27 percent. In other words, a typical Kenyan household might sell about one-quarter of its fruit and vegetable production, but almost 40 percent of the total value is marketed (see Table 15).

How does the importance of individual crops vary across different types of households? As shown in Table 16, the proportion of households growing selected crops[20] shows little variation across farm-size categories. Large farmers are slightly more likely to grow fruits and vegetables, but the difference is small. For some crops, such as citrus, tomatoes, pumpkin, and onions, large farmers are more likely to grow them than small ones. For other crops, such as Irish potatoes, indigenous vegetables, bananas, avocados, and guava, there is no consistent pattern.

Table 16--Percentage of farms growing each crop by farm-size category

	Farm-size category					
Crop	<1 ha	1-2 ha	2-5 ha	5-10 ha	>10 ha	Total
Bananas	70	69	71	73	64	70
Avocado	39	33	36	22	30	36
Mangoes	26	32	35	53	33	32
Pawpaws	28	29	33	31	33	30
Guava	25	29	31	22	27	28
Oranges	11	15	19	33	33	16
Lemons	11	14	19	36	21	15
Lugard	15	16	13	9	9	15
Passion fruit	16	13	15	5	18	15
Other fruit	12	18	17	18	24	16
Sukuma wiki	56	63	71	67	73	63
Irish potatoes	38	39	37	42	27	38
Onions	32	34	37	56	52	35
Pumpkin	27	26	35	55	64	31
Indigenous vegetables	27	29	32	35	39	30
Tomatoes	20	33	36	35	39	29
Cabbage	17	23	28	40	24	23
Other vegetables	35	42	46	55	55	41

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000.

[20] Fewer crops are shown in this table than in the previous ones. Because we are disaggregating the results into different household categories, we have limited it to crops grown by at least 250 farms in the sample.

It is interesting to note that small farmers are just as likely to grow the main horticultural fruit exports (avocados, and mangoes) as large farmers.

But farm-size is only a rough indicator of the income or wealth of a family. In Table 17, the same figures are presented by income quintile, and the differences across categories are more marked.

Table 17--Percentage of farms growing each crop by income category

	Income quintile					
Crop	Poorest	2	3	4	Richest	Total
Bananas	49	67	72	78	84	70
Avocado	17	25	36	44	58	36
Mangoes	21	32	34	39	33	32
Pawpaws	22	32	35	37	25	30
Guava	22	29	26	33	29	28
Oranges	14	12	12	21	19	16
Lemons	12	16	15	18	15	15
Lugard	5	12	14	17	25	15
Passion fruit	7	9	12	20	25	15
Other fruit	7	13	15	19	25	16
Sukuma wiki	45	55	66	71	79	63
Irish potatoes	22	28	38	44	59	38
Onions	22	28	33	42	51	35
Pumpkin	25	28	30	36	35	31
Indigenous vegetables	27	34	33	30	23	30
Tomatoes	20	24	28	37	36	29
Cabbage	11	12	19	31	42	23
Other vegetables	27	34	37	52	56	41

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000.

Avocadoes, mangoes, passion fruit, Irish potatoes, cabbage, and many other crops are more likely to be grown by higher-income households than by poor households. For example, 42 percent of the richest income category grows cabbages, compared to just 11 percent of the poorest category. Similarly, 58 percent of the richest farmers grow avocados, but just 17 percent of the poorest ones do.

Unfortunately, causality is difficult to determine in this case. It may be that high-income households have more of the liquidity, access to credit, and appetite for risk that horticultural production often requires. Alternatively, it may be that farmers (small and large) who engage in horticulture have higher incomes because of the relatively profitability of this sector. A third possibility is that the two variables (income and horticulture) are correlated, but do not strongly influence each other. For example, it may be that households that have good market access are more likely to grow fruits and vegetables and have higher incomes for other reasons, such as off-farm employment.

Another measure of the importance of each crop is the value of production relative to household income. Table 18 shows that small farms rely more heavily on fruit and vegetable production for their income. The ratio falls from 26 percent among farms with less than 1 hectare to 10 percent among those with more than 10 hectares. This pattern holds true for both fruits and vegetables, particularly for bananas, pawpaws, guava, and sukuma wiki. Other crops show little or no consistent pattern.

Table 18--Fruit and vegetable production as a percentage of the total value of crop production by farm-size category

	Farm-size category					
Crop	<1 ha	1-2 ha	2-5 ha	5-10 ha	>10 ha	Total
Bananas	3	3	3	1	1	3
Pawpaws	6	6	2	4	0	4
Guava	3	2	3	1	1	2
Mangoes	1	1	1	1	0	1
Lemons	0	0	0	0	0	0
Oranges	0	0	0	1	1	0
Avocado	0	0	0	0	0	0
Lugard	0	0	0	0	0	0
Passion fruit	0	0	0	0	0	0
Other fruit	0	0	0	0	0	0
Fruit sub-total	15	13	10	9	4	11
Irish potatoes	2	2	2	2	1	2
Tomatoes	2	2	2	4	2	2
Sukuma wiki	3	2	4	1	1	3
Pumpkin	1	1	1	2	1	1
Cabbage	0	0	0	0	1	0
Onions	1	0	0	0	0	0
Indigenous vegetables	1	2	1	2	1	1
Other vegetables	2	2	2	4	2	2
Vegetable sub-total	11	12	12	13	6	12
Fruit & vegetable total	26	24	22	22	10	23

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

If we look at the ratio for different crops across income categories, the overall importance of fruits and vegetables is more-or-less constant. Bananas are much more important in the income of poor households than in the income of higher-income households (see Table 19). Pawpaws, onions, pumpkins, and tomatoes show similar but weaker patterns. But other crops show the opposite pattern, being more important in the income of richer farms. Examples include avocados, mangoes, and Irish potatoes.

Table 19--Fruit and vegetable production as a percentage of the total value of crop production by income category

	Income category					
	Poorest	2	3	4	Richest	Total
Bananas	6	5	5	3	2	3
Avocado	1	1	1	2	5	4
Mangoes	1	2	1	2	3	2
Pawpaws	2	3	2	2	0	1
Guava	1	0	0	0	0	0
Oranges	1	1	0	1	0	0
Lemons	0	0	0	0	0	0
Lugard	0	0	0	0	0	0
Passion fruit	0	0	0	0	0	0
Other fruit	0	1	0	1	0	0
Fruit sub-total	13	14	10	11	11	11
Sukuma wiki	3	3	3	3	2	2
Irish potatoes	1	1	2	2	3	3
Onions	2	1	1	1	1	1
Pumpkin	1	0	0	0	0	0
Indigenous vegetables	0	1	1	1	0	0
Tomatoes	2	2	2	2	1	1
Cabbage	2	1	2	2	2	2
Other vegetables	1	2	2	3	2	2
Vegetable sub-total	11	12	11	14	11	12
Fruit & vegetable total	25	26	21	25	22	23

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

How do farmers supplying the fruit and vegetable export market differ from other farmers in Kenya? The survey data does not identify export farmers, but we can get a rough picture of some of the differences by looking at French bean growers, since this is the most commercialized crop and a large portion of output is exported. Table 20 compares the characteristics of French bean growers with other farmers, though the results must be interpreted with caution given that there are only 62 French bean growers in the sample. French bean growers appear to be similar to other farmers in farm-size, although the average farm-size is slightly larger and there may be a somewhat higher proportion of farms that are larger than 10 hectares. More surprisingly, the average value of assets owned by French

bean growers is no greater (and perhaps somewhat less) than that of other farmers. On the other hand, there is a large difference in income, with French bean growers earning more than twice as much as other farmers. Among French bean growers, only 8 percent are in the poorest quintile, while 38 percent are in the richest quintile. Furthermore, as mentioned above, French bean growers are much more likely to own some type of irrigation equipment (50 percent) compared to other farmers (10 percent).

Table 20--Comparison of French bean growers and other farmers

	French bean growers	Other farmers
Farm size category		
<1 ha	35%	35%
1-2 ha	32%	30%
2-5 ha	26%	28%
5-10 ha	4%	2%
>10 ha	2%	5%
Average farm size (sown area)	2.57 ha	2.15 ha
Income quintile		
Poorest	21%	8%
2	20%	15%
3	20%	13%
4	20%	25%
Richest	19%	38%
Average per capita income	99,617 Ksh	48,568 Ksh
Province		
East/Cent/Coast	30%	58%
Rift Valley	35%	15%
Western	35%	27%
Distance to paved road		
Less than 1 km	17%	12%
1-5 km	30%	33%
5-10 km	24%	45%
10-20 km	22%	8%
More than 20 km	6%	2%
Average value of assets	110,692 Ksh	139,019 Ksh
Pct owning irrigation equipment	50%	10%
Number of households	62	1548

Source: Egerton/Tegemeo/MSU Rural Household Survey 2000

In terms of location, French bean growers are much more likely to live in the East, Central, and Coast provinces and much less likely to live more than 10 kilometers from a paved road (see Table 20). French bean growers also appear to be concentrated in a few locations. The survey sample is scattered across 24 districts, but over 70 percent of the French bean growers in the sample are found in just three districts: Meru, Makueni, and Vihiga[21]. Because of the small sample, it should not be inferred that these are the main production zones for French beans, but the results do indicate that French bean production is clustered.

CASE STUDIES

Survey data provides a comprehensive and balanced view of easily quantified variables, but it does not capture the dynamic nature of the attempts by farmers to improve their lives through by experimenting with different production methods, crops, and marketing strategies. For this reason, it is useful to examine a number of case studies of Kenyan fruit and vegetable growers. Information about these growers was gathered by the authors using semi-structured interviews carried out in March and April 2002.

Case 1: Diversification from staples to vegetables

Asha Muthori is a middle-aged woman who owns a five-acre piece of land on the banks of the Thiba River, a permanent river. She started growing horticultural crops in 1996 after observing that the neighbors that grew horticultural crops were better off than those who did not. She also learned from the growers that returns from horticulture were

[21] Meru is a high-rainfall district about 180 km northeast of Nairobi at the foot of Mount Kenya. Makueni is about 150 km southeast of Nairobi along the road to Mombassa, and rainfall varies with altitude. Vihiga is a high-rainfall district about 250 km northwest of Nairobi near Lake Victoria.

generally higher than those from intercropping maize and beans, as she had been doing until then.

She started with a crop of tomatoes, which she sold to traders who resold in the main wholesale market in Nairobi. Later, she started growing French beans and selling them to brokers buying for major exporters. Last year, she joined the Kimuri Farmers Self-help Group and sold her French beans to an exporter through the Group. She explained that sale through the Group has a number of advantages. First, her output is too small to attract direct deals with a major exporter. On her own therefore, she is constrained to sell to brokers at a price that is lower than that offered by major exporters. As a group, however, members pool their produce to achieve volumes that attract direct negotiations with major exporters. She stated that exporters offer a more reliable market outlet than brokers do. In addition, the group deposits each farmer's payments directly in his/her personnel savings account, thus offering better security than cash transactions. This also saves the farmer the cost of traveling to the bank, which are usually located in major urban centers, to deposit the money.

At the same time, she pointed out a major weakness of selling through the Group. The fact that produce from member-farmers is pooled and presented to the buyer as one lot reduces the incentive to maintain quality control in production and handling. Some members do not strictly follow the recommended production practices, and the low quality of their output reduces the quality and price of the entire lot.

Asha stated that the well-being of her family has greatly improved since she started growing commercial horticultural crops. In particular, she said that she used to have difficulties paying her children's school fees, so her children were frequently being sent away from school. Since starting horticultural production, this is no longer a problem and her

children have been able to attend school without interruption. In addition, she said that she used to be forced to sell all her maize and beans at harvest to generate cash for school fees. This meant it was necessary to engage in causal wage labor to raise money for food. Now, she is able to save some of her maize and bean harvest for own consumption. Finally, she noted that she used some of the proceeds of the horticulture farming to buy a plot of land in Mombassa , which she plans to develop.

When asked why other farmers in her area did not grow fruits and vegetables as a commercial activity, she cited lack of capital, especially money required to acquire a water pump. Currently, her only other crop is a three acres intercrop of maize and beans. She also owns one dairy cow and a team (two) of plough oxen. She ranks horticulture as her most important source of income, followed by dairy.

Case 2: A trader is unimpressed with vegetable production

Nancy Wanjiru is a middle-aged woman who ventured into commercial horticultural farming two years ago. Before then, she was a small-scale trader dealing in cereals but heavily dependent on hired transport to ship supplies from the production areas. It was difficult for her to compete with larger traders because they could negotiate volume discounts when buying and transport their product at lower per-unit costs. Because of her poor competitive position, she was on the look out for a better source of income. She noticed that her sister's family, despite owning no land, was doing well by renting land and growing commercial horticultural crops. Like her sister, Nancy does not own any land, but she rented four acres and started with tomatoes and cabbages, which she sold to traders mainly serving the city of Nairobi. Last season she produced two acres of French beans, which she pooled with her sister's, who is a member of "Kimuri Farmer's Self-help Group".

Ms. Wanjiru said that the well being of her family has not changed with her shift to commercial horticultural farming and that she plans to shift back to trade business when her land lease expires. She cited inadequate capital as the major reason for her lack of success with horticulture. Without adequate working capital, she is not able to plant a crop of French beans on a weekly basis, which is essential for a continuous flow of produce and thus, cash. Further, the uncertainty of the continuity of land lease discourages her from investing in irrigation infrastructure. During dry spells, she has to pay casual laborers to carry water from Thiba River, which about a kilometer from her plot. She cites this as the major factor constraining other farmers in her area from growing fruits and vegetables as a commercial activity. Her only other crop production consists of intercropping maize and sweet potatoes.

Wanjiru cites lack of transparent in grading of the produce as a major marketing problem. Instead of conducting grading at the produce collection center, the buyers collects the whole produce delivered, grades it at his own pre-cooling center in the absence of the farmer or his representative. The group only gets figures of the quantities assigned the respective grades including the quantity rejected. There are no verifying mechanisms. She recommended that the government can assist horticulture farmers by designing and enforcing a more transparent grading system in which both parties (the farmers' representative and the buyer) are involved.

Case 3: Tomatoes help pay for school fees

Joseph Githiga is a 32 years old farmers who started growing commercial horticulture three years ago after he acquired an irrigation pump. Before that time, he intercropped maize and bean and working as a casual laborer sorting tomatoes for other farmers. He bought the pump out of savings from his causal labor and sale of maize and started growing French beans. Last season he produced one acre of tomatoes which he sold at "Wakulima Market,"

the major wholesale market in Nairobi, using hired trucks to ship the produce. He continues to grow maize and beans on a two-acre plot of leased land and he raises chickens, but horticulture is now his main source of income.

Mr. Githiga explained that the well-being of his family has greatly improved since he started growing commercial horticultural crops. In particular, his family now eats better, and he pays his children's fees comfortably. In addition, he has, out of the proceeds of the horticulture farming, bought a 1.5 acre plot of land where he is planning to settle his family. Current he lives on and cultivates a one acre section of his parent's land, but he feels he needs to move to his new piece of land to make room for his younger brother.

He cited high petrol prices as a major constraint to the profitability of his enterprise, since he uses a petrol irrigation pump. Marketing problem is his other major hindrance in the activity. He feels that the market fee charged by the city council of Nairobi is excessive. He and other traders have held talks with the municipal officials in charge of the market and are waiting for feedback. According to Mr. Githega, the main factor constraining other farmers in the area from becoming involved in commercial horticulture is the lack of capital required to buy a water pump.

Case 4: An accounts-clerk turns to passion fruit

Karimi is in his mid-thirties and started growing commercial horticulture in 1999. Before then, he was an accounts-clerk with the city council of Nairobi. His major motivation came from the observation that a friend who had resigned from Unilever-Kenya to grow commercial passion fruit had improved his lot greatly. Karimi resigned his job and uprooted his 0.25 acres of tea to plant passion fruit trees. There was a strong market demand in both the local and export market. The export market offers a higher price, but it is very demanding in terms of quality and only about 50% of his output is of export quality.

Karimi had a bad start: after only one season, his first crop of passion fruit was completely destroyed by counterfeit fungicides. The production of passion fruits is constrained by *muthu* birds, and protecting the fruit is very labor intensive. Since then, the crop has done better and the well-being of his family has greatly improved. With the savings from passion fruit production, he bought a one-eighth acre plot in Kirinyaga town, where he plans to put-up a residential rental house. He has also been able to take his son to a better school.

He cited lack irrigation as the major factor constraining other farmers in his area from growing fruits and vegetables as a commercial activity. During dry spells, he has to pay casual laborers to manually carry water a bole-hole on the farm. With regard to passion fruit growing, which is a fairly new activity in the area, he cited lack of knowledge about production methods, high costs of fruit tree planting, the long waiting period before the first harvest (about six to nine months), and labor-intensity as the major constraints. When asked how the government could assist horticultural producers, he said that greater effort was needed to control the quality of agricultural chemicals and regulate input stockists. He does not have any other agricultural enterprise.

Case 5: A long-time horticultural grower

Joyce Wambui and her husband have been growing commercial horticultural crops since they started a family in 1981. They started with a tomato crop for sale. Last season they cultivated a crop French bean. At the time of this interview, they were harvesting a crop of sweet corn. In their own assessment, they feel that the horticultural activity have afforded their family a relatively good livelihood. From the proceeds of the activity, they are able to pay their children's school fees. In addition, they have, bought a dairy cow and a pair of oxen, and they have a brick-house under construction.

One major concern, which they explained is shared by many horticultural growers in the area, is that they have started observing problems with the soils. They explained that tomato and some varieties of French beans and even the traditional varieties of bananas have

been affected by a wilting disease. They were concerned that they may already be experiencing the problem affecting Kibirigwi Irrigation scheme (see below). To deal with this from, they explained that they have shifted from French bean and tomatoes to sweet corn. Another problem experienced in the area is poor water–use management. During dry spells, farmers down steam do not get sufficient water. To solve this problem the farmers in the areas have formed the Kutus-Kiriti Water Furrow Farmers' Group. However, although the group has designed a system of water use shifts, it has not been able to enforce the new system. The group is also encouraging farmers to use pipes to extract water from the main furrow instead using lateral furrows. This effort has been more successful, mainly because the pipes help control the soil problem cited above.

Case 6: A horticultural farmers' group.

The Kathiriti-Kanjau Horticulture Growers is a registered farmers' self-help group. It was founded in the year 2001 and has a membership of 27 farmers. This and other farmer groups in the area were formed, in part, by the desire to eliminate brokers and permit direct deals with the principal exporters. An official of the group explained that the growers recognized that the major function of brokers is to assemble large lots for exporters. The farmers realized they could achieve such lots by pooling their produce for collective handling by prospective exporters. Such groups are common in the area. They, on behalf of member-farmers, approach an exporter to seek contractual market arrangements. Such market arrangements offer a more liable market outlet as well as high prices as compared to the broker market. Through such arrangements, the exporter contracts the group to supply a certain quantity of produce per week depending on the market season. The exporter supplies the seed on credit with a promise to buy the entire produce. He recovers his cost from the group's sales proceeds.

The exporter also prescribes the recommended chemicals and production methods, as well as requiring farmers to uphold certain sanitary condition. The group recognizes that since member produce is pooled and marketed as one lot, there is an incentive for some members not to strictly follow the prescribed practices. Poor quality crops produced by such farmers downgrades the produce for the whole group with heavy losses for farmers adhering to the prescribed practices. The group has therefore employed a field supervisor charged with the responsibility of supervising and monitoring production practices to ensure that farmer-members follow the prescribed methods. The supervisor was trained by the exported. The group only met his transport cost to Nairobi and his/her subsistence. The exporter offers free training.

With encouragement from the Department of the Social Services, under which the group sought legal recognition, the group has implemented a savings and credit schemes. The scheme currently provides members with credit to meet harvesting labor costs. The group is also planning to issue dividends from any surplus savings.

The group cited poor market agreement as the major problem market constraining collective marketing. The agreements achieved are usually asymmetrical with the buyer having the upper hand. In particular, the group explained that exporters do not conduct grading on the field. The current practice is for buyer to collect the whole produce delivered and to grade it in the absence of the farmer representative. The group only receives communication on the quantities meeting the respective grades. There was a general concern that exporter may be using the grading to pass all market risks and uncertainties to the farmer.

Summary

In spite of the variety of crops and experiences, there are some common themes that come out of the case studies. First, success in horticultural production involves a continuous series of experiments and adjustments. Rarely do farmers "get it right" the first time, and often several crops are tried. Second, the capital cost of irrigation pumps and the institutional issues of water management are perceived to be major constraints on horticultural production. Third, farmer groups play an important role in reducing the transaction costs between small farmers and exporters. These groups allow exporters to distribute inputs on credit, to assemble the output, and to recover loan repayments with many small farmers. Brokers sometimes play this role, but growers feel they are better off working through a farmer group. And fourth, most of the farmers interviewed felt that commercial horticultural production had made a significant contribution to the well-being of their families. In many cases, the additional income is used to buy land and/or to pay school fees.

5. FRUIT AND VEGETABLE MARKETING

The success of the fruit and vegetable sector is largely based on the efficiency and flexibility of the marketing system. This is partly because a large share of the potential demand for fruits and vegetables is in urban areas and in foreign markets, so that the volume of horticultural production is highly dependent on markets to link producers and consumers[22]. In addition, the perishability of fruits and vegetables makes prices more volatile and production more risky, thus increasing the potential gain from the exchange of marketing information between producers and traders. Third, fruit and vegetable production requires more labor, more purchased inputs, and more skill than do grains and legumes,

[22] In contrast, the bulk of the market for staple foods in a developing country is typically in rural areas, so that the volume of production is less sensitive to the efficiency of the marketing system.

implying that the transmission of credit, inputs, and technical assistance is often necessary. The second and third factors suggest that vertical coordination between producers and traders is important in fruit and vegetable marketing, particularly when the producers are smallholders.

This section describes the fruit and vegetable marketing system in Kenya. We begin with a discussion of some of the marketing institutions and then describe the main characteristics of different types of market channels. Because of the diversity of the sector, however, we are only able to provide a brief outline

MARKET INSTITUTIONS

Unlike other major agricultural sub-sectors, where both external and domestic trade has been under tight government controls, the marketing of horticultural products has generally been free of direct government interventions. With the exception of onions, the government has not been directly involved in the pricing or performance of physical functions of horticultural marketing. The role of the government has been minimal and mainly confined to regulatory and facilitative functions (Kimweli 1991). The remarkable performance of the industry has been ascribed to this policy, which engendered autonomy in production and marketing decisions thus fostering significant local private initiatives and dynamism within the industry.

The Horticultural Crop Development Agency (HCDA) was established in 1967 under an Act of Parliament. It is a government parastatal charged with the responsibility of promoting the development of horticultural crops, licensing exporters, and disseminating information on horticultural marketing. Initially, the HCDA was involved in the direct export of onions and a few other horticultural commodities. In 1986, however, the

government decided to leave horticultural exports to the private sector, and the HCDA withdrew from this activity.

Currently, HCDA is funded by a levy (12 cents per kilogram) on horticultural exports and through support from various international organizations (Lambert 2002). Unfortunately, the fact that HCDA is funded by a tax on exports creates an incentive for exporters to under-state fruit and vegetable exporters, compromising perhaps the main task of HCDA which is to gather and disseminate information about the sector. Djikstra (1997) reports that the some farmers and exporters criticize the HCDA for failing to provide useful information to farmers in exchange for the tax. One report suggests that HCDA "has played little role in the past decade, staying safely on the sidelines" (Ebony Consulting International 2001).

Other government involvement in the industry includes provision of extension services and promotion through research and development. The importance attached to the industry is reflected in the fact that the Ministry of Agriculture and Rural Development (MoARD) has a full-fledged Horticultural Division charged providing extension services to producers. Further, Kenya Agricultural Research Institute (KARI), the national agricultural research institute, has, as part of its research stations, a National Horticultural Research Institute charged with research and development of horticultural crops.

The Kenya Plant Health Inspectiion Service (KEPHIS) became operational in 1997 with a staff of 287. One of KEPHIS's tasks is to inspect imported and exported agricultural commodities and to issue required phytosanitary certificates for export shipments. A team of 22 inspectors cover the fresh produce and flower sectors. KEPHIS is seeking recognition by the European Union Commission as a "competent authority," which would delegate most

inspection responsibilities to KEPHIS and facilitate the entry of Kenyan exports into the E.U. Its role in the horticultural sector is likely to increase with the rise in sanitary and phytosanitary requirements for exporting to the E.U. (see Jaffee 2003 for more detail).

The Fresh Produce Exporter Association of Kenya (FPEAK) is a non-governmental organization formed in 1975, which currently has 80 members. Its activities include market research, representing exporter interests to the government, liason with research and regulatory organizations, support for smallholder outgrower schemes, and the drafting and implementation of the Code of Practice for horticultural producers. FPEAK has been supported by USAID (though funding has recently expired) and recieves income from a small levy (5 cents per kilogram) on exports. Although FPEAK traditionally represented small and medium exporters, larger exporters are beginning to join to deal with regulatory issues and new European environmental regulations.

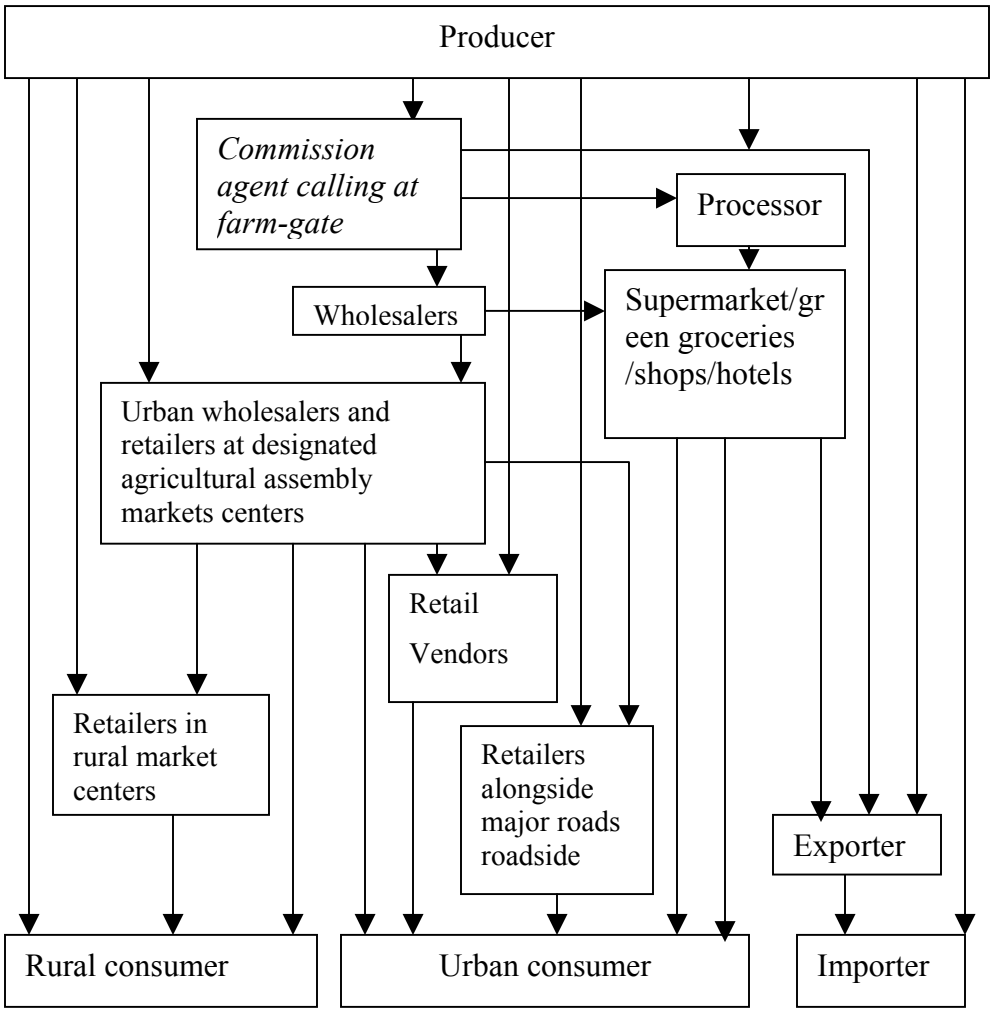
FPEAK, in collaboration with HCDA and others, have drafted a 70-page Code of Practice for horticultural growers and exporters (FPEAK 1999). The Code is designed satisfy European importers that Kenyan horticultural products are produced in an environmentally-friendly way with due regard for worker health and safety. There is no legal enforcement mechanism, but with European certification of the Code, it is likely that importers will pressure exporters to adhere to the standards. Some have expressed concern about the cost and feasibility of meeting and documenting compliance with the new Code. (Harris et al. 2000; Ebony Consulting International 2001).

MARKET CHANNELS

Market channels vary widely depending on the commodity, the location of the final consumer relative to the farmer, and the degree of processing. It is convenient to distinguish

between market channels to serve rural consumers, urban consumers, and the export market. Figure 3 summarizes the main market channels for each type of consumer, but it is important to recognize that this diagram necessarily simplifies the situation, since market channels vary widely across commodities and regions. Some of this diversity is described in the following sections.

Figure 3--Horticultural marketing channels



Source: Based on author's interviews.

Market channels for rural consumers

Horticultural producers easily access nearby rural consumers through direct marketing channels involving sales at the farm-gate or at rural market centers. The smallest rural markets are informal and periodic, with one or two market days per week. These markets are located close enough to production areas so that the produce is transported to market by head-load and by bicycle. At these markets, transactions are often directly between farmers and consumers.

Larger rural markets are registered and supported by the local government (county councils). These are also periodic, though trade may take place on non-market days as well. They are more likely to have permanent stalls where traders sell to consumers and other traders. These larger markets draw farmers from greater distances, so the produce may be brought to market on the top of mini-buses and by small trucks (Dijkstra 1997 and 1999).

Because of the range of agro-ecological conditions in Kenya, different regions specialize in different types of fruits and vegetables. Thus, there is some long-distance rural-rural trade in fruits and vegetables. These goods often pass through wholesalers in large urban markets, giving rise to the phenomenon of urban-rural flows of produce.

Market channels for urban consumers

Produce is brought from rural to urban areas through a chain of intermediaries that may include assemblers, brokers, wholesalers, and retailers. Produce is brought to the urban markets by independent assemblers or by wholesalers agents who purchase directly from farmers or gather produce from rural markets. Transportation may involve minibuses (for small quantities) or trucks (for larger quantities). Because of the widely ranging agro-ecological zones and the associated geographical distribution of production, long distance traders and transporters play a very crucial role in moving fruits and vegetables to the urban

markets. For the same reason and because of the small sizes of farm production, commission brokers, acting on behalf of large and long-distant traders, play an important role in searching for supplies and organizing procurements into economical loads. Dijkstra (1999) shows that farm-gate sales of potatoes to "collecting wholesalers" makes sense for the farmer because the traders have lower marketing costs due to economies of scale. Nonetheless, farmers often feel exploited by traders and express a strong desire to deal directly with the principal buyers, with some forming into commodity-specific community based groups to organize collective sales in order to by-pass the agent.

Horticultural cooperatives have been promoted by the government as a way to avoid "exploitation" by traders. Although cooperatives are active in marketing coffee, cotton, and dairy products, horticultural cooperatives are rare in Kenya. Attempts in the 1980s to organize farmers into a Horticultural Cooperative Union were beset with serious management difficulties leading to their abandonment. According Dijkstra (1997), farmers do not trust cooperatives because, in the past, farmers were forced to market their output through inefficient and sometimes corrupt cooperatives that were created and managed by the government.

Generally, every major urban center in the country has two markets, a wholesale and a retail market, at locations designated by the local government. The markets are administered by urban councils of the local governments. The councils are charged with the responsibility of providing the markets with necessary facilities, including concrete floors, roofed sheds, display benches, security, running water and toilets as well as to enforcing sanitation. To finance and maintain the facilities, the councils levy a cess from traders using the market facilities. As shown in Figure 2, the council markets are the main market contact

points for distribution of horticultural commodities to urban areas. The state of the markets, however, varies greatly with most experiencing a serious problem of congestions. The authorities often have trouble separating the retail and wholesale functions, as retailers often "invade" wholesale markets (Dijkstra 1997).

Over the years, roadside-market assemblies have developed as convenient target sites for motorist, who stop for a snack or to buy fruits and vegetables to take home. Produce commonly sold at roadside contact points includes pineapples, ripe bananas, oranges, potatoes, green peas, and carrots. Green maize, boiled or roasted on the cob, is also a common snack sold alongside major roads. Roadside-sellers procure suppliers either directly at farm gates or from urban agricultural market assemblies. Some producers also retail own produce at the roadsides.

Fruits and vegetable retailers comprise the principal linkage between the urban markets and the final urban consumer. These are typically small-scale traders operating in make-shift-sheds in high-density residential areas, on pavements in busy urban streets, or hawking produce door-to-door in the residential areas. Such vending is common with most other agricultural commodities as well as other general consumer products. It a major component of a fast growing informal sector . However, the legal status of the activity is not clearly defined. Major issues of concern are the congestion of urban streets and sidewalks and the sanitary conditions under which produce is sold.

Market channels for processed fruits and vegetables

Studies of Kenya's horticultural processing sub-sector show that the market for the processed food products is highly segmented (Maritim 1994). The main processed commodities include canned vegetables and fruits, jams and marmalades, dehydrated vegetables, spices and food seasoning, and frozen products and juice concentrates. Canned

vegetables and fruit preserves are generally targeted to affluence consumers in Kenya. According, they are distributed through supermarkets, specialty shops, hotels, and other outlets catering to high-income consumers.

Juices and dehydrated vegetables, on the other hand, are target for a wider market segment with different marketing strategies for the different market sub-segment. Low-income groups are reached with smaller packages through shops and kiosks. Processor are also devoting special marketing strategy towards the school children segment with small packages and ease in dispensing of the content. Spices and food seasoning are generally targeted for the high-income groups. Frozen products and juices concentrates are mainly targeted for the export market.

Apart from large and medium processing entrepreneurs, observations in major urban centers reveal that individual and village-based small-scale processors, principally producing fruit juices, have recently emerged with the liberalization of the sub-sector. However, there is little documentation of their operations. A study by RELMA (2001) concluded that local processing of avocado is limited to cottage industries with potential opportunities in a wide market segment.

Export market channels

Export channels vary widely, but they can be roughly classified according to the degree of vertical integration. At one extreme is the verticallly integrated Del Monte, which produces pineapples on its own plantation in Thika, processes the pineapples, arrange shipping to Europe or other destinations, and even distributes the goods to supermarkets and wholesalers in foreign markets. This system is not limited to canned pineapple, however.

Dolan and Humphrey (2000) find that, among the four largest fruit and vegetable exporters, 40 percent of the production was from their own farms (including own and leased land)[23].

Another channel involves exporters who contract farmers to produce fruits and vegetables for export. Dijkstra (1997) reports that almost all horticultural exporters rely to some degree on contract farmers. The agreements between exporters and farmers are often unwritten and are subject to frequent disputes. If the market price falls, the exporter may fail to pick up the produce and try to source elsewhere. If the market price rises, farmers may sell elsewhere and default on the agreement (Jaffee 1995; Kimenye 1995). When exporters contract directly with farmers, they are often large or medium-scale farmers Among the four largest fruit and vegetable exporters, about 40 percent of supplies are obtained from large-scale commercial farms and only 18 percent from smallholders (Dolan and Humphrey 2000).

A third channel involves various types of intermediaries between the farmer and the exporter. Small farmers and those that do not live in the main production zones often rely on traders or brokers to assemble produce for resale. Sometimes a large farmer who has a contract with an exporter will coordinate the production and marketing of the some of the produce by smallholders living nearby. These are more likely to be spot market transactions. A third type of intermediation is community-based organizations. For example, in the production of French beans for export, farmers have created groups to ensure a minimum level of production to attact exporters or traders. Through self-selection and peer-monitoring, such groups also provide some assurance of quality and commitment. Exporters use spot market purchases to fill in gaps between their regular supply (from own production

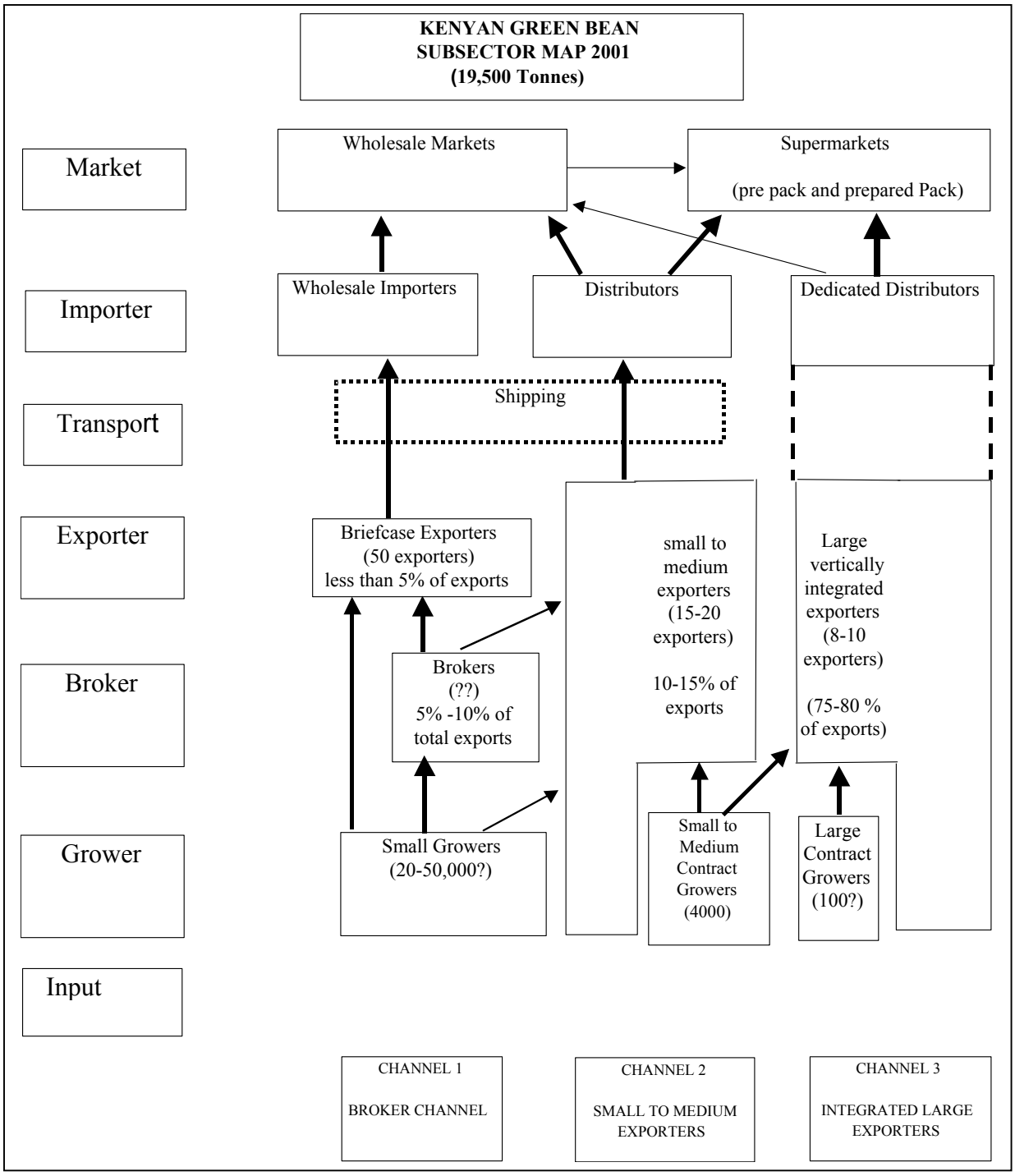
[23] As noted earlier, however, exporter may wish to exaggerate their own-farm production to reassure importers.

and contracts) and their commitments to distributors and supermarkets overseas (Jaffee 1995; Ebony Consulting International 2001).

In the early 1990s, there were about 200 licensed fresh produce exporters, but only 50 were full-time dedicated exporters. The other 150 were traders who enter the market as opportunities arise (Jaffee 1995). The smallest and most transient of these are called "briefcase exporters." Few of the fruit and vegetable exporters are foreign companies. One third of them are Kenyans of South Asian origin, who make use of kin connections to export produce, particularly Asian vegetables, to the United Kingdom (Dijkstra 1997). Several observers have noted that the export sector has become more concentrated over the 1990s. This trend is a response to the increasing role of supermarkets as importers and the premium they give for reliability of supply, consistency of quality, and documentation of production conditions. Exporters are being required to monitor and document production practices affecting food safety (such as chemical use) and, increasingly, worker conditions and environmental impact. Furthermore, the trend toward pre-packaging and labeling exports so they are ready for retail distribution increases the economies of scale in exporting (see Kamau 2000; Dolan and Humphreys 2000; ECI 2001; and Jaffee 2003).

The complexity of export marketing is illustrated by Figure 4, which shows the different channels used to export French beans as estimated by Ebony Consulting International (2001). According to this report, 8-10 large-scale exporters with foreign distribution capacity account for 75-80 percent of the export volume, while small and medium-size exporters represent another 10-15 percent (Ebony Consulting International 2001).

Figure 4--Marketing channels of French beans



Source: Ebony Consulting International (2001)

It should be noted that most exporters are involved in more than one type of marketing channel simultaneously. For example, of the eight largest green bean exporters, two rely primarily on own-production and contracts with large-scale farmers. Two others rely mainly on contracts with smallholders. And the other six make use of a variety of strategies for obtaining supplies (Ebony Consulting International 2001).

6. COMPARISON WITH CÔTE D'IVOIRE

BACKGROUND

As of 1999, Côte d'Ivoire was the main horticultural exporter in West Africa, exporting US$ 140 million of fruits and vegetable in 1999. This placed Côte d'Ivoire at approximately the same level as Kenya and second only to South Africa among sub-Saharan African countries (FAOSTAT 2002). This section examines the development of the horticultural sector in Côte d'Ivoire and the factors that contributed to the growth in this sector. The goal is not to provide a comprehensive analysis of horticultural exports, but rather to highlight the variety of experiences in horticultural development across African countries, as well as to identify some similarities with the Kenyan case.

Over the first two decades of independence, Côte d'Ivoire was considered an African success story. The country had maintained a high rate of economic growth (7.2 percent annually in real terms over 1960-1975) based largely on agricultural exports produced by small-scale farmers. The government successfully diversified its exports, with the contribution of cocoa and coffee to agricultural export revenue falling from over 90 percent in 1961 to 77 percent by 1975. Paradoxically, government support for the agricultural sector led to structural transformation in which the share of the primary sector (crops, livestock,

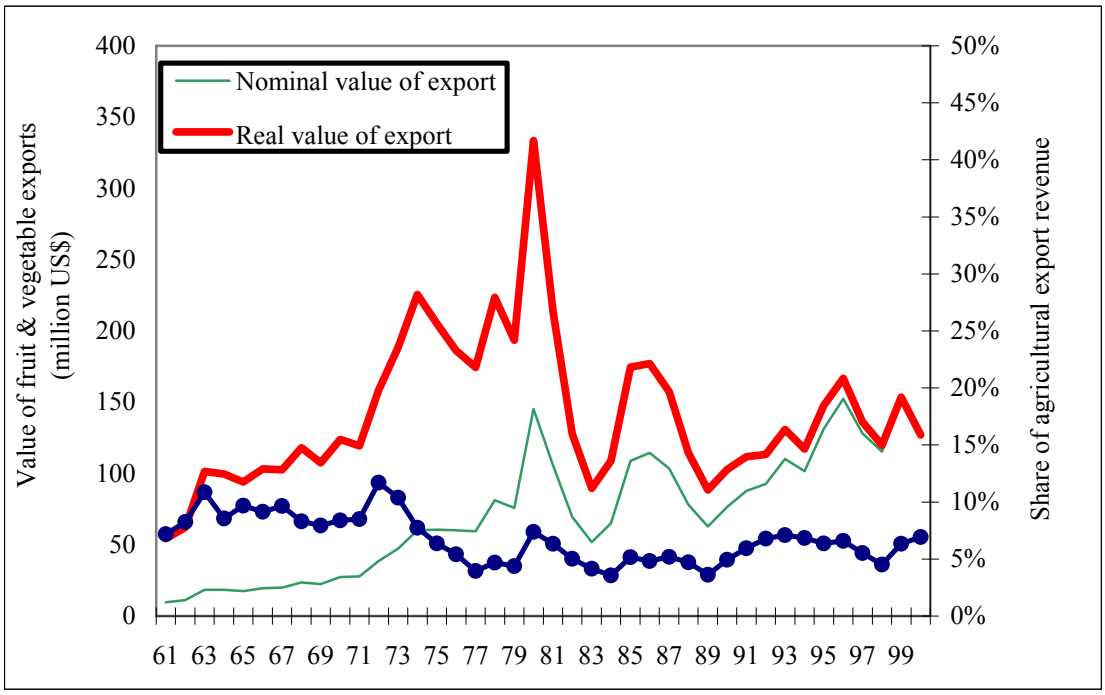
forestry, and fisheries) in gross domestic product fell from 43 percent at independence to 28 percent in 1974 (Tuinder 1978: 322-323; FAOStat 2002).

As in Kenya and many other developing countries, however, the government responded to the commodity price boom of the 1970s by embarking on a public expenditure and investment spree that could not easily be scaled back when the boom subsided. In the 1980s, adverse trends in world prices and the accumulation of public debt forced the country into a series of structural adjustment programs with the International Monetary Fund and the World Bank (Widner 1993; Zartman and Delgado 1984). More recently, the reputation of Côte d'Ivoire for political stability was undermined by a coup in 1999, allegations of rigged elections in 2000, a coup attempt in 2001, and a armed rebelion in 2002 (Government of Côte d'Ivoire 2003). Here, we focus on the challenges and opportunities related to horticultural exports from Côte d'Ivoire up to the recent political problems.

EVOLUTION OF THE IVORIAN HORTICULTURAL SECTOR

Fruit and vegetables exports from the Côte d'Ivoire were worth almost US$ 127 million in 2000, somewhat less than Kenyan fruit and vegetable exports. However, Ivorian exports have not grown as quickly, and they contribute less than 7 percent of the value of agricultural exports (see Figure 5).

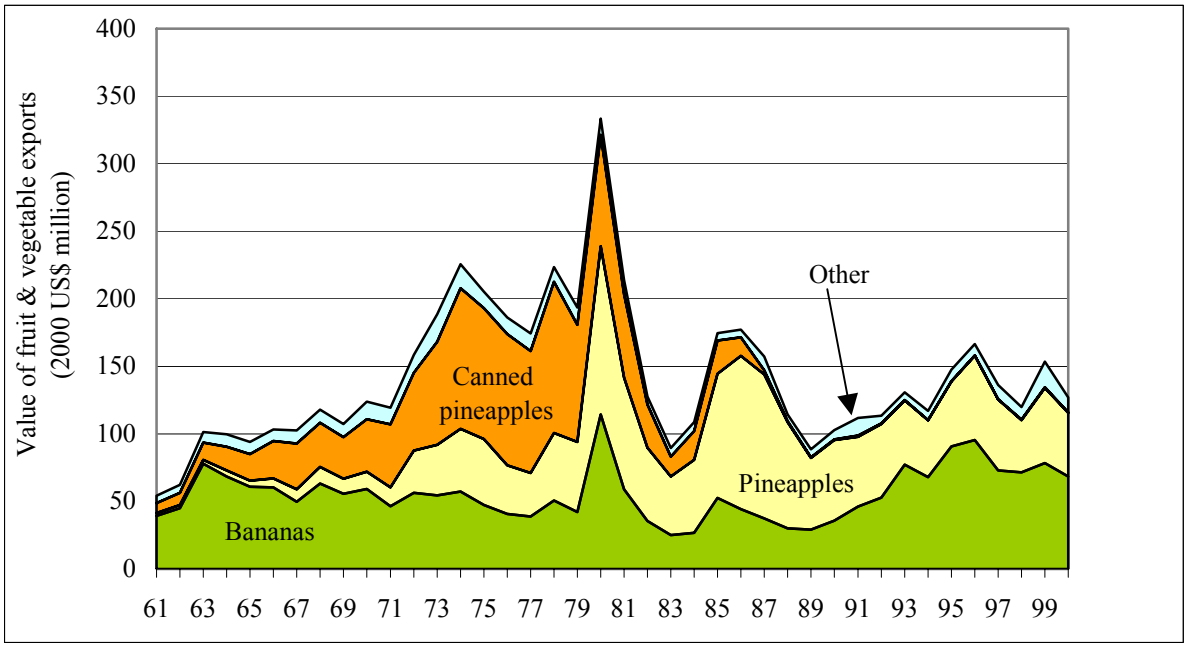
Figure 5--Value of Ivorian fruit and vegetable exports and share of agricultural export revenue



Source: FAOStat for agricultural statistics and U.S. Department of Commerce for U.S. consumer price index.

Unlike Kenya, where horticultural exports are relatively diversified, the horticultural exports of Côte d'Ivoire are based largely on two commodities, pineapples and bananas, each of these commodities has a long history in the country (see Figure 6). Bananas and plantains have been grown in West Africa for centuries, and banana production for export in Côte d'Ivoire began in 1933, when European settlers adopted the crop in response to low prices of cocoa.

Figure 6--Trends in the composition of Ivoirian fruit and vegetable exports



Source: FAOStat for agricultural statistics and U.S. Department of Commerce for U.S. consumer price index.

Exports were quite modest, however, and Guinea was the dominant supplier of bananas to France at the time (Sawadogo 1977: 119). During the 1950s, production of export crops by African smallholders expanded in spite of policies favoring European growers. In coffee and cocoa, African smallholders came to represent the bulk of production. The banana and pineapple sectors, however, evolved toward a dualistic structure with both large-scale and small-scale production. Because of the cost of transportation and the perishability of the product, banana production for export was (and remains) concentrated along paved roads near Abidjan. By the time of independence, banana exports were about 90 thousand tons, representing about 5 percent of the value of agricultural exports.

Banana exports have benefited from the highly regulated European banana market. France, the United Kingdom, and other European countries gave preferential access to exports from African, Caribbean, and Pacific (ACP) countries, most of which were former

colonies[24]. In the case of bananas, this policy has given favorable treatment to exports from Côte d'Ivoire, Cameroon, other African exporters, and a few Caribbean exporters at the expense of lower-cost producers in Latin Amercia. The restrictions on European imports made banana exports quite remunerative, since European prices were significantly higher than world market prices, but import quotas limited the volume. In spite of a peak in 1974, banana exports from Côte d'Ivoire over the period 1961-1989 averaged 120 thousand tons per year, no greater than the level in the early 1960s.

The export of pineapple products also began during the colonial period, when two processing plants were established with foreign investment. At independence, the export of pineapple products was less than half the value of banana exports (2 percent of agricultural exports). However, these exports grew steadily through the 1960s and 1970s so that, by the early 1970s, the export value of pineapple had surpassed that of bananas. At this time, most of the pineapple exports were in the form of canned pineapples and single-strength pineapple juice. In the 1980s, however, Thailand expanded exports three-fold, increasing its market share of the canned pineapple market to over 50 percent and pushing world prices down (Loeillet 1997). Also during the 1980s, economic reforms in Côte d'Ivoire reduced subsidies for many state enterprises and closed others, including CORFRUITEL, the parastatal in charge of marketing fruit (Rouge and N'Goan 1997). As a result, Côte d'Ivoire exports of canned pineapple and pineapple juice had practically disappeared by the late 1980s.

Much of the Ivorian pineapple production, however, switched over to fresh pineapple export to Europe by sea-freight, using the same refrigerated freighters ("reefers") used to

[24] The 1957 Treaty of Rome established preferential access to markets in France, Greece, Italy, Portugal, Spain, and the United Kingdom for exporters from ACP countries. Exports from other countries, most notably in Latin American, were subject to a quota and 20 percent duty. Germany maintained a duty-free import policy. The other five member states maintained a 20 percent duty on banana exports from non-ACP countries. These disparate policies continued until 1993, as discussed below (Guyomard, Laroche, and Le Mouel 1999).

transport bananas. This move took advantage of the advantage of Côte d'Ivoire in terms of its proximity to Europe, a factor much more important in the fresh pineapple trade than in the market for canned pineapple. This market is not without its problems, however. In the late 1980s, Côte d'Ivoire began to lose market share to Central American and Caribbean fresh pineapple exporters. After supplying close to 90 percent of the European market for fresh pineapple in the mid-1980s, their market share fell to two-thirds in 1990 (Rouge and N'Goan 1997).

The 1990s brought several changes favorable to Ivorian fruit and vegetable exports. First, in 1990s, the Office Centrale des Producteurs-Exportateurs d'Anana et de Bananes (OCAB) was formed to represent the interests of exporters, set quality standards, and facilitate communication. OCAB has reduced the number of "approved" exporters of fruit in an attempt to maintain quality standards. It also organizes the charter of refrigerated ships to transport bananas and pineapples to Europe.

Second, in 1993, after much debate, Europe harmonized its banana import policies to make way for the single European market. Although the United States and Latin American exporters pushed for a more liberalized system, as existed in Germany, the EU maintained the system of preferences for ACP countries, extending it to all members of the European Union. This expanded the size of the market to which Côte d'Ivoire and other ACP producers had preferential access[25].

[25] Under the new regime announced in 1993, EU and ACP exporters were entitled to duty-free access to European markets up to 858 thousand tons, with each exporter receiving a quota. Other imports were subject to a 2.0 million tons and a duty of 100 ECU/ton tariff that applied to non-ACP exporters only. Above 2 million tons, banana imports were subject to duties of 750 ECU/ton for ACP bananas and 850ECU/ton for other bananas. A fund was established to assist ACP exporters in the transition. There were two challenges to the new rules under the General Agreement on Trade and Tariffs (GATT). In both cases, GATT panels ruled against the EU, but adoption of the panel decision was blocked by the EU and ACP countries. To appease Latin American nations, the EU negotiated concession to four of the five Latin American complaintants. This "Framework Agreement" expanded the quota to 2.2 million tons, increased the country-specific quotas of these

Third, the 50 percent devaluation of the CFA franc in January 1994, helped stimulate the economy, particularly the export sectors.

The net effect of these three factors has been to reanimate fruit and vegetable exports from Côte d'Ivoire. Banana exports grew from 95 thousand tons in 1990 to 215 thousand tons in 1999, while fresh pineapple exports expanded from 135 thousand tons to 183 thousand tons over the same period (FAOStat 2003). Côte d'Ivoire became the second-largest fresh pineapple exporter in the world after Costa Rica (Ti 2000). In addition, the export of mangoes has grown rapidly, increasing seven-fold over the 1990s to reach US$ 5 million. As of 2000, the total value of fruit and vegetable exports was US 127 million, of which 54 percent was bananas, 37 percent fresh pineapple, and 4 percent was mangoes.

In the last two years, two international agreements have been signed that will affect Côte d'Ivoire horticultural exports. Under the "Everything but Arms" policy, implemented by the EU in March 2001, duties and quotas on almost all goods from the poorest 48 countries (including almost all of sub-Saharan Africa) have been eliminated. Although the policy excludes bananas, it will facilitate exports of other fruits and vegetables from Côte d'Ivoire and other African countries. Quality and sanitary and phyto-sanitary barriers remain a key constraint to horticultural exports.

Under pressure from the U.S. and Latin America, supported by WTO rulings, Europe has reduced the preferential treatment of ACP countries in its banana imports and promises to adopt a tariff-only system by 2006. As a result, Côte d'Ivoire and other ACP producers will come under increasing competitive pressure from Ecuador and other low-cost Latin American exporters (Dickson 2002; Lambert 2002).

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countries, reduced the non-ACP duty, and allowed these countries to issue export licenses, effectively transferring the quota rents to the exporting country governments (see Dickson 2002 and Guyomard, Laroche, and Le Mouel 1999).

POVERTY IMPACT OF IVORIAN HORTICULTURAL EXPORTS

Who benefits from fruit and vegetable exports from Côte d'Ivoire? According to Lambert (2002), the small-scale rainfed banana farms that used to dominate the sector have given way to medium and large-scale irrigated farms of 100 to 1000 hectares, mostly owned by Europeans and selling directly to French importers. In addition, exporters such as Chiquita and the *Compangie Fruitière* are vertically integrated with their own plantations. One factor behind this consolidation is the competitive pressure from non-ACP countries to reduce the cost of production. Another factor is the increasingly strict marketing requirements by European importers regarding the size, quality, and consistency of the fruit and the use of pesticides and other chemicals in production. The implication is that most of any positive impact in terms of poverty reduction would be through the employment of workers on the plantations. It is estimated that there are 35 thousand people employed by the banana and pineapple plantations.

In pineapple production, on the other hand, smallholders continue to dominate. According to Rouge and N'Goan (1997), 70 percent of Ivorian pineapple exports are produced by smallholders with 0.5 to 10 hectares. The remaining 30 percent is produced by large plantations, including some owned by the vertically integrated banana companies such as *Compagnie Fruitière* and Chiquita. One reason for the greater involvement of smallholders in pineapple production compared to banana production is that the initial investment cost of establishing a plot is estimated to be 3-4 times as great for bananas (Rouge and N'Goan 1997).

Mangoes are the third most important horticultural export. They are produced by smallholders in the north of the country, as well as by farmers in Burkina Faso and Mali who export via Côte d'Ivoire (Lambert 2002). Thus, it is likely that a high proportion of the

mangoes are produced by poor households. Given the cost of getting mangoes to the coast and then to Europe, the farm-gate price may be low, so it is not clear whether mango sales are an important component of the income of growers.

FACTORS BEHIND THE IVORIAN SUCCESS

The success of the Ivorian fruit and vegetable sector is a qualified one. Fruit and vegetable exports from Côte d'Ivoire have not grown as fast as those of Kenya, and the role of smallholders is less important than in Kenya. On the other hand, Côte d'Ivoire is one of the three largest exporters of fruits and vegetables in sub-Saharan Africa and it maintained solid growth in the 1990s. Although smallholders play a less important role than in Kenya, tens of thousands of rural households depend on the sector for their livelihoods, either as farmers or agricultural laborers.

Several factors lie behind the success (albeit qualified) of fruit and vegetable exports from Côte d'Ivoire. First, Côte d'Ivoire has long been known for its political stability. Until the last few years, Côte d'Ivoire had a reputation for being the most politically stable country in West Africa. President Felix Houphouet-Boigny served as president from independence in 1960 until his death in 1993. He was successful in promoting economic growth and minimizing political turmoil until the 1980s when commodity prices fell. The advent of multiparty democracy in 1990 is said to have created (or perhaps just exposed) ethnic and religious divisions.

Second, President Houphouet-Boigny has, for the most part, supported agriculture-led growth. He came to prominence representing the interests of African cocoa growers during the colonial period. As president, he drew his support from the rural areas and maintained a cocoa farm himself. Although agriculture was taxed directly through the policies of the

marketing boards and indirectly through over-valued exchange rates, investment in rural infrastructure and agricultural research reflected the priority given to agriculture.

Third, Côte d'Ivoire has benefited from its proximity to European markets. Côte d'Ivoire is just 8-10 days by sea freighter from Marseilles. Although it also benefits from frequent air-connections with Paris, this is less important since most of the Ivorian fruit and vegetable exports have been by sea-freight.

Fourth, the government has had relatively limited involvement in production and marketing, particularly in the horticultural sector. Although the Ivorian agricultural policy was more interventionist than that of Kenya, President Houphouet-Boigny had a more pro-market orientation than most of its West African neighbors. In particular, Côte d'Ivoire maintained close ties to France, while many of its neighbors rejected European involvement and experimented with different variants of socialism.

7. CONCLUSIONS

As described in the introduction, this paper was motivated by three questions regarding the development of the Kenyan fruit and vegetable sector, particularly the export sector.

- Does the horticultural sector of Kenya and Côte d'Ivoire constitute a valid success story in African agriculture?
- What factors have contributed to the historical development of the horticultural sector in the two countries?
- What lessons can be drawn from these examples for policymakers in other African countries and for the international development organizations?

We now return to those questions as a way of organizing the conclusions.

IS HORTICULTURE A SUCCESS STORY?

Certainly, horticulture in Kenya can be considered a success in terms of export growth. Fruit and vegetable exports have grown from US$ 2-3 million at independence to over US$ 150 million in 1999. The sector has even grown as a percentage of agricultural exports, rising from 3 percent of the total at independence to 17 percent today. Although coffee and tea continue to dominate agricultural exports in Kenya, the growth of tourism and horticulture have reduce the vulnerability of the Kenyan economy to price swings in those two commodity markets.

It is more useful, though more difficult, to evaluate its success in terms of the impact on the lives of Kenyan families, particularly the poor. The fact that smallholders produce some 60 percent of the exported fruits and vegetables provides strong support for the idea that horticultural development has been good for the rural poor. The results of McCulloch and Ota (2002) suggest that farmers who participate in horticultural production earn higher incomes than their neighbors who do not. And the case studies presented in this paper, in spite of their non-systematic nature, seem to support the idea that when small farmers get involved in horticultural production for export, their incomes rise and this translates into more tangible improvements in standard of living such as being able to pay for school fees and purchase land.

The data from the 2000 Rural Household Survey suggest that almost all farmers, large and small, rich and poor, participate in some form of horticultural production. Better-off farmers seem to grow a wider variety of fruits and vegetables, but the percentage contribution of horticulture to income is fairly constant across income and farm-size categories. Somewhat surprisingly, the horticultural production of large farmers is no more commercially-oriented than that of small farmers. While higher income households tend to

be more commercially oriented, it would be a mistake to think of poor farmers (and small farmers) as subsistence farmers. Even among the poorest 20 percent of Kenyan farmers, 41 percent of the fruit and vegetable output is marketed.

And the gross margin analysis indicates that, under certain conditions, horticultural production can produce substantially higher returns per hectare than staple food crop production. For example, one crop of French beans can generate gross margins more than ten times greater than maize-bean intercropping.

What is the direct impact of horticultural exports on Kenyan smallholders? If smallholders account for about 47 percent of fresh produce exports and the farm-gate price is 60 percent of the F.O.B. price, then the direct benefits of fruit and vegetable exports to smallholders is about US$ 46 million. Estimates of the number of smallholders that participate in horticultural exports vary widely. Jaffee (1995) estimates that 13-16 thousand smallholders are involved in fresh produce export, while Swanberg (1995) cites a figure of 500 thousand. In their diagram of the French bean market channels, ECI (2001) shows 20-50 thousand small growers participating in French bean exports alone. If we assume the smallholder French bean exporters in the survey by Kamau (2000) are typical of smallholder exporters, this would imply about 108,000 smallholders in the export sector[26]. This figure must be considered highly speculative since we do not know if the sample was representative of smallholders producing export French beans, much less smallholders producing fresh produce for export.

[26] This calculation is based on US$ 46 million in total horticultural export revenue for smallholders, an average horticultural sales of about 32 thousand Ksh, and the June 1999 exchange rate of 70 Ksh/US$. Among those selling French beans in the 2000 Rural Household Survey, the average value of sales was just Ksh 14,000 or US$ 175, but these farms include those supplying the domestic market. The average value of horticultural sales in the survey carried out by McCulloch and Ota (2003) was 170 thousand shillings or over US$ 2000, but the average farmsize was 2.7 so it is not clear if the sample was limited to "smallholders."

Although less visible, it is likely that the indirect benefits associated with horticultural exports are greater than the direct benefits. First, the multiplier effect of injecting US$ 46 million annually into the rural sector generates benefits for other households and sectors who produce goods purchased by export producers. Second, this analysis has focused on smallholders producing for export, but it is important to recognize the employment effects of horticultural exports extend beyond this. Del Monte alone employs several thousand workers in its processing plants and estates. Third, the skills and institutional development stimulated by the horticultural export sector also serve to development the domestic horticultural market. Given the fact that 96 percent of fruit and vegetable production is consumed domestically, even small improvements in yield, post-harvest methods, and marketing efficiency in the domestic supply chain could have benefits to the economy that are large relative to the direct benefits of horticultural exports.

It is less clear whether to consider the Ivorian horticultural sector a success story. First, the sector has not grown in a consistent manner. In real terms, the value of fruit and vegetable exports in 1999 was still somewhat below the levels it reached in the mid-1970s and the mid-1980s. Second, the role of smallholders in the Ivorian fruit and vegetable sector is more limited. Bananas, the largest horticultural export, are produced mainly on large-scale farms and by vertically integrated multi-national companies. Certainly, there are thousands of farm workers whose livelihoods are supported by the banana sector, but it is likely that the benefits are less widely distributed among Ivorian households than it would be if banana production were based on smallholder production. Third, it is not clear to what degree the success of the Ivorian banana sector is based on European trade policies that discriminate against Latin American producers. It is not clear whether current levels of banana exports

can be maintained when Europe removes these preferential policies, a change which is not imminent but may be inevitable under World Trade Organization commitments.

Nonetheless, there are some positive signs in the Ivorian horticultural sector. First, the sector was able to adjust to the loss of the canned pineapple exports by developing fresh pineapple exports to Europe (Kenya attempted to launch fresh pineapple exports to Europe, but it proved uneconomical). In addition, Ivorian horticultural exports showed healthy growth (4.4 percent) over the 1990s, including expansion of smallholder crops such as pineapple, mango, and papaya for export. Although it is difficult to foresee the impact of the current political crisis in Côte d'Ivoire, it seems inevitable that the institutional and commercial development necessary to expand horticultural exports will be set back more than a few years.

WHAT FACTORS HAVE CONTRIBUTED TO THE SUCCESS?

Several factors have contributed to the success of the horticultural sector in Kenya and, in a more limited way, Côte d'Ivoire.

Geography and climate Kenya is favored with an equatorial latitude and bimodal rainfall that reduce seasonality, combined with a range of altitudes, allowing the production of tropical fruits such as mangoes, pineapple, and avocados, as well as temperate vegetables such as French beans. Furthermore, Nairobi and its airport are located in the western highlands, an area endowed with good soils and a suitable climate for vegetable production.

Similarly, the areas of Côte d'Ivoire most appropriate for banana production are along the cost, near the port of Abidjan. In addition, among countries with a humid-tropical climate Côte d'Ivoire is one of the closest by sea to major European ports.

Transportation infrastructure. The cost and duration of transportation to major markets in Europe is a critical factor in the success of the horticultural sector. Both Kenya and Côte d'Ivoire serve as regional hubs for air traffic. The growth of the Kenyan tourism industry and the consequent frequency of air connections with Europe has facilitated the development of fresh produce exports to Europe via air-freight. In Côte d'Ivoire, much of the horticultural export is by sea-freight, so investment and efficient management of the port in Abidjan is of critical importance. Domestic transportation infrastructure is also an important factor, since horticultural exports do not tolerate delays in getting to the airport. The Kenyan horticultural sector benefits from an extensive road network in the highland areas. It is estimated that much of the export vegetable production in Kenya takes place within 100 kilometers of the airport. Similarly, banana production in Côte d'Ivoire is concentrated along paved roads near the port.

Limited direct government intervention in horticultural markets. Another factor is that the Kenyan government has not intervened to any significant degree in horticultural markets to buy, sell, export, or set prices. In Kenya, the Horticultural Crop Development Authority was originally given authority to fix prices, regulate trade, operate processing facilities, and market horticultural goods. Based on its unsuccessful experience, the functions were pared back to regulation, market information, and advisory services[27]. State enterprises were actively involved in various horticultural processing operations, often as part of joint ventures with foreign companies. Most of the growth in horticultural exports, however, has been in fresh produce. In any case, the horticultural sector was never as tightly

[27] The HCDA maintained a monopoly on onion marketing and export briefly and later competed with private onion traders. In 1986, the government required HCDA to withdraw from direct marketing. It is probably not a coincidence that the only horticultural commodity the HCDA attempted to market is one of the least perishable vegetables.

controlled as the maize, coffee, and tea sectors were. In spite of the proliferation of state enterprises, the investment climate in Kenya was good, at least compared to many other African countries. This climate allowed investment in the horticultural sector by local and international firms, most notably by Del Monte in the 1960s.

Similarly, Côte d'Ivoire is said to have followed an agriculture-led development strategy and kept direct intervention in agricultural markets to a modest level. Probably the area of greatest direct involvement in the horticultural sector was in the pineapple processing, where joint ventures between private investors and various public institutions were the rule. When the export of processed pineapple products collapsed in the late 1980s, even this form of participation in horticulture disappeared. It is probably important not to exaggerate the importance of the lack of direct government intervention in horticulture. Even during the height of state intervention in agricultural markets in the late 1970s and early 1980s, few African governments ventured into the risky area of fresh produce marketing.

Policies allowing private and international investment. Both Kenya and Côte d'Ivoire have had relatively liberal policies regarding foreign investment and investment by local businesses. In both countries, foreign investment has contributed to increasing the capacity of horticultural production, processing, and export. In Kenya, Del Monte is the largest example, but Dijkstra (1997) lists 20 other private processors of fruits and vegetables in the country as of 1990. Lambert (2002) also stresses the importance of Kenya's "open skies" policy, under which exporters and shipping companies may charter planes in their own name. In Côte d'Ivoire, Chiquita and *Compagnie Fruitière* have played a central role in banana and fresh pineapple production and export.

Macroeconomic stability and realistic exchange rates. Both Kenya and Côte d'Ivoire had reputations for political and macroeconomic stability in the 1960s and 1970s, which is necessary to elicit long-term investments in productive capacity. Similarly, a realistic exchange rate, which gives exporters the full value of the foreign exchange they generate, is critical factor in stimulating exports, including horticultural exports. Although both countries experienced economic problems in the 1980s, the level of inflation and the extent of exchange rate over-valuation was modest compared to that experienced by some of their neighbors, including Tanzania, Uganda, and Ghana. The 1994 devaluation of the CFA franc provided important stimulus to horticultural exports (among others) in Côte d'Ivoire, contributing to the healthy 4.4 percent growth rate in fruit and vegetable exports over 1990-99.

Institutional innovation. Horticultural development requres a continuous process of institutional innovation at two levels. First, institutions are needed to address sector-wide externalities and coordination problems. For example, the adoption of a common code of practice, the exchange of market information, and funding of research and extension are activities that benefit the sector as a whole but cannot easily be carried out by an individual firm. Second, marketing institutions are needed to improve vertical coordination between farmers and trader/processors. This may include various types of contract farming, farmer credit groups, marketing cooperatives, or farmer associations.

The Kenyan government has allowed and (in some cases) promoted the development of a wide range of private marketing institutions such as the Fresh Produce Exporters Association of Kenya (FPEAK), local producer associations, self-help groups, and so on. In addition, it has allowed experimentation with a wide range of institutional arrangements

between farmers and buyers. In spite of early attempts to oblige processors to work with smallholders, greater leeway is now given for the most economical arrangement to evolve in response to market signals. Over the decades, Kenyan participants in the horticultural sector have accumulated considerable experience in managing the relationship between growers and buyers. Today, contract farming may be more widely used in Kenya than anywhere else in Africa, though conflicts between farmers and buyers are an almost universal feature of these schemes. One source of conflict is the fact that after a buyer provides the assistance needed by smallholders (in the form of seed, inputs, and credit) he faces the risk that other buyers will come and "poach" the harvest and the loan will not be repaid. Alternatively, if the market price falls, the buyer may refuse to honor its commitment or use grading as a pretext for refusing shipment. Arbitrary and non-transparent.grading procedures is a common complaint among contract growers.

In Côte d'Ivoire, the government has created a series of institutions to coordinate horticultural exports with varying success. In the 1960s, small-scale horticultural producers formed an export cooperative. In 1976, this was replaced by SICROFEL, a marketing board with a monopoly on horticultural exports. This approach failed due to high costs, bureaucratic procedures, and corruption. It was replaced in 1978 by COFRUITEL, a producer organization with greater participation by exporters but without a legal export monopoly (Hormann and Weitor 1980). More recently, the government created the Organisation Centrale de l'Ananas et de la Banane to coordinate the sector and provide information and other public goods. One of the biggest coordination tasks that the Ivorian horticultural sector faces is matching the supply of bananas and pineapples at the port with

the arrival of ships to transport them. Another is developing a strategy to address mounting concerns among importers regarding food safety, the environment, and working conditions.

Domestic demand. In Kenya, tourism expanded the domestic demand for high-quality fruits and vegetables. As hotels and restaurants established supply chains to supply this produce, they gave Kenyan farmers more experience with horticultural production and indirectly strengthened the infrastructure and logistical skills of traders, all of which facilitated the development of the horticultural export sector. Similarly, the domestic demand for Asian vegetable gave Kenyans experience in growing and marketing Asian vegetables. These factors facilitated the development of market channels to supply fruits and vegetables to Asian and European consumers overseas. Although less well documented, the large French population in Côte d'Ivoire before and after independence may have facilitated the development of the export fruit sector there.

International commercial links. The presence of the Asian community in Kenya has undoubtedly contributed to horticultural crop development. Before the 1970s, the Asian community created a demand for Asian vegetables, providing smallholders with valuable experience in these crops which would later be useful in serving the UK market. In addition, the presence of the Asian community made it easier to penetrate the UK market, first with Asian vegetables and later with French beans and other fresh produce. In the case of Côte d'Ivoire, multinational corporations (Chiquita and *Compagnie Fruitière*) offer a different solution to the problem of coordinating African supply and European demand. By vertically integrating production, processing, and distribution, the flow of information and credit is facilitated.

WHAT ARE THE LESSONS FOR OTHER AFRICAN COUNTRIES?

Clearly, some of the factors mentioned in the previous section are out of the control of public policy and investment. Little can be done to alter the geographic and climatic features of a country. Nor is it practical to alter the ethnic composition of a country to allow greater links with similar groups in Europe. On the other hand, most of the other factors carry lessons that are applicable for other countries.

Geography and climate. Although government policy has no control over these factors, similar conditions exist in Uganda, Rwanda, Burundi, and parts of Tanzania. Côte d'Ivoire does not have the same range of altitude, but rainfall varies widely between the semi-arid north and wetter south. In this respect, it is similar to other coastal West African nations, most notably Ghana and Cameroon.

Stability. Political and economic stability matter. Stability provides investors with the confidence that they will be able to reap the benefits of long-term investments. Although both Kenya and Côte d'Ivoire have had leaders whose tenure spanned decades, political stability should not be defined in terms of the duration of a given regime, but rather in terms of the durability of policies and economic institutions over time.

Non-intervention. The tendency of the Kenyan and Ivorian governments not to intervene directly in horticultural production and marketing is clearly an approach that can be (and is) emulated by other countries. The fresh fruit and vegetable sector is simply too diverse, too risky, and too fast-changing for state enterprises or marketing boards to play a constructive role. Kenya's earlier experience in promoting joint ventures between foreign companies and state enterprises is almost uniformly unsuccessful and serves as a counter-example. The most successful processed horticulture operation in Kenya has been Del Monte, which did not involve a partnership with a state enterprise.

Investment in agricultural research and extension. Both Kenya and Côte d'Ivoire have invested in horticultural research, developing institutions that have their roots in the colonial period. Although the contribution of horticultural research to the Kenyan and Ivorian horticultural sectors is not well documented, studies of the benefits of agricultural research almost invariably show high rates of return. The fact that horticulture often involves new crops or new varieties to satisfy a export market only increases the need for research and extension efforts. Disease control and post-harvest processing are also particularly important in the case of horticultural research. And new sanitary and phyto-sanitary requirements by importing countries create a demand for research into ways to reduce or eliminate pesticide residues and prevent the spread of horticultural pests.

Market exchange rate. Exchange rate policy is particularly important for horticultural exports. A market exchange rate provides greater incentives to produce exports (including horticultural exports). Furthermore, a liberalized market for foreign currency facilitates the purchase of imported equipment and inputs for production. This is more important for horticulture than for field crops because of the need for imported seed, agricultural chemicals, and specialized equipment. The positive response of Ivorian fruit exports to the 1994 devaluation of the CFA franc demonstrates this point.

Promoting institutional innovation. The Kenyan experience demonstrates the importance of allowing a variety of private institutions and marketing arrangements to develop. The early experience of Del Monte in Kenya shows that it takes more than experience and technical skills to survive in horticulture. It is necessary to continually experiment, innovate, and adapt to changing environments. The horticultural sector in Kenya is characterized by a wide array of institutional arrangements including smallholders selling

in spot markets, personalized relationships with traders, implicit contract, explicit contracts, farmer organizations, medium- and large-scale farming, and vertically integrated producer-exporters. Many commodity channels involve various scales of production and several types of farmer-buyer linkages. The government can play a role in facilitating institutional innovation through the provision of market information, extension services, mediation of disputes, and the establishment of standards.

Linking smallholders to high-value urban and export markets. Linking small farmers to high-value urban and export markets is an important strategy for raising rural incomes and reducing poverty. Such a strategy may also be critical for maintaining export competitiveness, at least for some labor-intensive crops that require careful husbandry. How can the government promote smallholder involvement? First, it should avoid leasing land at concessionary rates, subsidizing credit for mechanization, and providing tax incentives for agricultural investment, all of which subsidize the formation of large-scale capital-intensive farms. In some sectors, these farms will be more competitive anyway, but there is no rationale for favoring these farms through public policy. Second, the government should avoid counter-productive attempts to impose cooperative production, contract farming, nucleus estate production, or any other specific marketing system. Efficient market institutions should evolve out of experiments with different forms. Third, contract farming shows some promise for delivering improved technology, credit, and information to farmers, but such schemes only make sense with a crop that involves new technology, an uncertain market, a large initial investment, and/or specialized husbandry. Even in these cases, contract farming schemes often collapse when other buyers come to "poach" at harvest, allowing farmers to avoid repaying loans. The government can, however, facilitate linkages

between farmers and exporters or other buyers by helping to organize farmer groups, establishing ground-rules for farmer-buyer contracts, dissemination of lessons learned from successful contract schemes, establishing small-claims courts to address contract disputes, gathering and disseminating information about the past performance of buyers and farmers, and providing certification services to reduce the transactions costs faced by buyers trying to purchase from many small farmers.

Air transport sector. The importance of air-freight costs in the competitiveness of export horticulture indicates has implications for policy. The aviation industry is heavily protected in most parts of the world, with regulations controlling access by foreign carriers. Africa is no exception with its plethora of small and uneconomic national airlines. Adopting an open skies policy might endanger some of these national airlines, but it would probably introduce greater competition and reduce the cost of air freight. This would have a positive impact on the export of fresh produce and other high-value commodities.

Ethnic minorities. The positive contribution of the Asian traders to Kenya's horticultural development has lessons for other developing countries. Ethnic minority trading communities are a common feature across the world, from the Chinese in Malaysia to the Lebanese in West Africa. Given the suspicion and resentment that inevitably occurs on the part of the majority, special efforts are needed by the government to provide equal treatment under the law.

Investment in irrigation. Although public and private investment in irrigation has facilitated the growth of the horticultural sector, the implications must be drawn carefully. Large-scale public irrigation projects in Kenya and elsewhere in Africa have often proven to be uneconomic and unsustainable. Problems have arisen from the high cost of irrigation, the

lack of adequate feasibility analysis, and problems in managing and maintaining the system after completion. In the past ten years, most of the investment and increases in capacity in Kenyan irrigation have been carried in the private sector, by large-scale commercial farms and by groups of smallholders. The case studies discussed earlier provided several examples of farms that started horticultural production when they obtained a pump. This finding highlights the need for a competitive market for agricultural equipment, including water pumps. Given the externality issues associated with irrigation, the government has a role to play in facilitating the formation of water-user groups to regulate water use, organize maintenance, and resolve disputes. In addition, the government can fund research and dissemination activities to stimulate innovation, particularly in micro-irrigation technology.

Contract enforcement. Although disputes in contract farming arrangements will never be avoided completely, the experience of Kenya (and other countries) indicates that there may be a role for the government in enforcing contracts between buyers and growers, or at least in mediating the disputes between them. Developing new institutional arrangement that would facilitate the enforcement of contracts would contribute significantly to the more-widespread use of contract farming and would expand the participation of small farmers in high-value horticultural production and export. Although the costs of enforcing each contract may be prohibitively high, there may be scope for better record-keeping to identify and exclude farmers that have violated contracts in the past. In the short run, this would protect the interests of buyers, but in the long run it would increase the availability of credit and other forms of assistance for farmers.

Clearly, the development of export horticulture depends in part on geography, historical accident, and agro-climatic factors. Because of these factors, some countries do

not have the potential for large-scale horticultural development even with the best policies and investment. Many of the factors that have contributed to the success of the horticultural sectors in Kenya and Côte d'Ivoire are, however, subject to influence through policy, regulation, and public investment. Furthermore, most of the lessons derived from the Kenyan and Ivorian examples make sense for the development of commercial agriculture, regardless of whether or not horticulture is involved.

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